Mind the Gap

The size and costs of pay differentials between the public and private sectors in the UK

Matthew Oakley

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Corresponding author: matthew.oakley@policyexchange.org.uk

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Data used for analysis in this paper are:

Office for National Statistics. Social Survey Division, Annual Population Survey, January 2010 - September 2011 [computer files]. Colchester, Essex: UK Data Archive [distributor], February 2012. SN: 6950, SN: 7004, SN: 6897, SN: 6801.

Department for Communities and Local Government, English Housing Survey, 2009: Housing Stock Data [computer file]. Colchester, Essex: UK Data Archive [distributor], July 2011. SN: 6804, http://dx.doi.org/10.5255/UKDA-SN-6804-1.

Abstract

This paper considers how public and private wages differ in local areas. It extends the UK literature in two key ways. First it uses the Special License version of the Annual Population Survey to allow wage differentials to be identified using quantile regression estimation at a Local Authority level with the most up to date data available. This approach demonstrates a complex picture of mismatches between the wages one might expect individuals to receive based on their characteristics and types of job, and the public sector wages they receive: pay differentials vary dramatically both across and within regions and across the pay distribution. Secondly, this paper puts forward tentative estimates of the overall value of the pay differentials in order to inform discussion over how much it would cost or save, should differentials be reduced, ceteris paribus, over time. These results are also split by region. Total costs are found to be sensitive to whether or not other factors, such as pension entitlements, are accounted for.

Background

The UK labour market is characterised by differing local experiences. The decline of the manufacturing base throughout the latter half of the 20th Century and a sectoral shift towards the service sector and, in particular, the financial services sector, has left some regions and localities in the UK particularly weak. This is reflected both in labour market activity and in costs of living in these areas.

Employment rates currently vary from between 74.9% in the South East and East of England and 66.6% in the North East (ONS, 2012). In some regions the proportion of working age adults claiming benefits for sickness or disability stands at 9.4% (McInnes, 2012) and over 25% of households do not have any household members in work (25.7% in the North East, compared to 14.5% in the South East) (ONS, 2012).

The costs of living also vary between different regions. Perhaps the most startling difference can be seen in house prices and the associated rental costs, with the median price in 2009 of a two bed

property in the North East standing at £92,000 while in London the equivalent property has a median price of £215,000.[1] A recent report from the UK's Office for National Statistics (ONS) also revealed differences in the prices of goods and services across the UK. ONS (2011) found that Relative Regional Consumer Price Levels (where the UK = 100) were as high as 107.9 in London and as low as 97 in Yorkshire and the Humber.

These variations are even greater when we consider lower level geographic areas. Employment rates currently stand at 84.7% in East Northamptonshire, while they are 47.3% in the City of London and 54.7% in Middlesbrough. Unemployment in the London Borough of Newham stands at 15.2% while in South Lakeland in Cumbria it is 3.5%. Claims of benefits for sickness or disability stand at 16.8% of the working age population in Glasgow East, while they are 2.1% in North East Hampshire (McInnes, 2012).

However, despite these varied local labour and product markets, public sector wages in the UK are largely negotiated at a national level. In part, this is a story of Trade Union activity in the public sector. In common with other developed countries, union density has fallen dramatically in recent decades. In 1997 32.5% of the UK workforce were trade union members, this figure now stands at 26% and the historical fall is even greater. However, these figures hide disparities between the public and private sectors. Union density still stands at 56.5% in the public sector workforce and although this only accounts for around 3.9 million workers, a recent report (Wolf, 2010) has estimated that as many as five million public sector workers are still covered by collective agreements that are set nationally.

This raises a question of the impact of this approach to pay negotiation. A number of reports (see Oakley, 2011) have highlighted the potential for the combination of locally varied labour markets and a national pay negotiation structure to lead to individuals in some areas being over-paid relative to the private sector while in other areas individuals are under-paid compared to the private sector.

Other reports have highlighted the potential for public services to suffer. For instance, Bozio and Disney (2011) show that NHS vacancy rates vary substantially across the country and, in turn,

[1] Authors own calculations from *English Housing Survey 2008/9*. Department for Communities and Local Government, *English Housing Survey, 2009: Housing Stock Data* [computer file]. Colchester, Essex: UK Data Archive [distributor], July 2011. SN: 6804, http://dx.doi.org/10.5255/UKDA-SN-6804-1.

Propper and Van Reenen (2010) show that problems with recruitment which lead to an above average use of agency staff can be linked to worse hospital outcomes in terms of quality and productivity. They highlight that these falls in quality and productivity result in more deaths.

It is for these reasons that in November 2011, the UK Chancellor of the Exchequer asked the Pay Review Bodies in charge of making recommendations on public sector pay to consider ways in which pay could be made '...more market facing in local areas' for a number of key public sector workforces.[2]

It is with this in mind that this paper considers how public and private wages differ in local areas. It extends the UK literature in two key ways. First, it uses the Special License version of the Annual Population Survey to allow wage differentials to be identified using quantile regression estimation at a Local Authority level with the most up to date data available. This approach demonstrates a complex picture of mismatches between the wages one might expect individuals to receive based on their characteristics and types of job, and the public sector wages they receive: wage differentials vary dramatically both across and within regions and across the pay distribution. Secondly, this paper puts forward tentative estimates of the overall value of the wage differentials in order to inform discussion over how much it would cost or save, should differentials be reduced, ceteris paribus, over time. These results are also split by region.

The first section below reviews the existing literature and highlights the gaps that this paper addresses. The next section outlines the data used and then sets out our empirical strategy before the final two sections discuss the results from our empirical estimation and summarise the conclusions we draw.

[2] Specifically, this is limited to NHS workers on the 'Agenda for Change' pay scales, schoolteachers, operation prison staff, senior civil servants and very senior managers in Special Health Authorities and NHS Executive NDPBs. It explicitly excludes doctors, dentists and the Armed Forces. http://www.ome.uk.com/Article/Detail.aspx?ArticleUid=1fb5693f-71c7-4619-bf9f-79353b89925e and George Osborne, letters to the Pay Review Body Chairs, 7th December 2011, http://www.ome.uk.com/Article/Detail.aspx?ArticleUid=dfd0267d-9c7d-421b-80ba-71db9232f4b9, http://www.hm-treasury.gov.uk/tax_pay_index.htm

Related Literature

There are a number of ways in which one might attempt to estimate differentials between public and private sector pay. The most obvious would be to attempt to compare pay packages in otherwise identical jobs in the private and public sector. However, as numerous reports have highlighted (IDS, 2011; Disney, 2007), meaningful comparison can be constrained by the lack of equivalence between jobs in the public and private sector. For instance, with the public sector operating a large portion of the delivery of health care, education and policing across the UK it is sometimes difficult to find appropriate comparators.

This means that those who have adopted this approach have tended to utilise the UKs Annual Survey of Hours and Earnings (previously the New Earnings Survey) and have used "raw" comparisons of mean or median wages on aggregate or across broad occupational groups. The findings of such analysis tend to show that public sector employees receive higher pay both overall and in a large number of these groups. Disney and Gosling (1998) use data from the New Earnings Survey to show that, in 1994, there was a pay premium for employees in the public sector of around 12% for males and 20% for females. More recent evidence (Emmerson & Jin, 2012) shows that the raw differential stood at around 20% for males and 28% for females (2009/2011) and Holmes & Oakley (2010) use the 2010 Annual Survey of Hours and Earnings to show that of 288 comparable categories of worker in the public and private sector, around 58% (167) had higher pay in the public sector.

Both Emmerson and Jin (2012) and Holmes & Oakley (2011) recognise another constraint to using this approach. That is that the public and private sectors also have workforces that vary in their composition. This is key because there is a large body of research based on assessing the differences in pay one might expect from observed differences in characteristics across different individuals. An eloquent summary can be found in Willis (1986). Key determinants of pay at the individual level can be summarised by the accumulated level of general and specific human capital. In an empirical setting, these are often proxied by accounting for factors such as age, gender, formal qualifications, job tenure and experience.

Once we compare the private and public sectors based on these factors, it becomes clear that we might expect a differential: on average, public sector employees are better educated, older and have been employed for longer.

As well as individual characteristics, job characteristics are also important. Pay will vary with the number of hours undertaken and factors such as how enjoyable / rewarding the job might be, how dangerous it is, whether it is permanent or temporary and at what time of day the job is undertaken. Differences in these factors will lead to compensating differentials (Rosen, 1986) which are required to encourage employees to undertake the work. For example, one might expect two identical individuals to be paid different amounts if one was undertaking risky work at unsociable hours.

This means that, while comparing differences in simple averages shows a positive pay differential, we might expect the existence of these differentials because of the characteristics of the two workforces and the work they undertake. The true challenge is to assess how much of the differential remains once these characteristics are accounted for. As Disney and Gosling (1998) state, we must ask '...what a public sector worker, taken at random, would lose or gain by obtaining a job in the private sector?'

When attempting to answer this question, a number of reports have found that the raw differential is significantly reduced. After controlling for age, region, qualifications and years of education, Emmerson and Jin (2012) find the public premium to be 5.5% for males and 11.3% for females. The UK's Office for National Statistics employ similar techniques and finds an average premium of 7.8% (ONS, 2010) and Oakley (2011) finds an average (median) premium of 8.8%. All of these findings coincide with (Lucifora & Meurs, 2004, p.9.) who summarise the existing UK literature to find that '...the average differential controlling for standard human capital variables is close to 5%, although it is much higher for females (15-18%) as compared to men (2-5%).'

There are a number of reasons why these premia and penalties might exist. Disney (2007) provides a thorough overview. As well as differential worker characteristics and occupational composition, key factors include the presence of incentive-based pay; worker selection (preferences for public versus private sector employment); and the bargaining process that underpins wage determination.

On this final point, a closely related literature to that of public sector pay differentials is that which attempts to estimate whether Trade Union membership confers a financial benefit on those who are members or those covered (directly and indirectly) by Trade Union collective agreements. A long history of research in this area has shown that identification of the impact is complicated by sample selection, measurement error and a number of other econometric issues, however, studies

attempting to tackle these issues (Jakubson, 1991; Card, 1996) have tended to find significant positive wage premiums arising from trade union membership.

This is particularly relevant to the public sector in the UK where, although union coverage has fallen over time, it is still far more heavily unionised than the private sector. Thus, if one were to find that Trade Union membership did confer financial benefits, in the case of the UK, we would also expect to see a public sector pay premium on average.

The existing literature also considers whether pay differentials might vary across the wage distribution. This is motivated by the fact that one can easily imagine reasons why potential differences between public and private sector wages might vary in a systematically different manner at different parts of the wage distribution. Recent policy decisions give clear examples of why this might be the case. First, following the recent recession, the UK Government took action to limit public expenditure and, as part of this, the wages of public sector workers were frozen for 2011/12 and 2012/13. However, those earning less than £21,000 a year were excluded from this pay freeze and given a yearly pay increase of £250. At the other end of the pay distribution, there has been a continued debate in the UK about wages of top-ranking public servants. This debate led the Government to announce that any appointments made where the appointees' salary was to exceed that of the Prime Minister (£142,500 at the time) had to be agreed directly by the Chief Secretary to the Treasury.

At the bottom of the income distribution it seems unlikely that employees in the private sector would have enjoyed an exemption from pay policy affecting the rest of the workforce and at the top of the income distribution, it is also unlikely that senior managers in the private sector would have their pay limited by arbitrary caps rather than having a benefits package that reflected supply and demand in the market.

To address this point a number of studies employ quantile regression estimation (Koenker & Hallock; 2001) to estimate pay differentials at different quantiles of the wage distribution. Lucifora and Meurs (2004), Disney and Gosling (1998), Emmerson & Jin (2012) and Oakley (2011) all find that public sector pay premiums are at their highest at the bottom of the wage distribution. Emmerson & Jin (2012) find that the average premium stands at around 16% for public sector workers at the 10^{th} percentile of earnings, while it is negative for men (but not statistically significantly different from zero) at the 90^{th} percentile of the distribution.

The level at which negotiation of wages in the public sector takes place can also lead to pay differentials. This is because, although recent reforms in the UK have attempted to introduce more local flexibility in certain areas (for example, for Academy Schools and some NHS Foundation Trusts), the predominant way in which wages are negotiated in the public sector is still through national collective agreements. A recent report has suggested that these agreements cover as many as five million public sector workers in England alone (Wolf, 2010) and that they do little to address the differences in local labour markets in terms of costs of living or labour supply. This means that in high-cost areas we might expect private sector wages to exceed those in the public sector as the private sector can flex wages to take account of high costs. Conversely, in low cost areas, private sector employers are able to pay less to attract workers, while the public sector is tied to nationally negotiated pay levels. This suggests that public sector differentials might exist and that we might expect them to be very different in different geographic areas: in low cost areas we would expect a public sector premium, while in high-cost areas we might expect a penalty.

The existing literature also provides evidence of this occurring in practice. Emmerson and Jin (2012) find public sector pay differentials for men in London, the North and North West that are less than 5% and not statistically different from zero. Conversely, for females in Wales, Scotland and the North, the public premium stood at between 15% and 20%. As part of their evidence to the public sector Pay Review Bodies HM Treasury (2012) used slightly more detailed geographical groupings and found that the average pay premium for males and females varied from being slightly negative in the South East to reaching 20% in 'Rest of Yorkshire and Humber'.

However, a major gap in the existing literature is that differentials have not been estimated at a geographical level lower than sub-region. If we believe in the theory of compensating differentials (Rosen, 1986), this point could be important since differential pay might be needed to attract workers to different parts of a particular region (Wolf, 2010). For instance, private sector employers may use wage flexibility to encourage people to work in less attractive areas in a particular region. This means that we might expect wage differentials to vary within regions, as well as across regions.

This paper addresses this gap in the existing UK literature to estimate public sector pay differentials at the Unitary Authority/Local Authority level. It combines this with the existing approach of estimating these differentials at different points of the wage distribution, using quantile regression estimation.

Once these estimations have been made, it is possible to approximate the total cost or saving associated with the differential pay rates in the public and private sector. In other words, how much Government expenditure would differ to the current case if they were to pay wages equivalent to those in the private sector. This is complicated by the fact that the APS does not have an income weight (to account for under-reporting of earnings) and because of biases, described later, in the reporting of wages (hourly), earnings (weekly) and weekly hours. For these reasons it is difficult to make firm conclusions over the exact numbers involved and this would be a good place for further research to focus. However, assessing whether removing differentials between public and private pay results in a cost or a saving to Government is particularly important in the context of both the UK Government's ongoing desire to tackle the budget deficit and to localise pay negotiation. For this reason, this paper uses a straightforward methodology to put a tentative figure on the potential costs of equalising pay in the public and private sectors.

It also considers the complicating factor that we might be concerned by the presence of discrimination, where an individual from a certain demographic group might receive lower wages than an otherwise identical individual not in the same demographic group. Altonji and Blank (1999) provide a good summary of the literature for such discrimination based on gender and race.

In terms of recent UK evidence, Chatterji et al (2010) highlight that, in the UK in 2004, the gender wage gap in the private sector was three times larger than in the public sector. They also show that, in both the public and private sectors, the majority of the raw gender wage gap remains unexplained. While they argue that this fact suggests that equal pay legislation in Britain has not been completely effective in either the private or public sectors, they also highlight that the Gender Equality Duty (2007) leaves the potential for the unexplained portion in the public sector to fall. The duty came into force in 2007 and placed a legal requirement on all public authorities, 'to have due regard to the need (1) To **eliminate unlawful discrimination** and harassment on the grounds of sex, and (2) To **promote equality of opportunity** between women and men.'[3]

This is particularly relevant in the context of the public sector pay premium since, if any discrimination were present in the private sector, but not in the public sector, a positive pay differential would be expected for the average female in the public sector. However, this premium

[3] http://www.equalityhumanrights.com/

would represent an absence of discrimination, rather than a difference in the rewards for human capital or compensating differentials. This makes it important to account for this in our empirical strategy, which we will return to later.

Another gap in the literature is a lack of analysis which considers the total reward differentials between the public and private sectors. This stems from a lack of available, comparable data on the value of employer's pension contributions, annual leave allowances and other non-financial fringe benefits such as access to private health care or discount schemes. Analysis of these factors is beyond the scope of this paper. Until further analysis is conducted into non-wage reward, the results in this paper should be viewed in the context of the other aspects of reward that are unequal between the public and private sectors.

Empirical Strategy

This paper follows the approach of Lucifora and Meurs (2004) and Emmerson and Jin (2012) to conduct a quantile regression estimation of the public sector pay differential. However, using the Special License version of the Annual Population Survey[4] allows us to estimate differences between hourly wages in the public and private sector at a much lower geographical level than has been previously reported. Other studies (IFS, 2012; HM Treasury, 2012), have shown significant variation across regions in the UK, however, given the differing labour market experiences of different areas within regions, we might also expect to observe differences between the observed premia or penalties within regions. To do this we assess differences first at the national level, then at the regional level and finally at the Unitary Authority / Local Authority level in the UK.

Our general approach is to use a standard Mincerian wage equation, with the dependent variable being the log of hourly wages and the variables of interest with regards the public sector differential are then a public sector dummy:

$$Public_{it} = \begin{cases} 1 \; if \; individual \; i \; is \; employed \; in \; the \; public \; sector \; at \; time \; t \\ 0 \; if \; individual \; i \; is \; employed \; in \; the \; private \; sector \; at \; time \; t \end{cases} \quad (1)$$

[4] Office for National Statistics, Social and Vital Statistics Division, Annual Population Survey, 2004 — 2011 . Colchester, Essex: UK Data Archive [distributor].

and interaction dummies between this public sector dummy and dummies for gender and Unitary Authority / Local Authority.

Thus, we have:

$$lnY_{it} = \alpha + \delta_k X_{kit} + \beta Public_{it} + \gamma Public_{it}.Male_i + \sum_{n=1}^{N} \theta_n Public_{it}.LA_{itn} \quad (2)$$

Where X_{kit} is a vector of *k* explanatory variables used to control for age and its square, gender, highest qualification obtained, Unitary Authority / Local Authority of residence, whether the individual works full or part time, whether the job placement is permanent or temporary and individual job tenure (length of time in current employment).

The use of quantile regression allows us to address a key econometric issue considered above that estimation through Ordinary Least Squares allows the econometrician to estimate models of the conditional mean of the dependent variable but might not give a full description of the relationship of interest. This is because, just as the mean is not a full description of the distribution of a random variable, a model of the conditional mean does not fully describe the relationship between random variables. By using such techniques we are assuming that changes in each covariate shift the entire distribution of the dependent variable by a given amount (Koenker, 2003) which, in some situations, seems rather unrealistic.

For these reasons it is important to assess whether pay differentials between the public and private sector are different at different parts of the income distribution.

To do this quantile regression techniques can be used to estimate a "family of conditional quantile functions" (Koenker & Hallock, 2001). Following Buchinsky (1998) and Koenker and Hallock (2001) we estimate the conditional τ^{th} – quantile function by minimising a sum of asymmetrically weighted absolute residuals. Thus, if we simplify equation (1) to:

$$Y = X\beta + u \quad (3)$$

and instead of assuming, as we do in OLS, that the expected value of u conditional on the covariates, X, is zero, we assume that the τ^{th} quantile of the error term, u, conditional on the regressors, X, is zero then the τ^{th} conditional quantile of Y can be written:

$$Q_\tau(Y|x) = x\beta_\tau \quad (4)$$

and it can show that β solves:

$$\min_b E[\tau(Y - xb).1(Y - xb \geq 0|x) + (1 - \tau)(Y - xb).1(Y - xb \leq 0|x)] \quad (5)$$

therefore allowing us to penalise errors non-symmetrically. We can write this more succinctly, as:

$$\beta = argmin_{\beta \in \mathbb{R}^p} E[\rho_\tau(Y - x\beta)] \quad (6)$$

where $\rho_\tau(\cdot)$ is the check function.

Buchinsky (1998) progresses from here to show that β_τ can be estimated separately for each quantile of interest, easing computation by avoiding the need to estimate the quantiles simultaneously. For regressions using higher-level geographical regions, simultaneous computation is undertaken. However, because of computation difficulties when accounting for Unitary / Local Authority level variation, the individual approach of Buchinsky is adopted for the quantiles, $\tau \in$ (10, 25, 50, 75, 90).

One practical problem with quantile regression is the computation of standard errors with which to undertake valid inference. A number of sources discuss this matter in detail (see Buchinsky, 1998; Koenker, 2005; Rogers, 1992; Hahn, 1995) and show that different methods may be employed. However some of these methods rely on asymptotic results and strict assumptions on the presence of (for example) homoskedasticity (Rogers, 1992). We follow the analysis in Buchinsky (1998) and Rogers (1992) and use the bootstrap method, which performs better in the presence of heteroskedasticity and finite samples.

Cost of the differentials

To estimate a plausible value for the change in Government expenditure that might occur if public sector workers were paid in an equivalent fashion to private sector workers, we employ a reasonably simplistic approximation. Each of the coefficients on the dummies in equation (2) can be interpreted as the percentage change in hourly wages where the dummy variable is equal to one. This means that after calculating coefficients using the quantile regression estimation above, we simply create a variable, Y*, that represents a wage variable that each public sector worker would receive according to their position in the wage distribution, gender and region[5]:

$$Y_{it}^* = Y_{it} - \left(\beta Public_{it} + \gamma Public_{it}.Male_i + \sum_{n=1}^{N} \theta_n Public_{it}.gor_{itn} \right).Y_{it} \quad (7)$$

[5] Note that here we use region as the geographical level for sample size reasons outlined later.

In short, it is each public sector worker's wage adjusted for the pay differential they experience, as estimated in the model.

The difference between this imputed wage and their actual wage is then taken and multiplied by the number of hours a week they report that they work. These weekly differences are then summed across the weighted sample to give a total weekly figure, which can then be used to obtain an estimate of the yearly costs or savings.

Accounting for potential discrimination

As outlined above, there are reasons to believe that there is a gap between male and female wages in both the public and private sector and that, at least part of this variation, might be attributed to discrimination. Since we are interested in the difference between public sector and private sector wages that is unaccounted for and that is, arguably, a market failure, we want to exclude the impact of discrimination. The reason for this is that if levels of discrimination were different in the public and private sector, we would see a public sector differential, but this would be simply a difference in the incidence of discrimination rather than a difference in 'pure' pay differential.

To deal with this issue adequately is beyond the scope of this paper. However we employ a simple adjustment to assess the possible size of such impacts and to attempt to quantify whether a differential might exist after accounting for differences in discrimination between the public and private sectors.

This involves estimating a model for both the private and public sectors which attempts to measure the basic differences between hourly wages for males and females:

$$lnY_{it}|_{Public=1} = \mu + \theta_k X_{kit} + \phi Female_i + \rho fulltime_{it}.Female_i \quad (8)$$

$$lnY_{it}|_{Public=0} = \alpha + \delta_k X_{kit} + \beta Female_i + \gamma fulltime_{it}.Female_i \quad (9)$$

Where, the variable $Female_i$ is equal to unity if individual, *i*, is female and zero otherwise. The variable $fulltime_{it}$ is equal to unity if individual *i* is working fulltime in time *t*. It is equal to zero otherwise. The vector X_{kit} is the same set of explanatory variables as outlined in equation (2) above.

Again this is undertaken using quantile regression. The coefficients derived from the estimation of (8) and (9) are then used to create an adjusted wage, Y^{F*}, for each female to account for differences in gender pay gap in both the public and private sector at different points in the wage distribution:

$$Y_{it}^{F*}|_{Public=1} = Y_{it} - \left(\phi Female_i + \rho fulltime_{it}.Female_i\right).Y_{it} \quad (10)$$

$$Y_{it}^{F*}|_{Public=0} = Y_{it} - \left(\beta Female + \gamma fulltime_{it}.Female_i\right).Y_{it} \quad (11)$$

The new variable, Y_{it}^{F*}, is then used in the estimation of equation (2) through quantile regression to assess the public sector pay differential.

Under the assumption that at least some of the gender pay gap in the public and private sector is due to explainable, but otherwise unobserved, characteristics we can bound the result (in the absence of discrimination) for the female differential, as we know that we are accounting for too much.

The Data

The Annual Population Survey (APS) is a representative survey of individuals across the UK that has been running since 2004. It combines results from the Labour Force Survey with the LFS Boosts in order to allow the production of reliable estimates at the Unitary / Local Authority level, each dataset contains around 340,000 individuals. We use pooled data covering the period from January 2010 to September 2011 in order to further boost sample size. Individuals are selected such that they only appear once in the final dataset, in order not to introduce bias.

For analysis of the total cost or savings that would arise from equalising pay differentials, we only use data from the most recently available APS, October 2010 – September 2011. This is to ease computation of the weighted costs, as using the pooled data would require a re-weighting exercise that is beyond the scope of this paper.

The measure of pay we use is the natural log of reported hourly wages. This is not an ideal measure. Previous studies have shown the difficulties with using the measure of hourly wages from the Labour Force Survey (Manning & Dickens, 2002; Stuttard & Jenkins, 2001) that arise from measurement error. These include that those paid salaries (monthly) rather than wages (hourly) may struggle to compute hourly wages effectively and that reporting of hours, from which this hourly variable can be computed, suffer from recall error.

One alternative could be to use weekly, rather than hourly pay. However, an hourly measure does seem appropriate for our purposes. Weekly or monthly wages would suffer from similar problems

with the reporting of hours. For instance, it would be hard to distinguish the effects of a different distribution of hours between the public and private sectors from a different distribution of pay. In other words, pay might be higher in the public or private sector because of longer working hours, not because of unequal reward policy, and we would be unable to distinguish the two. This would lead to a biased estimate of the public sector pay differential.

The major problem with using the hourly pay variable is also that the distribution of wages is biased by the measurement error. Thus, under the assumption that measurement error is random and unrelated to membership of either the public or private sector, it is unlikely that this would affect our results.

To identify sector we use the self-reported public sector variable. We then interact this with gender and Local Authority to obtain pay differentials across different localities for both males and females.

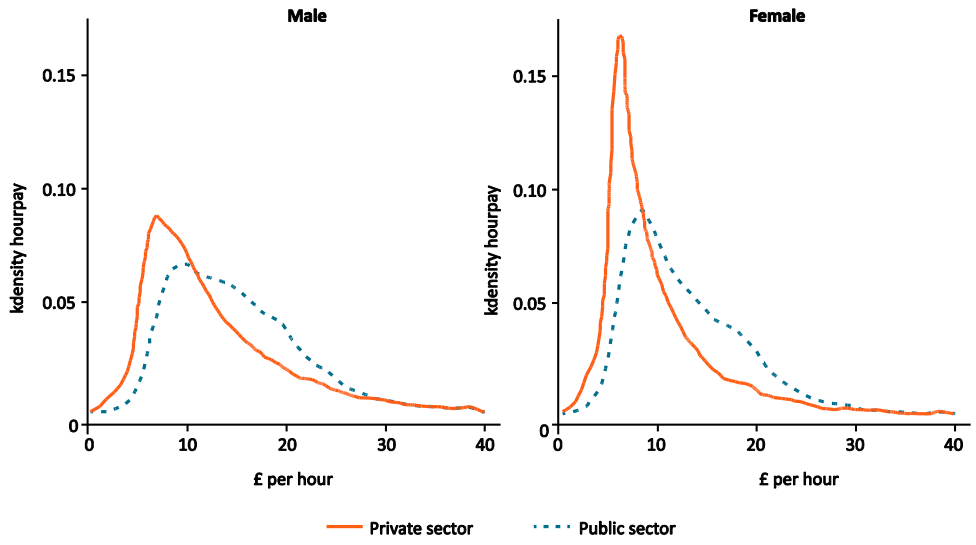
Results

Table 1 displays descriptive statistics for the sample used in the regression analysis, split by those employed in the private and public sector. We see that those employed in the public sector are, on average: older (with mean age of just under 44 years compared to a private sector mean of just over 40 years); less likely to be in full time work (69% compared to 74% in private sector); more highly qualified (with 55% having a degree level qualification or higher, compared to just 31% in the private sector); more likely to be female (33% of public sector employees are male compared to 54% in the private sector); and more likely to have been with their current employer for longer (44% had spent over five years with their current employer, compared to 28% in the private sector).

Table 1: Characteristics of the APS sample								
	Private sector				Public sector			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Log of hourly pay	2.313	0.607	-3.912	8.345	2.514	0.502	-1.966	7.902
Full time	0.739	0.439	0	1	0.694	0.461	0	1
Up to a year in job	0.164	0.370	0	1	0.078	0.268	0	1
1-5 years in job	0.200	0.400	0	1	0.220	0.414	0	1
5-10 years in job	0.282	0.450	0	1	0.440	0.496	0	1
Over 10 years in job	0.002	0.040	0	1	0.001	0.038	0	1
Job is permanent	0.950	0.219	0	1	0.926	0.262	0	1
Age	40.387	12.573	16	64	43.860	10.828	16	64
Male	0.544	0.498	0	1	0.329	0.470	0	1
No qualifications	0.053	0.224	0	1	0.024	0.152	0	1
Low qualifications	0.346	0.476	0	1	0.226	0.419	0	1
High qualifications	0.312	0.463	0	1	0.550	0.497	0	1
N	98,859				46,952			

We also see that mean hourly wages are higher in the public sector. Figure 1 demonstrates this point more comprehensively by plotting the kernel distribution of hourly pay for males and females in the public and private sector.

Figure 1: Kensal density plot of hourly pay (APS 2010-2011)



Given the greater qualifications and longer job tenure of public sector workers, this finding is unsurprising. This makes it important to control for these factors.

Results by region

Table 2 displays results from the estimation procedure outlined above, at the regional level. Table 3 shows the overall pay differentials by sex and region from these results. It shows that the size of public sector hourly pay differentials, after accounting for human capital and job type factors, vary significantly between males and females and across regions of the UK. The results suggest that, at the bottom of the wage distribution, males and females experience a similar differential. These vary from around 12% in the North East, West Midlands and the East of England to around 21% in London.

The result that London has the highest public sector premium at the bottom of the wage distribution is surprising given that it is a high cost area and the expectation that the private sector has the ability to increase wages in response to a higher cost of living. This would imply that we might expect to see a public sector penalty (or at least a smaller premium than in other regions) for those in London.

Table 2: Results (coefficients) from quantile regression estimation of public sector pay differentials at regional level										
	Quantile									
	q10		q25		q50		q75		q90	
	Coefficient	P>|t|	Coefficient	P>|t|	Coefficient	P>|t|	Coefficient	P>|t|	Coefficient	P>|t|
Public sector dummies										
Public sector	0.117	*0.000*	0.111	*0.000*	0.113	*0.000*	0.062	*0.000*	0.018	*0.169*
Public sector male	0.005	*0.428*	-0.028	*0.000*	-0.054	*0.000*	-0.052	*0.000*	-0.035	*0.000*
Public sector and North West	0.020	*0.220*	0.012	*0.302*	-0.013	*0.294*	-0.005	*0.685*	-0.020	*0.249*
Public sector and Merseyside	0.027	*0.317*	0.023	*0.183*	-0.014	*0.405*	0.019	*0.261*	-0.003	*0.919*
Public sector and Yorkshire & the Humber	0.057	*0.001*	0.019	*0.170*	0.011	*0.360*	0.030	*0.029*	0.004	*0.794*
Public sector and East Midlands	0.024	*0.190*	0.017	*0.198*	-0.007	*0.622*	-0.028	*0.030*	-0.029	*0.167*
Public sector and West Midlands	-0.001	*0.947*	-0.001	*0.954*	0.004	*0.759*	-0.002	*0.892*	0.027	*0.155*
Public sector and East of England	-0.002	*0.933*	-0.013	*0.292*	-0.064	*0.000*	-0.074	*0.000*	-0.121	*0.000*
Public sector and London	0.093	*0.000*	0.042	*0.001*	-0.063	*0.000*	-0.122	*0.000*	-0.184	*0.000*
Public sector and South East	0.008	*0.588*	-0.045	*0.000*	-0.116	*0.000*	-0.148	*0.000*	-0.209	*0.000*
Public sector and South West	0.018	*0.283*	0.000	*0.993*	-0.020	*0.127*	-0.042	*0.002*	-0.086	*0.000*
Public sector and Wales	0.047	*0.006*	0.046	*0.000*	0.031	*0.014*	0.055	*0.000*	0.057	*0.001*
Public sector and Scotland	0.062	*0.000*	0.050	*0.000*	0.007	*0.561*	-0.003	*0.801*	-0.031	*0.068*
Public sector and Northern Ireland	0.053	*0.028*	0.043	*0.041*	0.011	*0.557*	0.052	*0.041*	0.117	*0.001*
Job type and tenure										

Job is full time	0.180	*0.000*	0.185	*0.000*	0.171	*0.000*	0.147	*0.000*	0.113	*0.000*
Up to a year in job	-0.072	*0.000*	-0.062	*0.000*	-0.061	*0.000*	-0.058	*0.000*	-0.052	*0.000*
1-5 years in job	0.070	*0.000*	0.078	*0.000*	0.079	*0.000*	0.073	*0.000*	0.063	*0.000*
5-10 years in job	0.171	*0.000*	0.191	*0.000*	0.195	*0.000*	0.189	*0.000*	0.153	*0.000*
Over 10 years in job	0.040	*0.588*	0.052	*0.096*	0.058	*0.188*	0.081	*0.073*	0.006	*0.914*
Job is permanent	0.131	*0.000*	0.088	*0.000*	0.042	*0.000*	-0.005	*0.358*	-0.058	*0.000*
Age and sex										
Age	0.048	*0.000*	0.045	*0.000*	0.049	*0.000*	0.059	*0.000*	0.070	*0.000*
Age squared	-0.001	*0.000*	-0.001	*0.000*	-0.001	*0.000*	-0.001	*0.000*	-0.001	*0.000*
Male	0.112	*0.000*	0.134	*0.000*	0.162	*0.000*	0.191	*0.000*	0.220	*0.000*
Qualifications										
No qualifications	-0.188	*0.000*	-0.220	*0.000*	-0.284	*0.000*	-0.341	*0.000*	-0.368	*0.000*
Low qualifications	-0.094	*0.000*	-0.112	*0.000*	-0.134	*0.000*	-0.147	*0.000*	-0.151	*0.000*
High qualifications	0.203	*0.000*	0.293	*0.000*	0.377	*0.000*	0.410	*0.000*	0.422	*0.000*
Other controls										
Region dummies	*Yes*		*Yes*		*Yes*		*Yes*		*Yes*	
Quarter dummies	*Yes*		*Yes*		*Yes*		*Yes*		*Yes*	
Missing variable dummies	*Yes*		*Yes*		*Yes*		*Yes*		*Yes*	
Constant	0.404	*0.000*	0.666	*0.000*	0.831	*0.000*	0.919	*0.000*	0.989	*0.000*

Table 3: Estimates of public sector hourly wage differentials by region, gender and quantile of estimation (% difference in hourly pay in public sector)										
	Male					**Female**				
	Quantile					Quantile				
Region	10	25	50	75	90	10	25	50	75	90
North East	12.23	8.32	5.89	1.00	-1.63	11.73	11.07	11.26	6.17	1.83
North West	14.22	9.55	4.60	0.51	-3.65	13.72	12.30	9.97	5.68	-0.19
Merseyside	14.95	10.59	4.51	2.86	-1.90	14.45	13.35	9.87	8.03	1.56
Yorkshire & the Humber	17.98	10.24	7.02	4.02	-1.18	17.47	13.00	12.39	9.19	2.28
East Midlands	14.61	9.97	5.24	-1.76	-4.51	14.11	12.72	10.61	3.42	-1.05
West Midlands	12.11	8.23	6.30	0.81	1.10	11.60	10.99	11.66	5.98	4.55
East of England	12.08	7.05	-0.50	-6.35	-13.77	11.58	9.81	4.87	-1.18	-10.31
London	21.56	12.54	-0.39	-11.25	-20.04	21.06	15.29	4.98	-6.08	-16.59
South East	13.07	3.86	-5.70	-13.75	-22.57	12.56	6.61	-0.34	-8.58	-19.11
South West	14.01	8.31	3.85	-3.20	-10.25	13.50	11.06	9.21	1.97	-6.79
Wales	16.94	12.94	8.95	6.54	4.08	16.44	15.70	14.31	11.72	7.54
Scotland	18.48	13.32	6.55	0.71	-4.73	17.97	16.07	11.92	5.88	-1.27
Northern Ireland	17.56	12.61	7.04	6.23	10.04	17.05	15.36	12.41	11.40	13.50

This smaller premium for London is what we find when we move to results for the 50th percentile, where the premium has disappeared for males and stands at just 4.98% for females, compared to a UK average of around 4% for males and 9.5% for females. Further up the wage distribution, we begin to see wage penalties for public sector employees, with public sector males in the East of England, South East and London all experiencing statistically and economically significant pay penalties at the 75th percentile (6.35%, 11.25% and 13.75% respectively). Females in these regions see smaller pay penalties. In other regions, significant pay premiums exist for both males and females. These are as high as 13.5% at the 90th percentile for females in Wales (10% for males).

Statistical tests of the difference between the key variables (notably *Public* and *Public.Male*) at the 10^{th}, 50^{th} and 90^{th} percentile strongly reject the null hypothesis that the coefficients are equal.

The same approach is taken to identify wage differentials by sub region. Table 4 shows the differentials estimated at the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} percentiles. Again, it shows large variation across different sub regions, but perhaps the most interesting factor is that we observe large variation in the results compared to the larger regional areas used in Table 3.

For example, Table 3 shows a wage penalty of around 6% for females at the 75^{th} percentile of the wage distribution and living in London. However, when we split this into Outer London and Inner London in Table 4, we see the equivalent penalty falls to 1.6% in Outer London while it rises to around 14% in Inner London. While differences between sub-regions in other regions are smaller, it is clear that the moving to a lower geographical level adds greater detail to the results that we find.

Table 4: Estimates of public sector hourly wage differentials by sub-region, gender and quantile of estimation (% difference in hourly pay in public sector)										
	Male					**Female**				
	Quantile					Quantile				
Region	10	25	50	75	90	10	25	50	75	90
Tyne and Wear	10.93	7.87	4.93	0.69	-2.73	10.68	10.37	10.33	5.89	0.65
Rest of North East	13.51	8.75	6.78	1.44	-1.28	13.25	11.25	12.18	6.64	2.10
Greater Manchester	14.56	9.36	4.96	1.11	-0.36	14.31	11.85	10.36	6.31	3.02
Merseyside	14.86	10.65	4.50	3.05	-2.17	14.61	13.15	9.90	8.25	1.20
Rest of North West	13.90	9.85	4.57	-1.14	-7.06	13.65	12.35	9.97	4.06	-3.68
South Yorkshire	17.23	12.24	6.30	5.11	3.32	16.98	14.74	11.70	10.31	6.69
West Yorkshire	14.78	8.44	6.04	3.18	-6.59	14.53	10.93	11.44	8.38	-3.22
Rest of Yorkshire & Humberside	21.74	11.27	8.44	5.00	-0.06	21.49	13.76	13.84	10.20	3.32
East Midlands	14.62	10.09	5.29	-1.72	-4.60	14.37	12.59	10.69	3.48	-1.22
West Midlands Metropolitan County	12.46	8.52	5.81	1.67	-3.44	12.21	11.02	11.21	6.87	-0.07
Rest of West Midlands	10.13	7.90	6.45	0.10	2.93	9.87	10.40	11.85	5.31	6.30
East of England	12.00	7.19	-0.55	-6.48	-13.96	11.75	9.69	4.85	-1.28	-10.59
Inner London	19.05	7.02	-3.65	-19.50	-30.82	18.80	9.52	1.75	-14.30	-27.45

Outer London	22.35	15.70	1.29	-6.80	-14.60	22.10	18.20	6.69	-1.60	-11.22
South East	12.91	3.89	-5.66	-13.79	-22.68	12.65	6.38	-0.26	-8.59	-19.30
South West	13.98	8.37	3.88	-3.29	-10.28	13.73	10.87	9.28	1.91	-6.90
Wales	17.00	12.99	8.89	6.55	4.08	16.75	15.49	14.29	11.75	7.45
Strathclyde	19.08	14.94	8.67	2.71	-2.50	18.83	17.44	14.07	7.91	0.88
Rest of Scotland	18.12	12.35	5.11	-0.42	-6.76	17.87	14.85	10.51	4.78	-3.38
Northern Ireland	17.18	12.70	6.93	5.96	9.46	16.93	15.20	12.33	11.16	12.83

Results by unitary/local authority

The observation that results vary between sub-regions within a region highlights the importance of looking at the most detailed geographical level possible. Table 5 outlines the size of public sector pay differentials at the Unitary / Local Authority level. Full regression results can be found at the Annex. From table 5 it is clear that as well as varying between regions, public sector pay differentials also vary considerably within regions. For example, while the overall London differential for males at the 50th percentile stands at 0.39% penalty the equivalent figure for Croyden is a 12.39% premium, whereas in Islington it is a 20.69% penalty. Similarly, if we look at the female differential in the North East at the 75th percentile the differential stands at a 6.17% premium. However, in Middlesbrough the premium is 9.14% whereas in Stockton-on-Tees it stands at 0.45%.

To see the wide distribution of wage differentials, Figure 2 displays Kernel density plots of the hourly pay differentials across Unitary / Local Authorities for both males and females. Again, the dispersion of the public sector pay differentials is apparent.

Unsurprisingly, with much smaller sample sizes in some geographical areas, we see that some of the variation across Local Authorities is not statistically significant, and for some Local Authorities the estimated coefficients do not vary much across the income distribution. Again, this is to be expected given the relatively small sample sizes. However, in most cases, the coefficients conform with what we would expect from the economic model and do coincide with the findings using higher level geographic areas.

This variation and the differences between males and females are effectively demonstrated in Figures 3 and 4, which plot these public sector differentials on a map of the UK. Dark represents a large public sector pay premium and dark orange represents a large pay penalty for public sector workers. From this figure it is also clear that pay differentials vary much more on a geographic level than one would observe if just considering regions.

Table 5: Quantile regression estimates of public sector pay differentials for males and females, split by unitary / local authority (% difference in hourly pay in public sector)										
	Q10		Q25		Q50		Q75		Q90	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Bedfordshire	-0.85	0.04	0.71	3.34	-3.75	1.23	-8.47	-3.11	-12.77	-8.56
Buckinghamshire	14.56	15.46	-4.11	-1.48	-14.68	-9.71	-21.57	-16.21	-30.71	-26.50
Cambridgeshire	7.37	8.26	4.24	6.87	-9.67	-4.70	-2.77	2.60	-5.59	-1.39
Cheshire	6.89	7.78	4.41	7.04	2.98	7.96	1.15	6.51	-10.68	-6.47
Cornwall	1.91	2.80	13.01	15.64	5.97	10.94	4.17	9.54	-5.95	-1.74
Cumbria	10.20	11.09	3.92	6.55	0.31	5.28	-10.77	-5.41	-8.89	-4.68
Derbyshire	19.85	20.74	12.11	14.74	6.90	11.88	-0.29	5.08	-5.59	-1.38
Devon	14.21	15.10	8.55	11.17	9.96	14.93	0.98	6.35	-11.37	-7.16
Dorset	31.22	32.11	19.96	22.59	7.43	12.40	-0.54	4.83	-8.27	-4.07
County Durham	12.04	12.94	12.59	15.22	11.38	16.36	2.74	8.10	5.24	9.45
East Sussex	9.07	9.96	1.63	4.26	-2.33	2.65	-7.97	-2.60	-4.84	-0.63
Essex	14.74	15.63	7.47	10.10	1.22	6.20	-8.14	-2.78	-19.38	-15.17
Gloucestershire	16.16	17.05	5.16	7.79	7.05	12.02	5.94	11.30	-7.40	-3.19
Hampshire	12.27	13.16	4.12	6.75	-6.43	-1.46	-13.81	-8.45	-22.16	-17.95
Hertfordshire	6.21	7.10	3.48	6.11	-8.72	-3.74	-18.08	-12.72	-30.20	-25.99

Kent	20.13	21.02	14.78	17.41	5.63	10.60	-7.08	-1.71	-17.52	-13.31
Lancashire	13.64	14.53	11.50	14.13	6.37	11.35	0.45	5.82	-10.58	-6.37
Leicestershire	8.35	9.25	7.17	9.80	3.57	8.55	-5.50	-0.13	-13.02	-8.81
Lincolnshire	23.66	24.55	15.61	18.24	7.93	12.90	-1.13	4.23	-1.39	2.82
Norfolk	17.26	18.16	12.49	15.11	7.39	12.37	0.65	6.02	1.20	5.41
Northamptonshire	-2.45	-1.56	1.12	3.75	3.63	8.60	-3.32	2.04	-2.72	1.49
Northumberland	5.12	6.01	5.13	7.76	3.93	8.90	2.95	8.31	-4.47	-0.26
North Yorkshire	26.15	27.04	16.24	18.87	15.00	19.98	9.08	14.45	7.55	11.75
	Q10		Q25		Q50		Q75		Q90	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Nottinghamshire	19.58	20.48	15.16	17.79	12.68	17.66	1.38	6.75	-2.30	1.91
Oxfordshire	16.17	17.06	2.50	5.12	-4.20	0.77	-12.40	-7.04	-27.83	-23.62
Shropshire	14.44	15.34	7.57	10.20	4.85	9.83	3.69	9.05	-3.60	0.61
Somerset	15.25	16.14	14.46	17.08	14.97	19.95	15.01	20.37	7.88	12.09
Staffordshire	8.01	8.90	8.71	11.33	8.65	13.63	-6.01	-0.64	-0.07	4.14
Suffolk	2.75	3.64	10.55	13.18	8.23	13.21	-0.15	5.21	0.54	4.75
Surrey	14.79	15.68	0.45	3.07	-8.58	-3.61	-9.18	-3.81	-19.35	-15.15
Warwickshire	-3.31	-2.41	-0.57	2.06	-1.58	3.40	-4.25	1.11	-6.36	-2.15
West Sussex	17.50	18.39	9.57	12.20	-0.22	4.75	-12.55	-7.18	-6.65	-2.44

Wiltshire	9.61	10.51	3.19	5.82	-1.63	3.34	-11.70	-6.34	-16.39	-12.19
Worcestershire	13.92	14.81	12.23	14.86	11.73	16.71	8.16	13.52	14.57	18.78
Eilean Siar, Orkney & Sheltand	12.14	13.03	11.44	14.07	3.75	8.73	-4.64	0.72	-14.43	-10.23
Barking and Dagenham	32.21	33.10	19.51	22.14	2.80	7.78	3.09	8.45	7.45	11.65
Barnet	31.13	32.02	20.53	23.16	2.61	7.59	-2.43	2.93	-14.43	-10.22
Bexley	10.08	10.97	15.39	18.02	0.37	5.35	-12.08	-6.72	-25.58	-21.38
Brent	45.34	46.23	30.16	32.79	32.92	37.89	10.37	15.74	19.78	23.99
Bromley	6.77	7.67	-4.15	-1.52	-18.06	-13.08	-25.11	-19.74	-29.16	-24.96
Camden	17.51	18.40	4.63	7.25	-7.79	-2.81	-19.71	-14.34	-36.91	-32.70
Croydon	35.31	36.20	36.78	39.41	12.39	17.37	8.13	13.49	-6.62	-2.41
Ealing	18.95	19.84	22.74	25.37	3.97	8.94	-0.45	4.91	-7.83	-3.62
Enfield	31.41	32.30	19.47	22.10	-2.23	2.74	-21.87	-16.50	-9.27	-5.06
Greenwich	23.82	24.71	15.44	18.07	2.25	7.22	-11.21	-5.84	-15.68	-11.47
Hackney	15.36	16.25	15.49	18.12	3.58	8.56	-11.01	-5.65	-40.22	-36.01
Hammersmith and Fulham	8.93	9.82	1.61	4.23	3.30	8.28	-17.69	-12.32	-33.81	-29.61
Haringey	37.52	38.42	20.81	23.44	13.20	18.17	-11.33	-5.96	-7.79	-3.58
Harrow	-2.79	-1.90	15.88	18.51	-9.48	-4.50	-23.27	-17.90	-18.38	-14.17
Havering	22.37	23.27	12.39	15.01	-0.17	4.81	-11.14	-5.78	-32.72	-28.51
Hillingdon	38.10	38.99	27.43	30.06	9.50	14.47	9.99	15.35	-9.92	-5.71

	Q10		Q25		Q50		Q75		Q90	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Hounslow	-1.68	-0.79	0.55	3.17	-0.87	4.11	-4.52	0.85	-14.87	-10.67
Islington	-3.55	-2.66	-13.32	-10.69	-20.69	-15.71	-22.01	-16.65	-34.97	-30.76
Kensington and Chelsea	3.25	4.14	-15.55	-12.92	-30.78	-25.80	-43.90	-38.53	-42.93	-38.73
Kingston upon Thames	11.59	12.48	6.23	8.86	2.35	7.33	-4.68	0.69	-8.80	-4.59
Lambeth	5.40	6.29	-7.33	-4.70	-10.42	-5.44	-21.65	-16.29	-25.03	-20.82
Lewisham	40.06	40.95	36.59	39.22	21.75	26.73	3.33	8.69	-10.77	-6.56
Merton	21.48	22.37	18.52	21.15	-2.14	2.83	-6.87	-1.50	2.07	6.28
Newham	14.05	14.94	9.90	12.52	2.10	7.08	2.39	7.75	3.67	7.88
Redbridge	36.07	36.96	15.48	18.11	9.16	14.14	-6.59	-1.22	7.47	11.67
Richmond upon Thames	5.78	6.67	0.29	2.92	-3.95	1.02	-19.67	-14.31	-50.62	-46.41
Southwark	21.36	22.26	8.33	10.96	-5.23	-0.25	-24.24	-18.88	-32.94	-28.73
Sutton	10.47	11.36	5.60	8.23	2.07	7.05	-0.48	4.89	6.91	11.11
Tower Hamlets	26.65	27.54	7.10	9.72	13.85	18.83	-10.09	-4.72	-25.84	-21.63
Waltham Forest	54.99	55.89	27.11	29.74	12.59	17.56	5.47	10.84	-4.98	-0.78
Wandsworth	14.06	14.95	1.42	4.05	-2.84	2.14	-20.61	-15.24	-24.37	-20.16
City of Westminster	31.19	32.08	-0.84	1.79	-25.93	-20.95	-56.04	-50.67	-52.51	-48.30
Bolton	7.83	8.73	8.05	10.68	5.45	10.43	-5.70	-0.34	-4.27	-0.06

Bury	23.84	24.73	12.86	15.49	1.83	6.81	4.18	9.55	6.02	10.23
Manchester	19.46	20.35	7.17	9.79	7.98	12.95	10.58	15.94	9.46	13.66
Oldham	15.11	16.01	1.95	4.57	2.37	7.35	-0.47	4.89	-2.52	1.69
Rochdale	14.94	15.83	9.12	11.74	7.33	12.30	5.30	10.66	5.11	9.32
Salford	3.87	4.76	14.08	16.71	2.01	6.99	-3.67	1.69	2.65	6.86
Stockport	13.79	14.68	11.41	14.04	8.30	13.28	-0.05	5.31	-9.64	-5.43
Tameside	3.49	4.38	-2.32	0.31	0.37	5.35	-7.96	-2.59	-11.28	-7.07
Trafford	13.66	14.55	16.98	19.61	8.09	13.07	4.17	9.54	-12.44	-8.24
Wigan	14.99	15.88	10.49	13.12	2.20	7.18	1.24	6.61	-2.45	1.76
Knowsley	14.17	15.06	9.34	11.97	5.08	10.06	1.61	6.98	-4.64	-0.43
Liverpool	8.53	9.43	7.39	10.02	6.46	11.44	6.07	11.44	5.45	9.65
	Q10		Q25		Q50		Q75		Q90	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Saint Helens	7.76	8.65	9.43	12.06	1.30	6.28	-3.34	2.03	-6.18	-1.97
Sefton	21.64	22.54	10.81	13.44	11.02	15.99	4.66	10.02	-3.95	0.25
Wirral	22.17	23.07	17.20	19.83	2.66	7.63	2.57	7.94	4.55	8.75
Barnsley	15.63	16.52	20.89	23.52	10.75	15.72	9.17	14.53	7.93	12.14
Doncaster	10.25	11.14	9.54	12.17	3.93	8.90	3.41	8.78	-9.13	-4.92
Rotherham	14.51	15.40	3.45	6.08	-2.87	2.10	-1.82	3.54	-11.78	-7.58

Sheffield	16.57	17.46	16.90	19.53	13.42	18.40	11.41	16.77	6.72	10.93
Gateshead	15.83	16.72	6.49	9.12	6.51	11.49	-2.33	3.03	1.48	5.69
Newcastle upon Tyne	14.14	15.03	15.36	17.99	10.51	15.49	9.70	15.07	10.53	14.74
North Tyneside	9.66	10.55	11.06	13.69	6.22	11.20	1.22	6.59	-8.14	-3.93
South Tyneside	9.54	10.43	8.74	11.36	2.65	7.63	-4.39	0.97	-14.67	-10.46
Sunderland	4.31	5.20	-3.43	-0.80	1.66	6.63	0.24	5.60	-11.38	-7.17
Birmingham	18.74	19.63	11.77	14.40	8.00	12.98	1.29	6.65	3.14	7.35
Coventry	2.93	3.83	11.13	13.76	6.83	11.80	6.42	11.79	3.40	7.61
Dudley	13.35	14.24	9.42	12.05	10.05	15.03	7.95	13.31	8.70	12.91
Sandwell	15.48	16.37	9.56	12.19	6.85	11.83	7.31	12.67	3.73	7.94
Solihull	-0.44	0.45	-3.23	-0.60	-11.22	-6.24	-9.74	-4.38	-3.74	0.47
Walsall	15.99	16.89	5.27	7.90	1.79	6.77	3.71	9.07	4.71	8.92
Wolverhampton	-0.14	0.75	7.96	10.59	5.00	9.98	1.68	7.05	-4.13	0.08
Bradford	7.09	7.98	6.70	9.33	7.75	12.72	13.20	18.57	12.87	17.08
Calderdale	13.65	14.54	-1.18	1.45	1.19	6.16	-3.02	2.34	-22.88	-18.67
Kirklees	15.38	16.28	13.95	16.58	14.93	19.91	6.28	11.65	-1.64	2.57
Leeds	11.94	12.83	9.41	12.03	1.69	6.67	-1.32	4.04	-13.69	-9.49
Wakefield	18.51	19.40	12.44	15.07	6.16	11.13	3.34	8.71	-10.28	-6.07
Hartlepool	16.59	17.48	8.97	11.59	4.54	9.52	1.34	6.70	-3.40	0.80

Middlesbrough	17.43	18.32	9.65	12.28	2.85	7.83	3.77	9.14	3.15	7.36
Redcar and Cleveland	14.66	15.55	6.67	9.30	11.56	16.53	-4.45	0.92	-11.56	-7.35
Stockton-on-Tees	5.25	6.14	3.96	6.59	6.69	11.66	-4.92	0.45	-6.88	-2.68
	Q10		Q25		Q50		Q75		Q90	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Darlington	24.21	25.10	20.44	23.07	12.77	17.75	10.98	16.35	8.82	13.03
Halton	14.75	15.64	11.87	14.50	9.81	14.78	5.21	10.57	-6.00	-1.79
Warrington	16.95	17.85	9.31	11.94	4.07	9.05	2.40	7.77	-5.73	-1.52
Blackburn	24.16	25.05	18.82	21.44	11.37	16.34	-1.41	3.95	-0.92	3.29
Blackpool	-1.81	-0.92	5.75	8.38	1.94	6.92	5.44	10.80	0.10	4.30
Kingston upon Hull	19.71	20.60	12.92	15.55	6.67	11.65	5.52	10.88	-2.43	1.78
East Riding of Yorkshire	16.98	17.88	12.06	14.69	-0.33	4.65	-2.06	3.31	-5.30	-1.10
North East Lincolnshire	11.98	12.88	14.85	17.48	11.39	16.36	6.76	12.12	5.62	9.83
North Lincolnshire	10.03	10.92	2.51	5.14	-5.52	-0.54	-2.95	2.41	-5.81	-1.60
York	19.51	20.40	13.81	16.43	17.44	22.41	9.63	15.00	0.07	4.28
Derby	17.64	18.53	3.38	6.01	0.02	5.00	-5.98	-0.61	-10.17	-5.96
Leicester	3.56	4.46	3.80	6.43	4.87	9.85	5.62	10.98	2.57	6.78
Rutland	14.31	15.20	13.11	15.74	-4.29	0.69	-20.51	-15.14	-22.12	-17.91
Nottingham	12.03	12.93	17.49	20.12	7.83	12.81	3.62	8.98	-1.87	2.34

Herefordshire	20.23	21.12	8.72	11.35	20.54	25.52	20.93	26.29	33.13	37.34
Telford and Wrekin	7.58	8.47	4.80	7.43	-2.65	2.32	-8.12	-2.75	-12.20	-7.99
Stoke-on-Trent	13.38	14.27	12.16	14.79	9.74	14.72	11.02	16.38	14.25	18.46
Bath and North East Somerset	16.50	17.39	9.40	12.03	5.57	10.55	-1.55	3.82	-6.98	-2.77
Bristol	10.50	11.39	-0.56	2.07	-4.64	0.34	-10.47	-5.11	-23.08	-18.87
North Somerset	7.27	8.17	10.09	12.72	4.53	9.51	-7.68	-2.32	-20.26	-16.06
South Gloucestershire	15.32	16.21	9.90	12.53	1.02	5.99	-10.58	-5.22	-29.79	-25.58
Plymouth	13.46	14.35	10.55	13.17	5.46	10.43	2.35	7.71	0.44	4.65
Torbay	14.64	15.54	8.50	11.13	9.07	14.05	-1.99	3.37	5.39	9.60
Bournemouth	-0.05	0.85	2.56	5.19	-1.19	3.78	-12.79	-7.43	-19.13	-14.92
Poole	20.99	21.88	11.40	14.02	3.18	8.16	-10.09	-4.73	-12.66	-8.46
Swindon	4.32	5.22	4.37	7.00	5.66	10.64	-6.68	-1.32	-5.09	-0.88
Peterborough	9.41	10.30	-1.59	1.04	-1.55	3.43	11.19	16.55	9.29	13.50
Luton	12.00	12.89	8.03	10.66	5.69	10.67	-0.58	4.79	0.52	4.73
	Q10		Q25		Q50		Q75		Q90	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Southend-on-Sea	15.29	16.18	8.26	10.89	0.89	5.87	-9.32	-3.96	-19.74	-15.53
Thurrock	14.69	15.59	6.67	9.30	-7.24	-2.26	-9.46	-4.10	-11.97	-7.76
Medway Towns	-0.91	-0.02	-3.24	-0.61	2.46	7.44	-8.74	-3.38	-1.99	2.22

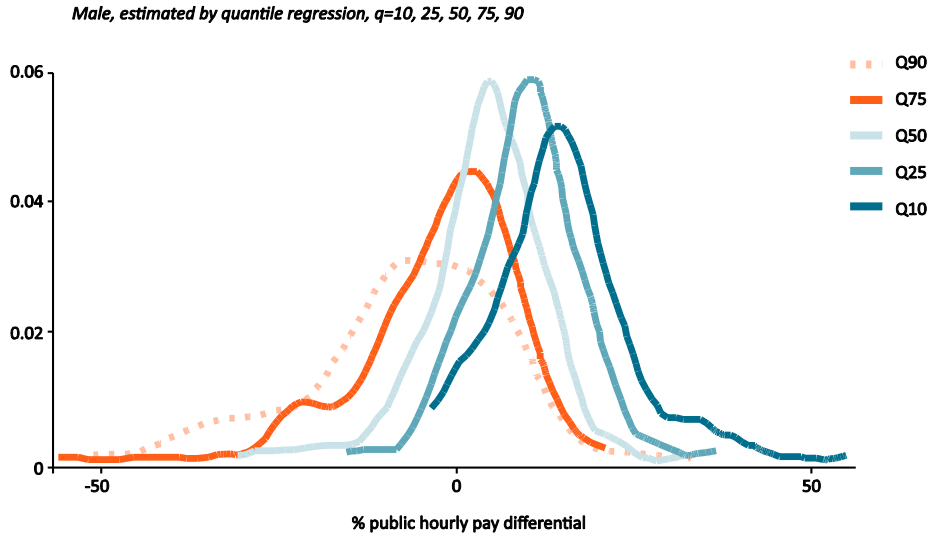
Bracknell Forest	12.16	13.06	-3.10	-0.47	-18.40	-13.42	-30.18	-24.82	-28.22	-24.01
West Berkshire	-1.54	-0.65	-2.85	-0.22	-12.84	-7.86	-24.01	-18.65	-37.26	-33.06
Reading	4.34	5.23	-0.40	2.23	-7.84	-2.86	-12.61	-7.24	-13.40	-9.19
Slough	0.97	1.87	6.01	8.64	-5.82	-0.84	-4.73	0.63	3.45	7.66
Windsor and Maidenhead	-1.39	-0.50	-10.44	-7.81	-25.11	-20.14	-35.38	-30.01	-39.44	-35.23
Wokingham	8.47	9.37	-2.03	0.60	-5.48	-0.51	-20.43	-15.07	-36.84	-32.63
Milton Keynes	10.94	11.83	8.23	10.86	-4.54	0.43	-22.45	-17.09	-36.23	-32.02
Brighton and Hove	17.48	18.37	11.87	14.50	5.56	10.54	-6.36	-1.00	-15.03	-10.83
Portsmouth	6.01	6.90	2.34	4.97	-0.76	4.22	-3.70	1.66	-5.69	-1.48
Southampton	9.21	10.10	-0.26	2.37	-7.63	-2.66	-12.44	-7.08	-12.66	-8.45
Isle of Wight	12.28	13.17	5.87	8.50	10.43	15.41	7.72	13.08	8.56	12.77
Isle of Anglesey (Sir Ynis Mon)	17.25	18.14	9.04	11.67	6.42	11.40	1.67	7.04	-4.34	-0.13
Gwynedd	34.87	35.77	23.69	26.31	23.80	28.77	21.00	26.36	9.33	13.54
Conwy	10.77	11.66	12.46	15.09	7.72	12.69	4.82	10.18	-7.98	-3.77
Denbighshire (Sir Ddinbych)	23.80	24.69	15.81	18.44	14.40	19.38	12.80	18.17	4.88	9.09
Flintshire (Sir Y Fflint)	10.29	11.18	11.20	13.82	2.17	7.15	-0.32	5.04	-12.63	-8.42
Wrexham (Wrecsam)	23.20	24.10	15.81	18.44	11.91	16.88	4.79	10.16	1.85	6.06
Powys	3.20	4.09	10.92	13.55	6.85	11.82	13.60	18.97	-6.63	-2.43
Ceredigion (Sir Ceredigion)	26.07	26.96	25.31	27.93	18.84	23.82	17.45	22.81	3.69	7.90

Pembrokeshire (Sir Benfro)	3.57	4.46	0.76	3.39	4.17	9.14	-0.04	5.33	-15.02	-10.81
Carmarthenshire (Sir Gaerfyrddin)	32.48	33.37	18.38	21.01	19.96	24.94	19.45	24.82	21.51	25.72
Swansea (Abertane)	12.92	13.81	12.10	14.72	-0.36	4.61	6.22	11.58	4.49	8.70
Neath Port Talbot (Castel-Nedd Port Talbot)	10.88	11.77	11.99	14.62	11.03	16.01	5.75	11.12	6.72	10.93
Bridgend (Pen-Y-Bont Ar Ogwr)	11.21	12.10	10.58	13.21	9.50	14.48	5.26	10.62	0.21	4.41
	Q10		Q25		Q50		Q75		Q90	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Vale of Glamorgan (Bro Morgannwg)	17.41	18.30	17.92	20.55	14.69	19.67	10.03	15.39	13.40	17.60
Rhondda Cynon Taff	22.83	23.72	19.43	22.06	8.95	13.93	7.00	12.37	0.61	4.81
Merthyr Tydfil (Merthyr Tudful)	14.75	15.64	8.04	10.66	3.75	8.73	3.08	8.45	3.44	7.65
Caerphilly (Caerffili)	13.10	13.99	9.96	12.58	2.78	7.76	5.82	11.18	-2.52	1.69
Blaenau Gwent	11.35	12.25	7.34	9.97	4.80	9.78	10.60	15.96	23.94	28.15
Torfaen (Tor-Faen)	18.76	19.65	10.91	13.54	6.25	11.23	0.89	6.26	3.71	7.92
Monmouthshire (Sir Fynwy)	15.10	15.99	11.33	13.96	5.44	10.41	4.66	10.02	3.04	7.24
Newport (Casnewydd)	16.60	17.49	15.35	17.98	7.89	12.86	6.51	11.87	11.55	15.75
Cardiff (Caerdydd)	22.61	23.50	18.50	21.13	13.02	17.99	3.06	8.43	3.88	8.08
Aberdeen	10.69	11.58	8.25	10.88	-4.44	0.54	-20.17	-14.81	-32.92	-28.71
Aberdeenshire	0.69	1.58	4.90	7.52	0.23	5.20	-4.82	0.55	-10.58	-6.38

Angus	8.04	8.93	13.32	15.95	3.74	8.72	0.90	6.26	5.44	9.64
Argyll and Bute	22.89	23.78	20.47	23.10	16.07	21.05	0.65	6.02	2.45	6.66
Scottish Borders	20.75	21.64	20.30	22.93	17.07	22.05	6.42	11.79	0.02	4.23
Clackmannan	28.31	29.20	14.88	17.51	2.43	7.41	0.72	6.08	-11.12	-6.91
West Dunbartonshire	16.51	17.41	11.17	13.80	2.41	7.38	-0.33	5.03	-3.96	0.25
Dumfries and Galloway	20.50	21.39	15.68	18.31	13.31	18.29	3.53	8.90	3.22	7.43
Dundee	26.28	27.18	18.95	21.58	14.81	19.79	8.55	13.91	4.75	8.96
East Ayrshire	23.85	24.75	20.01	22.64	14.02	19.00	7.00	12.37	9.21	13.42
East Dunbartonshire	40.66	41.55	22.10	24.73	14.78	19.75	0.73	6.10	-14.69	-10.49
East Lothian	20.49	21.38	15.98	18.61	6.91	11.89	-5.73	-0.36	-18.04	-13.83
East Renfrewshire	21.73	22.62	5.73	8.36	-3.70	1.28	-19.81	-14.45	-26.33	-22.13
Edinburgh	16.50	17.39	8.06	10.69	5.93	10.91	0.89	6.26	-8.46	-4.25
Falkirk	11.37	12.26	11.03	13.66	0.65	5.62	-2.59	2.77	-13.20	-8.99
Fife	22.12	23.01	14.57	17.20	15.28	20.25	8.59	13.96	8.66	12.86
Glasgow	23.82	24.71	19.25	21.88	14.80	19.78	11.33	16.69	9.44	13.65
Highland	14.68	15.57	9.96	12.59	11.27	16.24	11.30	16.66	10.43	14.64
Inverclyde	19.33	20.22	18.74	21.37	12.26	17.24	3.65	9.01	6.27	10.48
	Q10		Q25		Q50		Q75		Q90	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female

Midlothian	4.64	5.54	2.39	5.02	-1.87	3.11	-5.80	-0.43	-9.12	-4.91
Moray	31.54	32.43	11.81	14.44	10.97	15.95	7.94	13.30	5.17	9.38
North Ayrshire	18.78	19.67	13.16	15.79	2.93	7.90	0.45	5.82	-0.65	3.56
North Lanarkshire	6.10	6.99	11.12	13.75	5.70	10.67	3.80	9.16	-2.65	1.56
Perth and Kinross	18.13	19.03	10.67	13.30	6.19	11.16	0.10	5.47	-6.07	-1.87
Renfrewshire	12.17	13.06	7.49	10.12	7.84	12.82	-2.13	3.23	-3.73	0.48
South Ayrshire	19.55	20.45	17.34	19.97	11.79	16.77	2.57	7.94	4.17	8.38
South Lanarkshire	9.36	10.25	11.12	13.75	6.35	11.33	-0.81	4.56	-10.37	-6.16
Stirling	25.24	26.13	14.90	17.53	12.07	17.05	9.17	14.53	-20.73	-16.52
West Lothian	16.99	17.88	10.78	13.41	-5.20	-0.22	-7.72	-2.35	-8.09	-3.89
Northern Ireland	16.69	17.59	12.75	15.37	8.31	13.28	7.69	13.06	11.23	15.44

Figure 2: Kernel density plots of local authority public pay differentials (male and female)



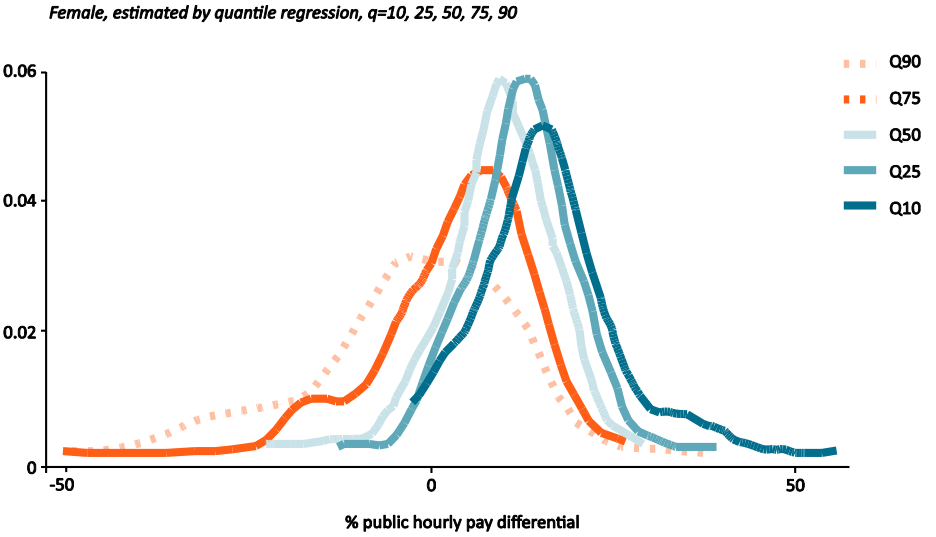


Figure 3: Public sector male pay differential at the 50th percentile, by Unitary / Local Authority

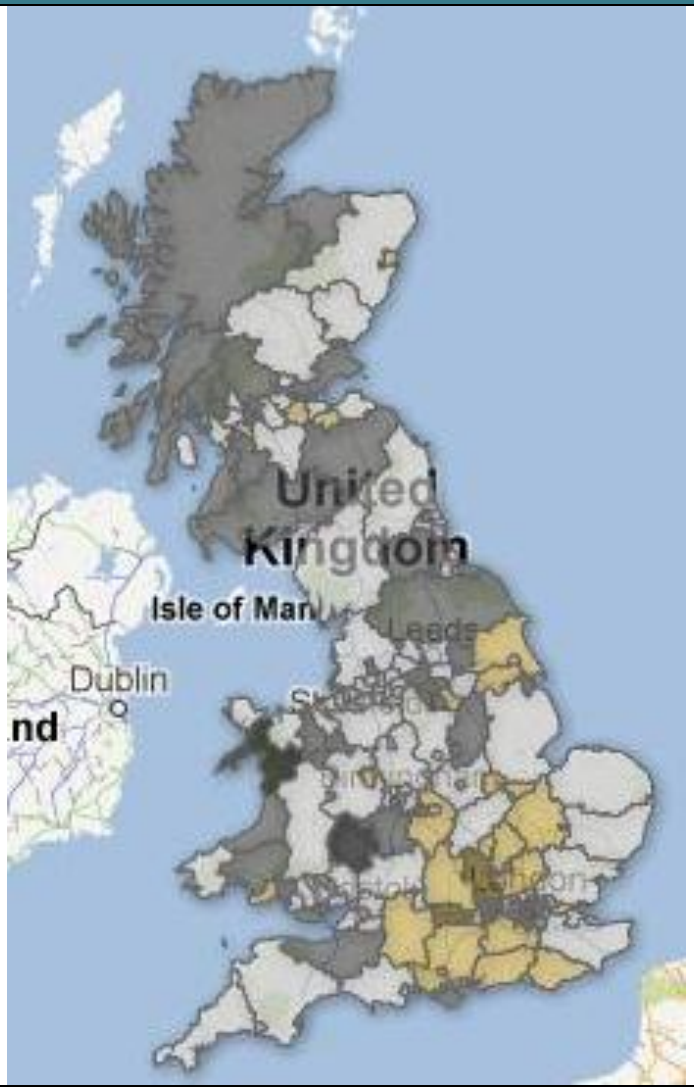
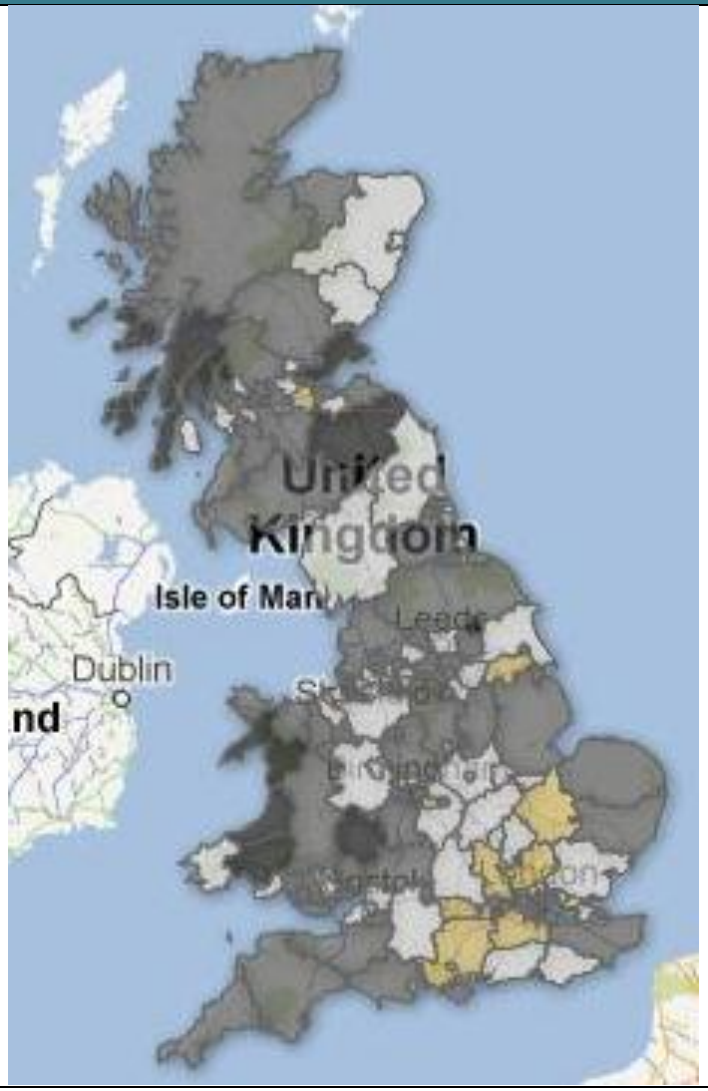
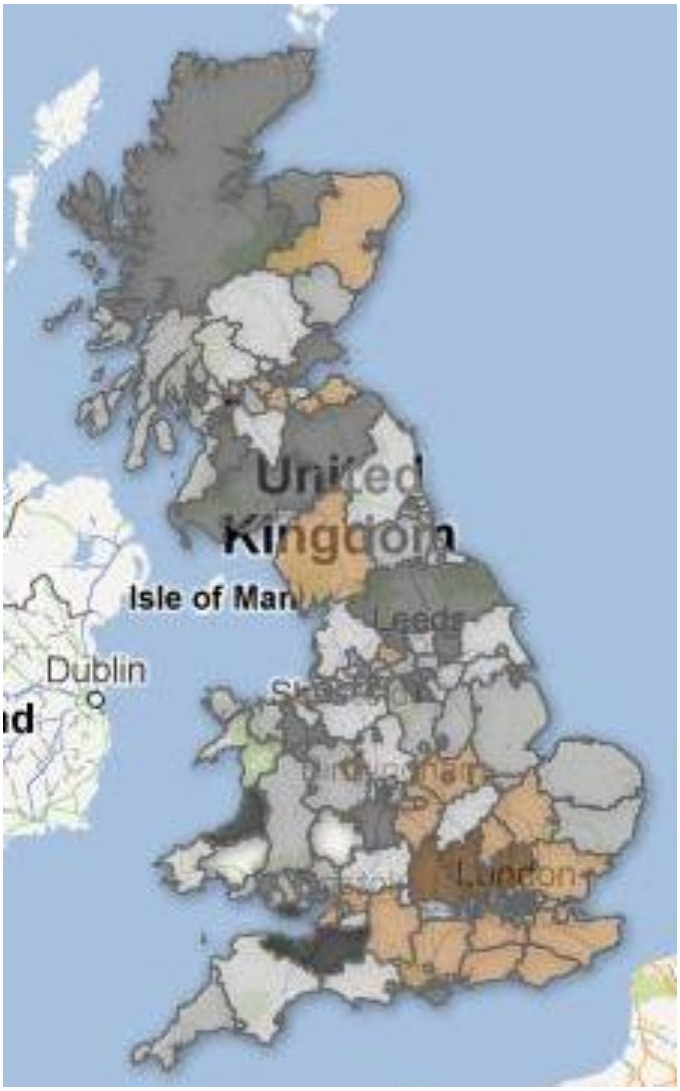


Figure 4: Public sector female pay differential at the 50th percentile, by Unitary / Local Authority



We can also view a similar chart that assesses the 'average differential' for each public sector worker in each Local Authority. To do this, we assign each public sector worker a value of the differential based upon their gender, Local Authority and position in the wage distribution. We then take the average of this number for each Local Authority. Figure 5 shows results from this, where orange colours represent a pay penalty [dark orange is a 20% or over penalty], white represents equivalence and grey colours represent a wage premium in the public sector [dark grey is a premium of over 15%].

Figure 5: Local Authority average public sector hourly wage differential



Costs of the Differentials

Having estimated wage differentials for public and private sector workers, we can now estimate the potential costs or savings that might be associated with equalising these differential rates of pay. While the methodology we outline above is a basic attempt at deriving an accurate figure, we believe this is an important element of our analysis because of the importance it holds for Government policy in the context of fiscal constraint and the desire to move to a more localised system of pay negotiation.

We recognise that relatively small levels of variation are likely, thus in our analysis we do not adjust wages in the public sector where they fall within a symmetric 1% margin around the wage of the equivalent private sector individual. Table 6 shows the proportions of public sector workers paid wages that are outside of a 1% band around their equivalents in the private sector. The results again demonstrate the differences that are present between males and females in this analysis. In a number of sub-regions it is estimated that all females in the public sector receive an hourly wage that is greater than 101% of their private sector counterparts.

Table 6 also outlines the total costs and the breakdown by region from this analysis. We see that the total costs and potential savings from moving those with wages greater than 1% above or below their private sector counterparts can be very large. In Outer London alone, the costs of removing pay penalties would amount to nearly £1.5 billion a year. Conversely, Greater Manchester, South Yorkshire and Rest of Yorkshire and Humberside all have pay differentials, which if equalised would lead to savings of around £260 million a year.

In terms of the total impact on Government expenditure, should Government's attempts to localise pay lead to a complete alignment of pay between the public and private sector (such that public wages align to those in the private sector, ceteris paribus), the total costs could be at least £3.8 billion a year. This is made up of a reduction in spending of around £4.2 billion for those paid more than their private sector counterparts and a spending increase of around £8 billion for those paid less than their private sector counterparts. For the reasons outlined above, there is a large amount of uncertainty around this figure. For example, if we assume that those who do not report hourly

wages in the APS have similar characteristics to those who do report hourly wages[6], we can expect the true figure to be much larger than this if they were included in the analysis.

To test the potential impact of this missing data on total costs we ran the same analysis as outlined above using the most recent Labour Force Survey data (October-December 2011). This allows us to use the specifically designed income weighting variable that accounts for non-response in earnings data. This analysis raised the total costs to around £7.2 billion.

On the other hand, this analysis does not include an assessment of the full reward package differentials. For instance, there are also differences in lengths of paid leave available to public and private sector workers. A recent survey of business found that the median public sector annual leave entitlement (excluding public holidays) was 27 days in 2011. This compares to 25 days in the private sector.[7] Public sector workers in Whitehall Departments and Government Agencies also receive two and a half 'privilege days' of holiday a year on top of their yearly paid leave allowance. On the other hand, private sector workers, particularly towards the top of the income distribution, often have remuneration packages where bonuses and other fringe benefits, such as private health care, are common.

Of course, pensions contributions form an important part of any reward package and is one of the few areas where any robust research has been undertaken. Disney, Emmerson and Tetlow (2009) find that pension arrangements for public sector workers are, on average, more generous than their private sector counterparts: public sector workers are more likely to be covered by defined benefit (DB) schemes and for those public sector workers with defined benefit schemes '...one-period accruals in the public sector are, on average, worth 6.6% of salary more' (Disney et al, 2009, p.F532).

This implies that, since those in defined contribution schemes will see a much larger gap compared to those in DB schemes in the public sector, the average public sector employee has a pension contribution premium compared to private sector equivalents of at least 6.6%.

[6] A simple tabulation of highest qualifications shows that the two groups in the public sector have very similar levels of qualifications.

[7] http://www.xperthr.co.uk/article/110163/benchmarking-annual-leave-entitlements-in-2011.aspx

To assess the potential impact of differentials in pension arrangements on the costs of equalising reward packages in the public and private sector, we repeated the analysis above and adjusted the quantile regression estimates of the public wage differentials by the appropriate amount from the Disney et al (2009) paper.[8] Making this modest adjustment for pensions results in the previously estimated cost becoming a large saving of around £6.3 billion.[9] Applying the same methodology using the LFS (as above) also results in a saving of just over £6.1 billion.

Given the age of the data used in Disney et al (2009) and the fact that they do not adequately map differentials for all employees, these are uncertain estimates. However, they do give an indication of the potential impact of including other aspects of total reward in the analysis. This will be vital to Government deliberations, particularly when they consider whether it would be beneficial to equalise pay for those judged to be under-paid compared to their private sector counterparts. This is because the basic analysis presented here, using Disney et al (2009) results, suggest that around half of those judged to be underpaid based on an analysis of hourly pay alone are, in fact, fully compensated by more generous pension arrangements.

Other aspects of reward packages will also affect these results. For instance, a lack of data on bonus payments means that the penalty for those at the top of the wage distribution is likely to be larger than estimated here. At both ends of the pay distribution, the premium for public sector employees is likely to be an underestimate of the total reward package premium after taking into account differences in holiday allowances.

[8] Disney et al (2009) create estimates that vary across the education distribution – so we apply these to the appropriate education groups.

[9] Full results available from the author by request.

Table 6: Costs of pay differentials broken down by region and percent of workforce paid more / less than private sector counterparts									
	Overall net costs of pay premia / penalties	Costs of overpayments	Costs of underpayments	Percent of public sector employees					
				Within 1% band of private sector equivalent		Overpaid		Underpaid	
	Yearly £ ,000's	Yearly £ ,000's	Yearly £ ,000's	Male	Female	Male	Female	Male	Female
Tyne and Wear	42,692	105,435	-62,765	0	0	66	77	34	23
Rest of North East	183,092	183,100	0	38	0	62	100	0	0
Greater Manchester	241,516	267,421	-25,905	0	0	62	100	38	0
Merseyside	150,640	167,032	-16,392	0	0	61	100	39	0
Rest of North West	49,893	189,377	-139,484	30	0	35	75	35	25
South Yorkshire	264,761	264,761	0	0	0	100	100	0	0
West Yorkshire	82,148	170,784	-88,636	0	0	60	76	40	24
Rest of Yorkshire & Humberside	261,995	261,995	0	0	0	100	100	0	0
East Midlands	130,426	251,224	-120,798	31	26	28	74	41	0
West Midlands Metropolitan County	115,263	157,740	-42,477	0	22	55	78	45	0
Rest of West Midlands	289,402	289,402	0	31	0	69	100	0	0
East of England	-703,935	91,802	-795,737	18	30	6	42	76	28
Inner London	-1,880,785	19,157	-1,899,942	0	0	6	22	94	78
Outer London	-1,305,964	77,464	-1,383,428	11	0	4	28	84	72

South East	-2,830,647	47,927	-2,878,574	0	25	7	15	93	60
South West	-44,280	289,755	-334,035	32	0	26	72	42	28
Wales	699,102	699,102	0	0	0	100	100	0	0
Strathclyde	179,937	215,014	-35,078	33	0	27	100	40	0
Rest of Scotland	31,992	237,291	-205,299	33	0	26	68	41	32
Northern Ireland	253,551	253,551	0	0	0	100	100	0	0
UK	-3,789,201	4,239,334	-8,028,550	15	6	44	73	41	20

Note: all £ figures are rounded to nearest 1,000

Accounting for potential discrimination

Table 7 outlines results from our original estimation and compares them to results when we use the adjusted female wage variable outlined in equations (10) and (11).[10]

Removing, as far as possible, the differences in pay of males and females in both the public and private sectors allows us to assess the extent to which different levels of discrimination might be impacting upon the wage differentials we observe in the public sector.

We see that although the female wage differentials have changed slightly the results of the analysis above still hold and the changes are not particularly large. This implies that, even if the gender pay gaps in the public and private sectors were completely driven by discrimination (which will not be the case), if these were removed, large wage differentials between the private and public sector would still be found for females.

[10] Full regression results from each of the stages of calculation can be obtained from the author but are excluded here for brevity.

Table 7: Accounting for potential differences in discrimination in the public and private sector										
	Female wage differential									
	Quantile									
	10		25		50		75		90	
Region	Raw	Adjusted	Raw	Adjusted	Raw	Adjusted	Raw	Adjusted	Raw	Adjusted
Tyne and Wear	10.68	8.55	10.37	7.74	10.33	8.63	5.89	6.48	0.65	0.79
Rest of North East	13.25	11.09	11.25	6.42	12.18	10.40	6.64	6.80	2.10	2.45
Greater Manchester	14.31	12.77	11.85	9.66	10.36	8.61	6.31	6.93	3.02	2.05
Merseyside	14.61	12.80	13.15	10.03	9.90	8.76	8.25	7.21	1.20	2.15
Rest of North West	13.65	10.66	12.35	10.05	9.97	8.47	4.06	4.93	-3.68	-3.94
South Yorkshire	16.98	14.49	14.74	9.98	11.70	12.90	10.31	11.80	6.69	6.34
West Yorkshire	14.53	12.53	10.93	14.07	11.44	9.20	8.38	7.77	-3.22	-2.73
Rest of Yorkshire & Humberside	21.49	18.00	13.76	10.33	13.84	13.96	10.20	10.78	3.32	4.21
East Midlands	14.37	12.37	12.59	12.59	10.69	9.38	3.48	4.00	-1.22	-1.91
West Midlands Metropolitan County	12.21	9.77	11.02	10.31	11.21	9.37	6.87	6.47	-0.07	0.48
Rest of West Midlands	9.87	8.59	10.40	8.58	11.85	10.56	5.31	5.70	6.30	5.97
East of England	11.75	8.47	9.69	9.06	4.85	3.63	-1.28	-0.93	-10.59	-11.11
Inner London	18.80	14.88	9.52	8.15	1.75	1.22	-14.30	-14.76	-27.45	-26.00

Outer London	22.10	18.17	18.20	7.54	6.69	5.60	-1.60	-0.36	-11.22	-9.66
South East	12.65	10.08	6.38	17.27	-0.26	-1.30	-8.59	-9.12	-19.30	-18.30
South West	13.73	11.35	10.87	4.18	9.28	8.47	1.91	1.74	-6.90	-6.62
Wales	16.75	14.49	15.49	10.13	14.29	13.13	11.75	11.54	7.45	7.87
Strathclyde	18.83	15.89	17.44	13.72	14.07	13.13	7.91	8.28	0.88	0.22
Rest of Scotland	17.87	15.12	14.85	15.05	10.51	9.51	4.78	4.80	-3.38	-3.30
Northern Ireland	16.93	15.00	15.20	13.33	12.33	13.66	11.16	13.08	12.83	11.57

Conclusion

This paper has extended the existing analysis of wage differentials between public sector and private sector employees in two key ways. First, we use the Special License version of the Annual Population Survey to allow pay differentials to be identified using quantile regression estimation at a Local Authority level with the most up to date data available. Secondly, we put forward tentative estimates of the overall value of the pay differentials in order to inform discussion over how much it would cost or save, should differentials be reduced, ceteris paribus, over time. These results are also split by region.

The results we present paint a complex picture of mismatches between the wages one might expect individuals to receive based on their characteristics and types of job, and the public sector wages they receive: pay differentials vary dramatically, and in a statistically significant manner, both across and within regions and across the pay distribution. At one end of the scale a female public sector worker located in Brent and working at the bottom of the wage distribution could expect a premium of around 46% on her hourly wage. At the other end of the scale, a male public sector work located in the City of Westminster could expect a 53% penalty on his hourly wage. Relatively small sample sizes mean that standard errors around these point estimates are quite large, however, even at a sub regional level where sample sizes are much larger, differentials range from around a 22% premium for males and females at the bottom of the wage distribution in Outer London and a 31% penalty for males in Inner London at the 90th percentile of the wage distribution.

A major limitation to this paper is that the differentials estimated are only one part of the potential difference in total reward packages available for the public and private sectors. There are also differences in lengths of paid leave, bonuses and other fringe benefits available to public and private sector workers. A particularly large differential in reward packages between the public and private sectors is found in pension arrangements. Disney, Emmerson and Tetlow (2009) find that pension arrangements for public sector workers are, on average, more generous than their private sector counterparts: public sector workers are more likely to be covered by defined benefit (DB) schemes and for those public sector workers with defined benefit schemes '...one-period accruals in the public sector are, on average, worth 6.6% of salary more' (Disney et al, 2009, p.F532).

Each of these factors will impact significantly on the estimated differential in reward given to public and private sector workers. Overall, it is clear that much more research is needed into these total reward differentials, particularly since much public discussion is purely focussed around the potential to bring public and private sector wages in line.

However, even before this further research is conducted, the results in this paper have relevance to UK Government's deliberations over how to make public sector pay more responsive to local labour market conditions. One option open to the Government would be to introduce a system of regional pay variation to build on the well-established London weighting. However, the analysis in this paper has shown that variation in the wage differential across the wage distribution, within regions, would make this approach very difficult to implement. For instance, in London the wage differential varies from around a 21% premium at the bottom of the distribution to a 20% penalty at the top of the distribution.

We have also demonstrated that intra-regional variation in pay differentials can be particularly high. Given that it is unlikely that pension, holiday or other fringe benefits vary significantly by region, this means that trying to introduce regional variation in wage negotiation would do little to address the variations in local labour markets that the Government desires.

Alternatively, the Government may be attracted to moving to a similar system to that which is currently operated in the Courts Service, after reforms to introduce zonal pay in 2007. However, again, this system is unlikely to be able to pick up the large variation in intra-regional variation that this paper finds and would do nothing to address the within-Local Authority variation that is likely to be present. For instance, as outlined earlier, the ability to vary wages based on compensating differentials in deprived areas with poor public services is vital to ensuring adequate staffing in these areas and, consequently, the quality of public services.

The second part of this paper attempted to measure the likely costs or savings of moving to a system that leads to a reduction in public sector pay differentials. We did this using the estimated levels of public sector wage differentials and found that to equalise pay for all of those in the public sector currently earning an hourly wage which is greater than 1% more or less than their private sector counterparts, would cost as much as £3.8 billion (levelling-up those paid less than their private sector counterparts would cost around £8 billion while levelling down those paid more than their private sector counterparts would save around £4.2 billion). This is particularly relevant to the

Government's deliberations since, in the context of fiscal consolidation, any pressures on public sector pay bills will need to be carefully managed.

We recognise that these are only tentative figures. The lack of an income weighting variable in the APS means that the figures reported here do not cover the whole population of public sector workers and we also lay out reasons why we might expect premia to be greater at the bottom of the distribution and penalties to be less at the top of the distribution (meaning that total costs would be lower). In particular, we showed that accounting for a modest estimate of the differences in pension arrangements between the public and private sector (using Disney et al (2009)) results in the previously estimated cost becoming a large saving of around £6.3 billion.[11]

Overall this paper finds significant variation in public sector pay differentials both across the wage distribution and within regions. This suggests that the task facing the UK Government in terms of more closely aligning public sector pay determination with local labour market conditions is difficult since local conditions are extremely varied. The implication is that, while an attempt to use centralised negotiations imposed on local areas could take into account differential costs across geographic areas, it unlikely to be successful in achieving the Government's stated aims of making public sector pay 'more market facing in local areas'. In particular, it would be hard to differentiate accurately across different parts of the wage distribution within regions and to take account of within-region variation that we have shown is present. Creating a market facing system will require that some degree of pay setting responsibility is provided to local decision makers and that they are required to use it.

[11] Full results available from the author by request.

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Annex

Regression results from quantile regression at Unitary / Local Authority level										
	Q10		Q25		Q50		Q75		Q90	
	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|
Public sector	0.00	*0.98*	0.03	*0.23*	0.01	*0.66*	-0.03	*0.29*	-0.09	*0.00*
Male in public sector	-0.01	*0.00*	-0.03	*0.00*	-0.05	*0.00*	-0.05	*0.00*	-0.04	*0.00*
Public interacted with:										
Buckinghamshire	0.15	*0.00*	-0.05	*0.25*	-0.11	*0.01*	-0.13	*0.00*	-0.18	*0.00*
Cambridgeshire	0.08	*0.00*	0.04	*0.34*	-0.06	*0.11*	0.06	*0.15*	0.07	*0.02*
Cheshire	0.08	*0.00*	0.04	*0.32*	0.07	*0.07*	0.10	*0.01*	0.02	*0.49*
Cornwall	0.03	*0.28*	0.12	*0.00*	0.10	*0.02*	0.13	*0.00*	0.07	*0.04*
Cumbria	0.11	*0.00*	0.03	*0.45*	0.04	*0.33*	-0.02	*0.61*	0.04	*0.26*
Derbyshire	0.21	*0.00*	0.11	*0.00*	0.11	*0.00*	0.08	*0.03*	0.07	*0.02*
Devon	0.15	*0.00*	0.08	*0.04*	0.14	*0.00*	0.09	*0.02*	0.01	*0.65*
Dorset	0.32	*0.00*	0.19	*0.00*	0.11	*0.00*	0.08	*0.06*	0.04	*0.17*
County Durham	0.13	*0.00*	0.12	*0.00*	0.15	*0.00*	0.11	*0.01*	0.18	*0.00*
East Sussex	0.10	*0.00*	0.01	*0.82*	0.01	*0.72*	0.01	*0.90*	0.08	*0.02*

Essex	0.16	*0.00*	0.07	*0.04*	0.05	*0.13*	0.00	*0.93*	-0.07	*0.02*
Gloucestershire	0.17	*0.00*	0.04	*0.26*	0.11	*0.01*	0.14	*0.00*	0.05	*0.10*
Hampshire	0.13	*0.00*	0.03	*0.30*	-0.03	*0.41*	-0.05	*0.13*	-0.09	*0.00*
Hertfordshire	0.07	*0.00*	0.03	*0.42*	-0.05	*0.15*	-0.10	*0.01*	-0.17	*0.00*
Kent	0.21	*0.00*	0.14	*0.00*	0.09	*0.00*	0.01	*0.69*	-0.05	*0.08*
Lancashire	0.14	*0.00*	0.11	*0.00*	0.10	*0.00*	0.09	*0.01*	0.02	*0.42*
Leicestershire	0.09	*0.00*	0.06	*0.08*	0.07	*0.04*	0.03	*0.44*	0.00	*0.93*
Lincolnshire	0.25	*0.00*	0.15	*0.00*	0.12	*0.00*	0.07	*0.06*	0.11	*0.00*
Norfolk	0.18	*0.00*	0.12	*0.00*	0.11	*0.00*	0.09	*0.02*	0.14	*0.00*
Northamptonshire	-0.02	*0.49*	0.00	*0.91*	0.07	*0.04*	0.05	*0.19*	0.10	*0.00*
Northumberland	0.06	*0.02*	0.04	*0.28*	0.08	*0.06*	0.11	*0.01*	0.08	*0.01*
North Yorkshire	0.27	*0.00*	0.16	*0.00*	0.19	*0.00*	0.18	*0.00*	0.20	*0.00*
Nottinghamshire	0.20	*0.00*	0.14	*0.00*	0.16	*0.00*	0.10	*0.01*	0.10	*0.00*
Oxfordshire	0.17	*0.00*	0.02	*0.64*	0.00	*0.90*	-0.04	*0.33*	-0.15	*0.00*
Shropshire	0.15	*0.00*	0.07	*0.10*	0.09	*0.04*	0.12	*0.01*	0.09	*0.01*
Somerset	0.16	*0.00*	0.14	*0.00*	0.19	*0.00*	0.23	*0.00*	0.21	*0.00*
Staffordshire	0.09	*0.00*	0.08	*0.03*	0.12	*0.00*	0.02	*0.51*	0.13	*0.00*
Suffolk	0.04	*0.11*	0.10	*0.01*	0.12	*0.00*	0.08	*0.03*	0.13	*0.00*

Surrey	0.16	*0.00*	0.00	*0.94*	-0.05	*0.16*	-0.01	*0.85*	-0.07	*0.02*
Warwickshire	-0.02	*0.31*	-0.01	*0.74*	0.02	*0.57*	0.04	*0.30*	0.06	*0.04*
West Sussex	0.18	*0.00*	0.09	*0.02*	0.04	*0.34*	-0.04	*0.30*	0.06	*0.05*
Wiltshire	0.10	*0.00*	0.02	*0.53*	0.02	*0.59*	-0.03	*0.44*	-0.04	*0.27*
Worcestershire	0.15	*0.00*	0.12	*0.00*	0.15	*0.00*	0.17	*0.00*	0.27	*0.00*
Eilean Siar, Orkney & Sheltand	0.13	*0.00*	0.11	*0.02*	0.08	*0.11*	0.04	*0.45*	-0.02	*0.67*
Barking and Dagenham	0.33	*0.00*	0.19	*0.00*	0.07	*0.25*	0.12	*0.05*	0.20	*0.00*
Barnet	0.32	*0.00*	0.20	*0.00*	0.06	*0.22*	0.06	*0.27*	-0.02	*0.70*
Bexley	0.11	*0.00*	0.15	*0.00*	0.04	*0.39*	-0.04	*0.48*	-0.13	*0.00*
Brent	0.46	*0.00*	0.29	*0.00*	0.37	*0.00*	0.19	*0.01*	0.33	*0.00*
Bromley	0.08	*0.01*	-0.05	*0.30*	-0.14	*0.00*	-0.17	*0.00*	-0.16	*0.00*
Camden	0.18	*0.00*	0.04	*0.48*	-0.04	*0.46*	-0.11	*0.05*	-0.24	*0.00*
Croydon	0.36	*0.00*	0.36	*0.00*	0.16	*0.00*	0.17	*0.00*	0.06	*0.12*
Ealing	0.20	*0.00*	0.22	*0.00*	0.08	*0.13*	0.08	*0.14*	0.05	*0.21*
Enfield	0.32	*0.00*	0.19	*0.00*	0.02	*0.76*	-0.13	*0.01*	0.03	*0.40*
Greenwich	0.25	*0.00*	0.15	*0.00*	0.06	*0.20*	-0.03	*0.58*	-0.03	*0.46*
Hackney	0.16	*0.00*	0.15	*0.00*	0.07	*0.15*	-0.03	*0.64*	-0.27	*0.00*
Hammersmith and Fulham	0.10	*0.01*	0.01	*0.89*	0.07	*0.25*	-0.09	*0.16*	-0.21	*0.00*

Haringey	0.38	*0.00*	0.20	*0.00*	0.17	*0.00*	-0.03	*0.63*	0.05	*0.28*
Harrow	-0.02	*0.58*	0.15	*0.01*	-0.06	*0.30*	-0.15	*0.01*	-0.06	*0.22*
Havering	0.23	*0.00*	0.12	*0.02*	0.04	*0.47*	-0.03	*0.61*	-0.20	*0.00*
Hillingdon	0.39	*0.00*	0.27	*0.00*	0.13	*0.01*	0.18	*0.00*	0.03	*0.52*
Hounslow	-0.01	*0.81*	0.00	*0.98*	0.03	*0.59*	0.04	*0.49*	-0.02	*0.63*
Islington	-0.03	*0.41*	-0.14	*0.01*	-0.17	*0.00*	-0.14	*0.01*	-0.22	*0.00*
Kensington and Chelsea	0.04	*0.45*	-0.16	*0.05*	-0.27	*0.00*	-0.35	*0.00*	-0.30	*0.00*
Kingston upon Thames	0.12	*0.00*	0.06	*0.28*	0.06	*0.23*	0.04	*0.48*	0.04	*0.33*
Lambeth	0.06	*0.06*	-0.08	*0.13*	-0.07	*0.20*	-0.13	*0.02*	-0.12	*0.00*
Lewisham	0.41	*0.00*	0.36	*0.00*	0.26	*0.00*	0.12	*0.03*	0.02	*0.63*
Merton	0.22	*0.00*	0.18	*0.00*	0.02	*0.75*	0.02	*0.76*	0.15	*0.00*
Newham	0.15	*0.00*	0.09	*0.10*	0.06	*0.29*	0.11	*0.06*	0.16	*0.00*
Redbridge	0.37	*0.00*	0.15	*0.01*	0.13	*0.02*	0.02	*0.74*	0.20	*0.00*
Richmond upon Thames	0.07	*0.04*	0.00	*0.94*	0.00	*0.97*	-0.11	*0.04*	-0.38	*0.00*
Southwark	0.22	*0.00*	0.08	*0.15*	-0.01	*0.78*	-0.16	*0.00*	-0.20	*0.00*
Sutton	0.11	*0.00*	0.05	*0.30*	0.06	*0.22*	0.08	*0.11*	0.20	*0.00*
Tower Hamlets	0.27	*0.00*	0.06	*0.28*	0.18	*0.00*	-0.02	*0.80*	-0.13	*0.01*
Waltham Forest	0.56	*0.00*	0.26	*0.00*	0.16	*0.00*	0.14	*0.01*	0.08	*0.08*

Wandsworth	0.15	*0.00*	0.01	*0.89*	0.01	*0.86*	-0.12	*0.02*	-0.12	*0.01*
City of Westminster	0.32	*0.00*	-0.02	*0.80*	-0.22	*0.00*	-0.48	*0.00*	-0.40	*0.00*
Bolton	0.09	*0.00*	0.07	*0.09*	0.09	*0.03*	0.03	*0.54*	0.09	*0.02*
Bury	0.25	*0.00*	0.12	*0.01*	0.06	*0.20*	0.13	*0.01*	0.19	*0.00*
Manchester	0.20	*0.00*	0.06	*0.10*	0.12	*0.00*	0.19	*0.00*	0.22	*0.00*
Oldham	0.16	*0.00*	0.01	*0.77*	0.06	*0.15*	0.08	*0.08*	0.10	*0.00*
Rochdale	0.16	*0.00*	0.08	*0.05*	0.11	*0.01*	0.14	*0.00*	0.18	*0.00*
Salford	0.05	*0.07*	0.13	*0.00*	0.06	*0.17*	0.05	*0.28*	0.15	*0.00*
Stockport	0.15	*0.00*	0.11	*0.01*	0.12	*0.00*	0.08	*0.05*	0.03	*0.35*
Tameside	0.04	*0.15*	-0.03	*0.52*	0.04	*0.38*	0.01	*0.92*	0.01	*0.70*
Trafford	0.15	*0.00*	0.16	*0.00*	0.12	*0.01*	0.13	*0.01*	0.00	*0.93*
Wigan	0.16	*0.00*	0.10	*0.02*	0.06	*0.14*	0.10	*0.02*	0.10	*0.00*
Knowsley	0.15	*0.00*	0.09	*0.06*	0.09	*0.05*	0.10	*0.04*	0.08	*0.03*
Liverpool	0.09	*0.00*	0.07	*0.10*	0.10	*0.01*	0.15	*0.00*	0.18	*0.00*
Saint Helens	0.09	*0.00*	0.09	*0.05*	0.05	*0.24*	0.05	*0.26*	0.07	*0.07*
Sefton	0.22	*0.00*	0.10	*0.02*	0.15	*0.00*	0.13	*0.00*	0.09	*0.01*
Wirral	0.23	*0.00*	0.16	*0.00*	0.06	*0.12*	0.11	*0.01*	0.17	*0.00*
Barnsley	0.16	*0.00*	0.20	*0.00*	0.14	*0.00*	0.18	*0.00*	0.21	*0.00*

Doncaster	0.11	*0.00*	0.09	*0.04*	0.08	*0.06*	0.12	*0.01*	0.04	*0.29*
Rotherham	0.15	*0.00*	0.03	*0.52*	0.01	*0.83*	0.07	*0.13*	0.01	*0.78*
Sheffield	0.17	*0.00*	0.16	*0.00*	0.17	*0.00*	0.20	*0.00*	0.19	*0.00*
Gateshead	0.17	*0.00*	0.06	*0.17*	0.10	*0.02*	0.06	*0.17*	0.14	*0.00*
Newcastle upon Tyne	0.15	*0.00*	0.15	*0.00*	0.14	*0.00*	0.18	*0.00*	0.23	*0.00*
North Tyneside	0.11	*0.00*	0.10	*0.01*	0.10	*0.01*	0.10	*0.02*	0.05	*0.15*
South Tyneside	0.10	*0.00*	0.08	*0.07*	0.06	*0.14*	0.04	*0.38*	-0.02	*0.60*
Sunderland	0.05	*0.05*	-0.04	*0.33*	0.05	*0.20*	0.09	*0.05*	0.01	*0.69*
Birmingham	0.20	*0.00*	0.11	*0.00*	0.12	*0.00*	0.10	*0.01*	0.16	*0.00*
Coventry	0.04	*0.15*	0.10	*0.01*	0.11	*0.01*	0.15	*0.00*	0.16	*0.00*
Dudley	0.14	*0.00*	0.09	*0.06*	0.14	*0.00*	0.16	*0.00*	0.21	*0.00*
Sandwell	0.16	*0.00*	0.09	*0.04*	0.11	*0.01*	0.16	*0.00*	0.16	*0.00*
Solihull	0.00	*0.89*	-0.04	*0.38*	-0.07	*0.09*	-0.01	*0.79*	0.09	*0.02*
Walsall	0.17	*0.00*	0.05	*0.32*	0.06	*0.22*	0.12	*0.01*	0.17	*0.00*
Wolverhampton	0.01	*0.81*	0.07	*0.12*	0.09	*0.06*	0.10	*0.04*	0.09	*0.03*
Bradford	0.08	*0.00*	0.06	*0.14*	0.11	*0.00*	0.22	*0.00*	0.26	*0.00*
Calderdale	0.15	*0.00*	-0.02	*0.67*	0.05	*0.27*	0.05	*0.25*	-0.10	*0.01*
Kirklees	0.16	*0.00*	0.13	*0.00*	0.19	*0.00*	0.15	*0.00*	0.11	*0.00*

Leeds	0.13	*0.00*	0.09	*0.02*	0.05	*0.13*	0.07	*0.06*	-0.01	*0.76*
Wakefield	0.19	*0.00*	0.12	*0.00*	0.10	*0.02*	0.12	*0.01*	0.02	*0.46*
Hartlepool	0.17	*0.00*	0.08	*0.08*	0.08	*0.08*	0.10	*0.05*	0.09	*0.02*
Middlesbrough	0.18	*0.00*	0.09	*0.04*	0.07	*0.13*	0.12	*0.01*	0.16	*0.00*
Redcar and Cleveland	0.16	*0.00*	0.06	*0.19*	0.15	*0.00*	0.04	*0.40*	0.01	*0.75*
Stockton-on-Tees	0.06	*0.02*	0.03	*0.45*	0.10	*0.01*	0.04	*0.43*	0.06	*0.09*
Darlington	0.25	*0.00*	0.20	*0.00*	0.17	*0.00*	0.19	*0.00*	0.22	*0.00*
Halton	0.16	*0.00*	0.11	*0.02*	0.14	*0.00*	0.14	*0.01*	0.07	*0.08*
Warrington	0.18	*0.00*	0.09	*0.05*	0.08	*0.07*	0.11	*0.02*	0.07	*0.05*
Blackburn	0.25	*0.00*	0.18	*0.00*	0.15	*0.00*	0.07	*0.14*	0.12	*0.00*
Blackpool	-0.01	*0.72*	0.05	*0.24*	0.06	*0.18*	0.14	*0.00*	0.13	*0.00*
Kingston upon Hull	0.21	*0.00*	0.12	*0.00*	0.10	*0.01*	0.14	*0.00*	0.10	*0.00*
East Riding of Yorkshire	0.18	*0.00*	0.11	*0.01*	0.03	*0.39*	0.06	*0.13*	0.07	*0.03*
North East Lincolnshire	0.13	*0.00*	0.14	*0.00*	0.15	*0.00*	0.15	*0.00*	0.18	*0.00*
North Lincolnshire	0.11	*0.00*	0.02	*0.69*	-0.02	*0.70*	0.06	*0.25*	0.07	*0.06*
York	0.20	*0.00*	0.13	*0.00*	0.21	*0.00*	0.18	*0.00*	0.13	*0.00*
Derby	0.18	*0.00*	0.03	*0.56*	0.04	*0.40*	0.02	*0.60*	0.03	*0.49*
Leicester	0.04	*0.11*	0.03	*0.47*	0.09	*0.04*	0.14	*0.00*	0.15	*0.00*

Rutland	0.15	*0.00*	0.12	*0.06*	-0.01	*0.93*	-0.12	*0.08*	-0.09	*0.08*
Nottingham	0.13	*0.00*	0.17	*0.00*	0.12	*0.01*	0.12	*0.01*	0.11	*0.00*
Herefordshire	0.21	*0.00*	0.08	*0.12*	0.24	*0.00*	0.29	*0.00*	0.46	*0.00*
Telford and Wrekin	0.08	*0.00*	0.04	*0.38*	0.01	*0.81*	0.00	*0.94*	0.01	*0.88*
Stoke-on-Trent	0.14	*0.00*	0.11	*0.01*	0.13	*0.00*	0.19	*0.00*	0.27	*0.00*
Bath and North East Somerset	0.17	*0.00*	0.09	*0.07*	0.09	*0.05*	0.07	*0.17*	0.06	*0.13*
Bristol	0.11	*0.00*	-0.01	*0.75*	-0.01	*0.82*	-0.02	*0.63*	-0.10	*0.00*
North Somerset	0.08	*0.00*	0.09	*0.03*	0.08	*0.05*	0.01	*0.86*	-0.07	*0.04*
South Gloucestershire	0.16	*0.00*	0.09	*0.03*	0.05	*0.25*	-0.02	*0.64*	-0.17	*0.00*
Plymouth	0.14	*0.00*	0.10	*0.02*	0.09	*0.03*	0.11	*0.02*	0.13	*0.00*
Torbay	0.15	*0.00*	0.08	*0.09*	0.13	*0.01*	0.06	*0.18*	0.18	*0.00*
Bournemouth	0.01	*0.78*	0.02	*0.68*	0.03	*0.56*	-0.04	*0.35*	-0.06	*0.08*
Poole	0.22	*0.00*	0.11	*0.02*	0.07	*0.12*	-0.02	*0.73*	0.00	*0.98*
Swindon	0.05	*0.07*	0.04	*0.42*	0.09	*0.04*	0.02	*0.71*	0.08	*0.04*
Peterborough	0.10	*0.00*	-0.02	*0.61*	0.02	*0.62*	0.20	*0.00*	0.22	*0.00*
Luton	0.13	*0.00*	0.07	*0.13*	0.09	*0.05*	0.08	*0.12*	0.13	*0.00*
Southend-on-Sea	0.16	*0.00*	0.08	*0.11*	0.05	*0.31*	-0.01	*0.86*	-0.07	*0.07*
Thurrock	0.16	*0.00*	0.06	*0.24*	-0.03	*0.48*	-0.01	*0.85*	0.01	*0.85*

Medway Towns	0.00	*0.98*	-0.04	*0.42*	0.06	*0.20*	0.00	*0.96*	0.11	*0.01*
Bracknell Forest	0.13	*0.00*	-0.04	*0.41*	-0.15	*0.00*	-0.22	*0.00*	-0.15	*0.00*
West Berkshire	-0.01	*0.81*	-0.04	*0.42*	-0.09	*0.04*	-0.16	*0.00*	-0.24	*0.00*
Reading	0.05	*0.08*	-0.01	*0.81*	-0.04	*0.37*	-0.04	*0.40*	-0.01	*0.87*
Slough	0.02	*0.55*	0.05	*0.27*	-0.02	*0.66*	0.04	*0.46*	0.16	*0.00*
Windsor and Maidenhead	-0.01	*0.86*	-0.11	*0.03*	-0.21	*0.00*	-0.27	*0.00*	-0.27	*0.00*
Wokingham	0.09	*0.00*	-0.03	*0.56*	-0.02	*0.71*	-0.12	*0.02*	-0.24	*0.00*
Milton Keynes	0.12	*0.00*	0.08	*0.08*	-0.01	*0.85*	-0.14	*0.00*	-0.23	*0.00*
Brighton and Hove	0.18	*0.00*	0.11	*0.01*	0.09	*0.02*	0.02	*0.62*	-0.02	*0.50*
Portsmouth	0.07	*0.01*	0.02	*0.71*	0.03	*0.48*	0.05	*0.29*	0.07	*0.05*
Southampton	0.10	*0.00*	-0.01	*0.82*	-0.04	*0.35*	-0.04	*0.37*	0.00	*0.97*
Isle of Wight	0.13	*0.00*	0.05	*0.27*	0.14	*0.00*	0.16	*0.00*	0.21	*0.00*
Isle of Anglesey (Sir Ynis Mon)	0.18	*0.00*	0.08	*0.11*	0.10	*0.05*	0.10	*0.06*	0.08	*0.05*
Gwynedd	0.36	*0.00*	0.23	*0.00*	0.28	*0.00*	0.29	*0.00*	0.22	*0.00*
Conwy	0.12	*0.00*	0.12	*0.02*	0.11	*0.02*	0.13	*0.01*	0.05	*0.23*
Denbighshire (Sir Ddinbych)	0.25	*0.00*	0.15	*0.00*	0.18	*0.00*	0.21	*0.00*	0.18	*0.00*
Flintshire (Sir Y Fflint)	0.11	*0.00*	0.10	*0.03*	0.06	*0.22*	0.08	*0.12*	0.00	*0.97*
Wrexham (Wrecsam)	0.24	*0.00*	0.15	*0.00*	0.16	*0.00*	0.13	*0.01*	0.15	*0.00*

Powys	0.04	*0.17*	0.10	*0.03*	0.11	*0.02*	0.22	*0.00*	0.06	*0.11*
Ceredigion (Sir Ceredigion)	0.27	*0.00*	0.25	*0.00*	0.23	*0.00*	0.26	*0.00*	0.16	*0.00*
Pembrokeshire (Sir Benfro)	0.04	*0.15*	0.00	*0.99*	0.08	*0.10*	0.08	*0.10*	-0.02	*0.57*
Carmarthenshire (Sir Gaerfyrddin)	0.33	*0.00*	0.18	*0.00*	0.24	*0.00*	0.28	*0.00*	0.34	*0.00*
Swansea (Abertane)	0.14	*0.00*	0.11	*0.01*	0.03	*0.44*	0.15	*0.00*	0.17	*0.00*
Neath Port Talbot (Castel-Nedd Port Talbot)	0.12	*0.00*	0.11	*0.01*	0.15	*0.00*	0.14	*0.00*	0.19	*0.00*
Bridgend (Pen-Y-Bont Ar Ogwr)	0.12	*0.00*	0.10	*0.02*	0.13	*0.00*	0.14	*0.00*	0.13	*0.00*
Vale of Glamorgan (Bro Morgannwg)	0.18	*0.00*	0.17	*0.00*	0.18	*0.00*	0.18	*0.00*	0.26	*0.00*
Rhondda Cynon Taff	0.24	*0.00*	0.19	*0.00*	0.13	*0.00*	0.15	*0.00*	0.13	*0.00*
Merthyr Tydfil (Merthyr Tudful)	0.16	*0.00*	0.07	*0.17*	0.08	*0.16*	0.12	*0.04*	0.16	*0.00*
Caerphilly (Caerffili)	0.14	*0.00*	0.09	*0.05*	0.07	*0.16*	0.14	*0.00*	0.10	*0.01*
Blaenau Gwent	0.12	*0.00*	0.07	*0.22*	0.09	*0.11*	0.19	*0.00*	0.37	*0.00*
Torfaen (Tor-Faen)	0.20	*0.00*	0.10	*0.02*	0.10	*0.02*	0.09	*0.05*	0.16	*0.00*
Monmouthshire (Sir Fynwy)	0.16	*0.00*	0.11	*0.02*	0.09	*0.04*	0.13	*0.01*	0.16	*0.00*
Newport (Casnewydd)	0.17	*0.00*	0.15	*0.00*	0.12	*0.01*	0.15	*0.00*	0.24	*0.00*
Cardiff (Caerdydd)	0.23	*0.00*	0.18	*0.00*	0.17	*0.00*	0.12	*0.01*	0.17	*0.00*
Aberdeen	0.12	*0.00*	0.08	*0.08*	-0.01	*0.87*	-0.12	*0.01*	-0.20	*0.00*

Aberdeenshire	0.02	*0.57*	0.04	*0.33*	0.04	*0.35*	0.04	*0.42*	0.02	*0.53*
Angus	0.09	*0.00*	0.13	*0.01*	0.07	*0.10*	0.09	*0.06*	0.18	*0.00*
Argyll and Bute	0.24	*0.00*	0.20	*0.00*	0.20	*0.00*	0.09	*0.05*	0.15	*0.00*
Scottish Borders	0.22	*0.00*	0.20	*0.00*	0.21	*0.00*	0.15	*0.00*	0.13	*0.00*
Clackmannan	0.29	*0.00*	0.14	*0.03*	0.06	*0.32*	0.09	*0.17*	0.02	*0.75*
West Dunbartonshire	0.17	*0.00*	0.10	*0.02*	0.06	*0.18*	0.08	*0.10*	0.09	*0.02*
Dumfries and Galloway	0.21	*0.00*	0.15	*0.00*	0.17	*0.00*	0.12	*0.01*	0.16	*0.00*
Dundee	0.27	*0.00*	0.18	*0.00*	0.19	*0.00*	0.17	*0.00*	0.18	*0.00*
East Ayrshire	0.25	*0.00*	0.19	*0.00*	0.18	*0.00*	0.15	*0.00*	0.22	*0.00*
East Dunbartonshire	0.42	*0.00*	0.21	*0.00*	0.19	*0.00*	0.09	*0.07*	-0.02	*0.63*
East Lothian	0.21	*0.00*	0.15	*0.00*	0.11	*0.02*	0.03	*0.59*	-0.05	*0.18*
East Renfrewshire	0.23	*0.00*	0.05	*0.28*	0.00	*0.99*	-0.11	*0.02*	-0.14	*0.00*
Edinburgh	0.17	*0.00*	0.07	*0.06*	0.10	*0.01*	0.09	*0.02*	0.04	*0.17*
Falkirk	0.12	*0.00*	0.10	*0.02*	0.04	*0.30*	0.06	*0.19*	0.00	*0.90*
Fife	0.23	*0.00*	0.14	*0.00*	0.19	*0.00*	0.17	*0.00*	0.21	*0.00*
Glasgow	0.25	*0.00*	0.19	*0.00*	0.19	*0.00*	0.20	*0.00*	0.22	*0.00*
Highland	0.16	*0.00*	0.09	*0.03*	0.15	*0.00*	0.20	*0.00*	0.23	*0.00*
Inverclyde	0.20	*0.00*	0.18	*0.00*	0.16	*0.00*	0.12	*0.01*	0.19	*0.00*

Midlothian	0.05	*0.07*	0.02	*0.73*	0.02	*0.69*	0.03	*0.60*	0.04	*0.36*
Moray	0.32	*0.00*	0.11	*0.02*	0.15	*0.00*	0.16	*0.00*	0.18	*0.00*
North Ayrshire	0.20	*0.00*	0.12	*0.01*	0.07	*0.16*	0.09	*0.08*	0.12	*0.00*
North Lanarkshire	0.07	*0.01*	0.10	*0.01*	0.09	*0.02*	0.12	*0.01*	0.10	*0.00*
Perth and Kinross	0.19	*0.00*	0.10	*0.03*	0.10	*0.03*	0.09	*0.07*	0.07	*0.07*
Renfrewshire	0.13	*0.00*	0.07	*0.13*	0.12	*0.01*	0.06	*0.18*	0.09	*0.01*
South Ayrshire	0.20	*0.00*	0.17	*0.00*	0.16	*0.00*	0.11	*0.02*	0.17	*0.00*
South Lanarkshire	0.10	*0.00*	0.10	*0.01*	0.10	*0.01*	0.08	*0.07*	0.02	*0.47*
Stirling	0.26	*0.00*	0.14	*0.01*	0.16	*0.00*	0.18	*0.00*	-0.08	*0.06*
West Lothian	0.18	*0.00*	0.10	*0.03*	-0.01	*0.75*	0.01	*0.87*	0.05	*0.21*
Northern Ireland	0.18	*0.00*	0.12	*0.00*	0.12	*0.00*	0.16	*0.00*	0.24	*0.00*
Job type and tenure										
Job is full time	0.18	*0.00*	0.19	*0.00*	0.17	*0.00*	0.15	*0.00*	0.11	*0.00*
Up to a year in job	-0.07	*0.00*	-0.06	*0.00*	-0.06	*0.00*	-0.06	*0.00*	-0.05	*0.00*
1-5 years in job	0.07	*0.00*	0.08	*0.00*	0.08	*0.00*	0.07	*0.00*	0.07	*0.00*
5-10 years in job	0.17	*0.00*	0.19	*0.00*	0.20	*0.00*	0.18	*0.00*	0.15	*0.00*
Over 10 years in job	0.04	*0.01*	0.07	*0.02*	0.08	*0.00*	0.09	*0.00*	0.02	*0.39*
Job is permanent	0.13	*0.00*	0.09	*0.00*	0.04	*0.00*	-0.01	*0.03*	-0.06	*0.00*

Age and sex										
Age	0.05	*0.00*	0.04	*0.00*	0.05	*0.00*	0.06	*0.00*	0.07	*0.00*
Age squared	0.00	*0.00*	0.00	*0.00*	0.00	*0.00*	0.00	*0.00*	0.00	*0.00*
Male	0.12	*0.00*	0.13	*0.00*	0.16	*0.00*	0.19	*0.00*	0.21	*0.00*
Qualifications										
Missing variable dummies	-0.13	*0.00*	-0.17	*0.00*	-0.19	*0.00*	-0.17	*0.00*	-0.10	*0.00*
No qualifications	-0.19	*0.00*	-0.22	*0.00*	-0.28	*0.00*	-0.33	*0.00*	-0.36	*0.00*
Low qualifications	-0.09	*0.00*	-0.11	*0.00*	-0.13	*0.00*	-0.14	*0.00*	-0.15	*0.00*
High qualifications	0.21	*0.00*	0.29	*0.00*	0.36	*0.00*	0.40	*0.00*	0.40	*0.00*
Other controls										
Region dummies	*Yes*		*Yes*		*Yes*		*Yes*		*Yes*	
Quarter dummies	*Yes*		*Yes*		*Yes*		*Yes*		*Yes*	
Missing variable dummies	*Yes*		*Yes*		*Yes*		*Yes*		*Yes*	
Constant	0.50	*0.00*	0.81	*0.00*	1.00	*0.00*	1.14	*0.00*	1.24	*0.00*

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