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The gender pay gap in the UK: evidence from the UKHLS

Research report

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Executive summary

This report provides an analysis of the main predictors of the gender pay gap (the gap between men and women's average hourly earnings) using the latest waves of the British Household Panel Survey (BHPS) and the United Kingdom Household Longitudinal Survey (UKHLS) relating to 2014/2015. We also provide additional tests using 2009/2010 data. The findings delivered in the report can be considered alongside the findings of our earlier research on the topic (Olsen et al. 2010a, b), with a similar research strategy and research method applied.

The report contributes to ongoing efforts to monitor the Gender Pay Gap (GPG) in an effort to approach parity in pay for men and women. ONS estimates suggest a median gender pay gap of 19.3% in 2015 for the UK as a whole, in its analysis of the Annual Survey of Hours and Earnings (ASHE) data. This report uses alternative data sources: the British Household Panel Survey (BHPS) and the United Kingdom Household Longitudinal Survey (UKHLS), which provide additional information necessary for our statistical analyses. All figures within this report use these data unless otherwise stated. This has led to some divergence in our estimates of the GPG than those generated using ASHE. Further differences can be found in our estimates of the GPG at the mean, whilst the ONS tends to examine the GPG at the median[1]. ONS estimates of the gender pay gap at the median suggest a larger pay gap than their estimates at the mean (ONS, 2016a).

A review of our sample statistics underscores the ongoing differences between women and men in their working strategies. Our sample statistics show that 81% of part-time workers were women in 2014/2015 and that 56% of full-time workers were men. So while an increasingly large proportion of women are in full-time employment, part-time employment, in particular, is deeply gendered. We also find that women with children continue to pursue part-time employment over full-time employment. While 38% of our female sample has children overall, the percentage rises to 51% for those who work part-time. There is no similar effect for men.

Turning our attention to the job characteristics of those in part-time and full-time employment, we note similar percentages of women and men in temporary contracts overall, and that the percentages of those on temporary contracts are higher for workers in part-time posts. The discrepancy is also greatest for male part-time workers: 8% of women who work part-time are on temporary contracts compared to 18% of men who work part-time (Table 2).

Key to our analysis is the effect of labour market and working history on wages and, therefore, the gender pay gap. We find that men in full-time employment have longer

[1] A full discussion of the different implications of analyses of the GPG at the mean versus the median can be found on page 10.

full-time work-histories than women in full-time employment, 17.8 years compared to 13.2 years, and that men in full-time jobs tend to have had little to no exposure to part-time employment nor to unpaid care work in their work history. We also note the strong difference in work history between men in full-time jobs and those in part-time jobs: men in part-time jobs have almost ten years less full-time work history than men in full-time jobs, and considerable prior experience of part-time work.

We establish a decline in the gender pay gap; using data from 2004-2007 Olsen et al. (2010a) found a mean pay gap of 19%. In this report, using more recent data, we establish a pay gap of 14.4% in 2009/2010 and a pay gap of 13.4% in 2014/2015. While the most recent declines are welcome they also need to be understood within the context of declining real wages.

Table 3 presents calculations of gross hourly pay by gender and working-time status for 2014/2015. It reveals an average hourly pay of £10.47 for women in the UK and of £12.09 for men in 2014/2015, and a gross wage difference per hour of £1.62.

In this report, we decompose the predictors of the gender pay gap by key covariates, referring to those that increase the gender pay gap as 'drivers' and those that decrease it as 'protective factors'. We established the following drivers of the pay gap in the UK using 2014/2015 data: The biggest drivers of the gender pay gap in 2014/2015 concern male-female differentials in labour market history, accounting for 56% of the drivers of the gender pay gap. We find that women earn £0.91 less per hour compared to men because they have fewer years of full-time work in their work history and because they have more years of unpaid care work in their work history compared to men. The next biggest factor concerns unobserved components of the gender pay gap, which includes all observed and unobserved characteristics systematically associated with being female, which accounts for 35% of the drivers behind the pay gap. Here we can say that women earn £0.57 less per hour than men because of these unobserved factors (Figure 3). While we cannot definitively say what these observed and unobserved factors are it is likely to be a combination of discriminatory behaviour against women and ongoing differentials in gendered behaviour between men and women. Pay differentials arising from industrial sector and occupational segregation are the next biggest drivers, accounting for 29% and 19% respectively.

We establish some significant changes in the protective features of the gender pay gap in the UK using 2014/2015 data. While institutional features, including public sector employment, continue to be protective against the pay gap, contrary to our earlier report we have found part-time employment to be a protective factor of the gender pay gap. We attribute this change, firstly, to the rise in male part-time employment which is of poor quality, and secondly to increased proportions of

female ‘retention part-time workers’[2]. So, while previous research has found that many women have had to occupationally downgrade in pursuit of reduced-hours posts (Connolly and Gregory, 2008), recent changes in policy may be limiting such flows to lower-calibre positions. Though many part-time jobs continue to be of poor quality - part-time jobs are less likely to be permanent or unionised - there are also many part-time workers employed in the public sector, a sector typically regarded to have preferential working conditions over others. For our sample, we find 39% of women in part-time jobs work in the public sector compared to 21% of women in full-time jobs. We find a pay premium for public sector employment when compared to private sector employment in the wage regressions estimated for this report, and have found a similar dynamic in our earlier research (Olsen et al 2010a). In addition to compositional differences as a result of the right to request flexible working, there has also been an increase in the proportion of men employed in part-time jobs since the recent recession, from 9.7% in 2007 to 11.9% in 2015 (OECD, 2016: 227-228), and this increase in male part-time employment has coincided with an increase in the percentage of men who are involuntarily employed in such posts.

[2] Retention part-time workers are workers who were previously working full-time and successfully managed to renegotiate a part-time contract with their employer. Retention part-time workers tend to be more highly skilled and valued by their employers who agree to reduced working hours in an attempt to retain a valued employee.

1. Introduction

This report aims to uncover the ongoing sources of the gender pay gap (GPG), which, despite considerable legislative change, remains a feature of the UK labour market. The report is structured in the following manner. We begin with a brief outline of Olsen et al.'s (2010a) findings on the topic, with an aim to replicate that analysis using more recent data. We then provide estimates of the GPG using the latest available panel data from 2014/2015. This report includes a brief outline of the data used as well as our research method and empirical strategy.

As with other gender pay gap studies, we aim to reveal the predictors of the gender pay gap. This involves modelling the determinants of the wages of all workers and then identifying differences in the remuneration structures for women and men. The wage models estimated are then used to decompose the gender pay gap into its constitutive elements. This decomposition exercise is based on two important elements. First, it takes into account the importance of determinants such as education level, labour market experience and occupational group for an individual's wage. Secondly, the gender differences in the distribution of such determinants are taken into account. Using this methodology, we can see for instance, whether there are ongoing differences in industrial location[3] between men and women, and whether this continues to account for a large portion of the pay gap. Conversely, we could determine that education is an important determinant of wages. However, given that education levels have become more equal between men and women, education may not be a large determinant of the gender wage gap. We can also identify whether there are features of employment which are protective of women's pay and as such could help decrease the gender pay gap.

This report examines the gender pay gap (GPG) in the UK using the latest available wave of the UK Household Longitudinal Study (UKHLS). The UKHLS is a panel dataset, used in this report as both cross-sectional and panel data, though weights have been used to ensure the data is relevant to the 2014/2015 time period. This report offers a simulated decomposition analysis of the GPG in an effort to replicate the analysis provided by Olsen et al. (2010a, b) and Olsen at al. (2013) which used an earlier version of UKHLS data, the British Household Panel Survey.

[3] We use the standard industrial classification (SIC) to distinguish between up to eight different industrial sectors.

2. Method and analysis

The data

We use the UK Household Longitudinal Study (UKHLS), also known as the Understanding Society dataset and the British Household Panel Survey (BHPS). The UKHLS is the principal panel dataset in the UK. It has replaced the British Household Panel Survey (BHPS), 1991-2008, although a subsample of the BHPS remains within the UKHLS. This means the full panel sequence, which began in 1991, is maintained for researchers. The UKHLS has six waves of data. It is considerably larger than the BHPS, with around 40,000 people interviewed at Wave 1. The first year of data collection was in 2009. The study collects data from household members aged 10 and above on an annual basis. The primary data point used in this report concerns the latest wave of the UKHLS (wave 6); information was collected from respondents during 2014/2015. We use the BHPS to provide a long-ranging analysis of work histories on the gender pay gap. These data points can go as far back as 1991, which is the first wave of the BHPS. We also provide some tests of recent change in the GPG by providing some estimates of the GPG in 2014/2015 and 2009/2010, using UKHLS only. All tables and figures identify the data used for any reported estimates.

Measuring the gender pay gap

Government headline measure of GPG

We anticipate this report will be used alongside Government headline measures of the GPG. It is important to note, however, that our estimates of the gender pay gap differ from those estimated by the Office of National Statistics (ONS). There are several reasons for this. The main reason concerns the different datasets used. The Government's ONS headline measure is based on the Annual Survey of Hours and Earnings (ASHE) data. The ASHE sample is based on a 1% sample of employees on the pay as you earn register (PAYE) though employers are responsible for providing employee information. While ASHE is one of the largest datasets on earnings in the UK, it lacks key variables necessary for our analysis. The second reason for the difference in estimates concerns our examination of wages at the mean, while the Government's ONS measure is estimated at the median.

Table 1 below provides different estimates of the GPG using the Annual Survey of Hours and Earnings (ASHE) data and UKHLS data, and also provides an assessment of the difference in the GPG at the median versus the mean of the distribution of gross hourly pay. All estimates have been validated through multiple

checks to determine whether alternative strategies to obtain point estimates reveal similar results. Our *mean* estimates of the GPG are in line with those identified by others using the ASHE data (ONS 2016b, Brynin 2017, p.7). However, as can be seen in Table 1, different data can lead to different estimates of the GPG.

Table 1: Overall pay gap by mean and median earnings: ASHE vs. UKHLS

Mean		**Median**	
ASHE	**UKHLS**	**ASHE**	**UKHLS**
17.7%	13.4%	19.3%	5.8%

Source: Authors' calculations and ONS, 2016b. The ONS definition is used here, with "all male employees" as the denominator. The data for both samples relate to the 2014/2015 time period which was the latest available UKHLS data at the time of writing.

The ASHE estimates of the GPG are several percentage points higher than ours at the median, as are their point estimates of hourly pay (see Figure A in the appendix). We attribute this to the following: (1) the UKHLS collects wage information directly from respondents, while ASHE is completed by employers on behalf of their employees using firm's payroll reports. (2) ASHE does not collect wage information for self-employed workers, while UKHLS does. We suggest that respondent-collected data is more likely to obtain responses from low-paid workers, as well as the pseudo self-employed working in the gig economy. Those on low pay may not be reported by firms to ASHE due to subcontracting, whereas in the UKHLS respondents can self-classify as employees and report their pay. For instance, in our sample of employees with positive labour income and non-missing variables on key characteristics associated with paid employment, we find 8% of our sample self-classify their main labour market status as: 'doing caring work'. This suggests that UKHLS is more inclusive of low-pay and informal work than ASHE. (3) ASHE omits youth wages, while the UKHLS includes those on the 16-25 'youth' minimum wage rates (now renamed 'Living Wage'). (4) ASHE excludes those who have not been in continuous employment in their position for at least 12 months, those who are not deemed to be on an adult wage and those without employee status. They state: "[the estimates] relate to employees on adult rates of pay who have been in the same job for more than a year. ASHE is based on a 1% sample of jobs taken from HM Revenue and Customs' Pay As You Earn (PAYE) records" (ONS, 2016b). Exclusions based on tenure, employment status and adult wage minima are bound to affect point estimates of mean and median hourly pay. In combination, these differences in the sample selection for both data are expected to result in lower point estimates across the distribution of earnings in the UKHLS, with the greatest difference found on the right-hand side of the distribution of earnings. This is confirmed in Figure A in

the appendix which shows that ASHE has higher estimates of hourly pay in general, and that the differential is greatest for those in receipt of wages at the median and above (the 50th percentile).

The GPG at the mean versus the median

This report examines gender variation in gross hourly earned income *at the mean.* We do so for the following reasons. The first concerns our aim to provide a methodologically consistent manner of identifying the gender pay gap throughout the report and one which is consistent with our previous estimates at the mean (Olsen et al., 2010a). Second, our regression and decomposition methods are based on estimation methods which primarily base predictions at the mean, not the median; so for consistency, all our estimates of the overall gender pay gap also examine mean earnings. Third, there are notable differences in hourly pay at the mean and the median. In distributions that are skewed to the left, for instance when more people earn lower wages than higher ones, median wages will be lower than wages at the mean. This scenario is the current case in the UK and is true of the majority of national income distributions. Were we to shift our attention to an analysis at the median, however, we would weaken the effects of an important segment of the labour market, those in the upper echelons of paid employment. In an analysis of the gender pay gap, this segment is particularly important, as the gender pay gap is known to increase across the distribution of wages, with more men than women in receipt of high pay (Olsen et al. 2013, Figures 2-3).

Drivers and protective factors

We use the terminology ‘drivers’ to refer to covariates which, empirically, have been found to *increase the gender pay gap*. We use the term ‘protective factor’ to refer to covariates which, empirically, have been found to *decrease the gender pay gap*.

Real versus nominal wages

The report corrects for the changing purchasing power of earned income as a result of fluctuations in price levels. When considering the incentive and reward structures of paid employment it is important to recognise the purchasing power attached to wages. We use the ONS GDP deflator series to correct nominal income estimates in all analyses presented in this report.

Decomposition techniques and sample strategy

In our multivariate analyses, our report applies simulation decomposition methods which were previously applied in our 2010 report. We do so on two different sub-samples of the available data: The first, sub-sample 1, uses all BHPS cohorts in the

data. This allows us to examine an extended work-life history data spanning a 24-year period, from 1991 to 2015. This requires a combined analysis of two datasets. We use, 1, the work history data files from the BHPS, spanning 1991-2009/10 (the latest wave of BHPS before Understanding Society) and, 2, the five annual BHPS sub-samples retained within the new Understanding Society data set (consisting of wave 2 to 6, 2010 to 2014/2015). While this strategy allows us to analyse an extended time series, there is a risk that our sample characteristics are affected by non-random attrition. In response to this risk, we apply the relevant sample weights to our analysis and also conduct sensitivity tests, as described in sub-sample 2 below. Using data from sub-sample 2, we examine the GPG using much shorter work-histories and compare the UKHLS data using 5 years of work history data (relating to 2010-2015) with the BHPS data over the same time period. While both the UKHLS and the BHPS are nationally representative samples, the UKHLS is a much larger sample, and also will have considerably less sample attrition given that it began in 2009.

Standard Oaxaca-Blinder decomposition techniques reveal the different predictors of the gender pay gap (Oaxaca and Ransom, 1994). The Oaxaca technique consists of two different estimations. The first, the endowments effect (also sometimes called the characteristics effect) offers an assessment of the predictors of wages, separately for both men and women. Here we introduce a series of covariates typically used to measure variance in pay including socio-demographic differences, and differences relating to labour market position and labour market experience. The endowment effect offers an estimate of the weighted sum of gender differences in observed endowments associated with pay rates, e.g. men's tendency to have degrees in IT, which are well paid.

The second component of the Oaxaca decomposition concerns an estimate of the rewards, also sometimes called the coefficients effect. Here, the estimate measures the weighted sum of gender differences in estimated coefficients. For instance, it identifies different market returns for men and women relating to the same endowment, e.g. women IT graduates' wages compared to male IT graduates' wages. The rewards/coefficient estimate also includes the constant in the model, which captures unobserved and unmeasured attributes associated with the pay gap. The unobserved component is interpreted by some as a possible measure of discrimination (del Rio et al., 2011), though there is no agreement amongst users of the technique that this is the correct interpretation of the constant term (Boll et al., 2016). We indicate the Oaxaca-Blinder decomposition in equation 1 below, *ln ghw* is the logarithm of gross hourly wage, the bar above it denotes a mean, and subscripts *m* and *f* distinguish the coefficients and estimates for males and for females. *Σ* refers to the sum of the endowment and coefficient estimates.

$$\overline{\ln ghw}_m - \overline{\ln ghw}_f = \beta_{0m} - \beta_{0f} + \sum(\bar{X}_m - \bar{X}_f)\beta_m + \sum(\beta_m - \beta_f)\bar{X}_f \quad \text{(Eq. 1)}$$

In equation 1, the first two terms on the right reflect the male and female constants. Their difference is sometimes called the 'female residual'. Next, we see the gender difference in characteristics (also called endowments), $\bar{X}_m - \bar{X}_f$. Finally, the last set of terms reflects the difference in the structure of rewards to these characteristics, each reward being a slope in the regression of either male or female wages, β_m and β_f (seen, for example, in Boll et al., 2016).

Simulation decomposition

While Oaxaca decomposition is very common in analyses of the GPG, two aspects of it are problematic. The simulation approach was created in Olsen and Walby (2004) to overcome these problems, and it has been used by other researchers since (e.g. Watson, 2010a). The two problems with standard decomposition are as follows. First, the measurement of the portion of the gender pay gap due to gender alone is relegated to the 'constant term' in standard Oaxaca estimations (here labelled as 'unobserved' factors). The constant term captures many effects from the model including gender, and so it is imprecise. In a simulation approach, we include a separate estimate for gender in our models in a pooled male and female wage regression. This offers a more precise measure of the effect of gender on the gender pay gap and can be understood as the adjusted pay gap. Moreover, the measure of gender in such a model is more stable, as the size of the coefficient will not depend on the scale and form of other variables in the model. Secondly, we consider simulation models to be more stable, since the size of some coefficients in Oaxaca estimations is worryingly large, which leads to implausible substantive interpretations of the estimates.

Variable definitions

For comparative purposes, we restrict our decomposition analysis to Great Britain in order to allow a direct comparison of our results with that of Olsen et al. (2010a). This data restriction is due to the exclusion of Northern Ireland from the BHPS until 2000. All other analysis is conducted for the United Kingdom as a whole.

Measures for wages are gross per hour, omitting cases reported below the bottom 0.5 percentile and above the top 99.5 percentile. These wage cut-offs correspond to approximately £1.00 and £100 per hour. We also drop those working less than 5 hours per week from the dataset. We exclude the top and bottom 0.5 percent of our sample as extreme outliers can skew our point estimates at the mean, and are often also deemed to be incorrect accounts of respondent earnings. This is a common strategy in much research on wages. We drop those with less than five hours a week

as they often do not have full information on key covariates of interest for our multivariate analyses.

Occupational segregation measures the percentage of men in each occupational category, the variable is scaled by 10, the classification is based on a two-digit standard occupational classification. Table A1 in the appendix presents the different levels of segregation by occupational group. We distinguish four categories of firms, those with; less than 25 employees; 25 to 49 employees; 50 to 499 employees; and those with more than 500 employees.

We retrospectively constructed respondent work histories, providing counts of the number of months each respondent spent in each of the following labour force categories: full-time work, part-time work, unemployment, full-time education, retirement, sick leave, maternity leave, family care or other. The use of cumulative work-life history variables necessitates the exclusion of measures of age, as increments in age over time risk multicollinearity with our incremental work-history variables. We follow the same procedure in our generation of work histories in this report as that outlined in Annex 5 of Olsen et al. (2010a: 96-98).

The data are weighted by the relevant cross-sectional weights which correct for differences between the achieved and the desired sample as a result of non-response. The application of the cross-sectional weights ensure that the sample is statistically representative of the population. We also include proxy interviews. When analysing the larger Understanding Society sample, we exclude the Immigrant and Ethnic Minority Booster (IEMB) sample, which was first collected in wave 6 of the UKHLS and relate to the 2014/2015 time period.

Robustness tests

We tested for both heteroscedasticity and endogeneity in all the wage regressions shown. Our tests of heteroscedasticity tested for a possible relationship between our ‘female residual’, which tends to be large in a combined model of men and women, and individual case residual errors. We found no change in these errors across key factors including increasing age, industrial sector or region. We also tested for endogeneity by looking at correlations of sets of variables within a year. We found no endogeneity issues in our regressors.

3. Earlier research

Olsen et al. (2010a) examined changes in the gender pay gap between 1995-1997 and 2004-2007, using the now discontinued British Household Panel Survey (BHPS). They showed the pay gap to have fallen from 24% to 19% during the period from 1995-7 to 2004-7. For full-time working women, the pay gap stood at 15% in 2004-7 compared to 18% in 1995-7.

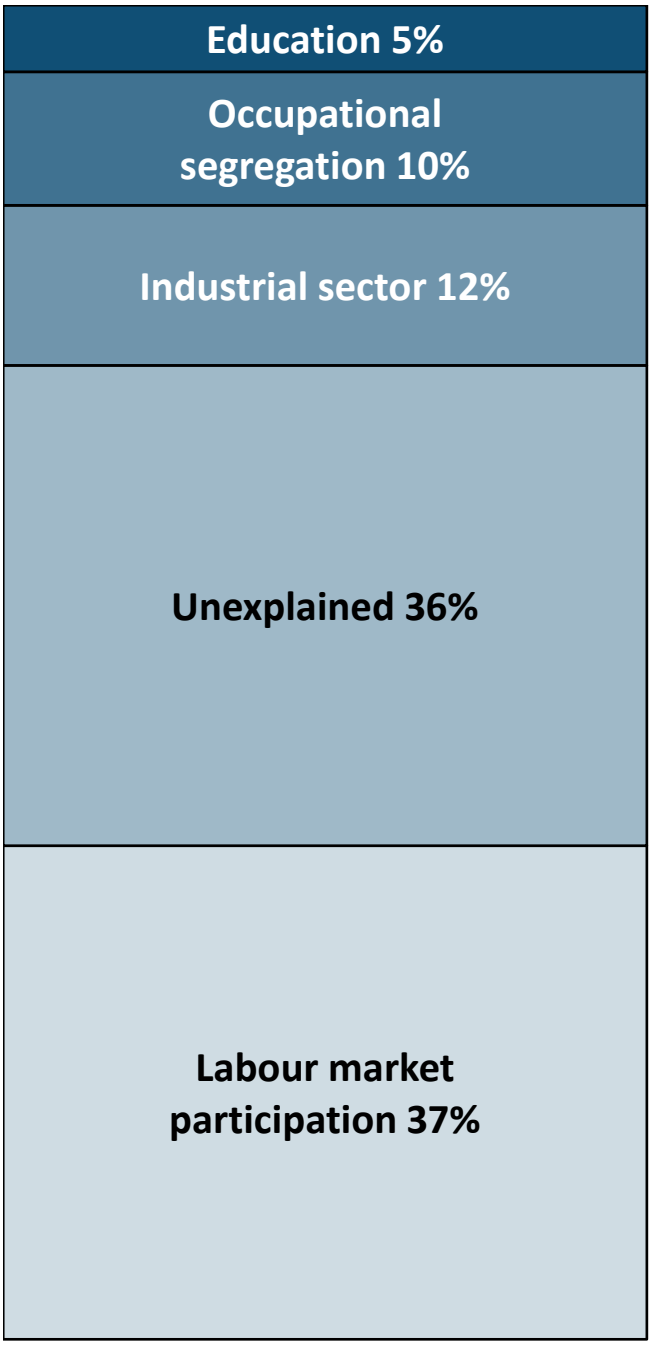
The report identified three principle sources of the ongoing pay differential between men and women. The first concerned the impact of *labour market history* on the pay gap. They found women who had career breaks to take care of children had, on average, wages that were lower than those of men. They found that for each year a woman took time off to engage in family care work, she could anticipate her wages to be 1% lower.

The second factor concerned the way in which occupational and industrial segregation affect earnings. Job design in the workplace was found to lower women's earnings, in the specific sense that women who work in female-dominated occupations tended to earn lower pay and that men who worked in male-dominated industries tend to earn higher pay. They found women's pay to be protected, however, if they were employed in the public sector, and if they were working in unionised enterprises and in regions with high unionisation.

The third area concerned gender discrimination and/or traditional gender ideologies. Olsen et al. (2010a) argued that the size and persistence of the effect of gender on wages were suggestive of the ongoing negative impact of traditionally gendered ideologies, held by both employers and employees, on income.

Figure 1 below presents the results of the main drivers of the pay gap in Great Britain from Olsen et al. (2010a) from a model specification that included estimates of labour market history variables (the report also included estimates without work-histories). Each block in the column shows the percentage of the gender pay gap that can be attributed to each driver. They found that 37% of the gender pay gap was due to variation in the labour market history of women and men. They found that unobserved factors associated with gender accounted for 36% of the pay gap in this estimation, while institutional factors, such as occupational segregation, accounted for 10% of the pay gap.

Figure 1: Drivers of the pay gap, 2007



Notes: Figure 1 is adapted from Olsen et al. (2010a, p.49). The figure was previously titled: Figure 5.3, Impact of career interruptions on the gender pay gap. It shows elements from a full simulation decomposition equation based on the BHPS, wave q. The base is: Employed individuals aged 16 to 65 inclusive; Great-Britain.

4. Current sample descriptives

We begin our report with a review of our sample's characteristics by gender and by working-time status. We do this given the ongoing differences between women and men in their working strategies. Our sample estimates show that 81% of part-time workers were women in 2014/2015,and that 56% of full-time workers were men (figures not shown). So while we find that an increasingly large proportion of women are in full-time employment, part-time employment remains deeply gendered. Table 2 below presents further statistics that outline the different socio-demographic character of part-time and full-time employment.

Women with children continue to pursue part-time employment over full-time employment. While 38% of our female sample has children overall, this increases to 51% for those who work part-time. There is no similar effect for men. While 35% of our male sample has children, the proportions who have children and work part-time is lower (29%) than the proportions who work full-time (36%). This underscores the known tendency that part-time employment is used by many working-mothers in their pursuit of working-conditions that allow them to engage in both paid employment and the care work required to raise children. Yet, it must also be acknowledged that just under one-third of women in full-time positions (30%) also have children. The age profile of our sample by gender and working-time is similar, with the average age being 41 years, with no noteworthy difference between working-times for women, though there is a slight tendency for younger men to be employed part-time compared to full-time.

Turning our attention to the job characteristics of those in part-time and full-time employment, we note similar percentages of women and men in temporary contracts overall, and that the percentages of those on temporary contracts are higher for workers in part-time posts. The discrepancy is also greatest for male part-time workers. While 8% of women who work part-time are on temporary contracts compared to 5% of women who work full-time hours, we find that almost one-fifth of men who work part-time (18%) are also temporary contract workers. We note a higher percentage of women are union members (30%) than is the case for men (26%). We also note that union membership is less common among part-time workers, about 10 percentage points lower, for both women and men, which may impinge on their working conditions and remuneration. Women are more likely to be employed in the public sector (25%) compared to men (12%), and even higher proportions of part-time workers are employed in the public sector for both genders (with 39% of female part-time workers employed in the public sector and 21% of male part-time workers). Finally, on a scale of 1 to10, where each point stands for 10% men working in the respective occupation (thus a '5' shows a gender-balanced occupation), we find strong evidence for occupational segregation. Women are most

likely to be employed in jobs which are disproportionately female. This appears to be even more true for women in part-time jobs. Men are also more likely to be employed in typically male occupations, though this is only true for men in full-time jobs. Men in part-time jobs are employed in sectors with similar proportions of men and women in them.

Table 2: Key characteristics of workers in the UK, by gender and working-time status

	WOMEN			MEN		
	All Women	*Part-time*	*Full-time*	*All Men*	*Part-time*	*Full-time*
Socio-demographic Characteristics						
Has children	38%	51%	30%	35%	29%	36%
Age (years)	41.9	42	41.8	41.7	37.4	42.1
Job Characteristics						
Temporary contract	6%	8%	5%	5%	18%	4%
In union	30%	24%	33%	26%	16%	27%
Public sector	25%	39%	21%	12%	21%	12%
Occupational segregation (male% x10)	3.6	3.2	3.8	6.3	4.7	6.5

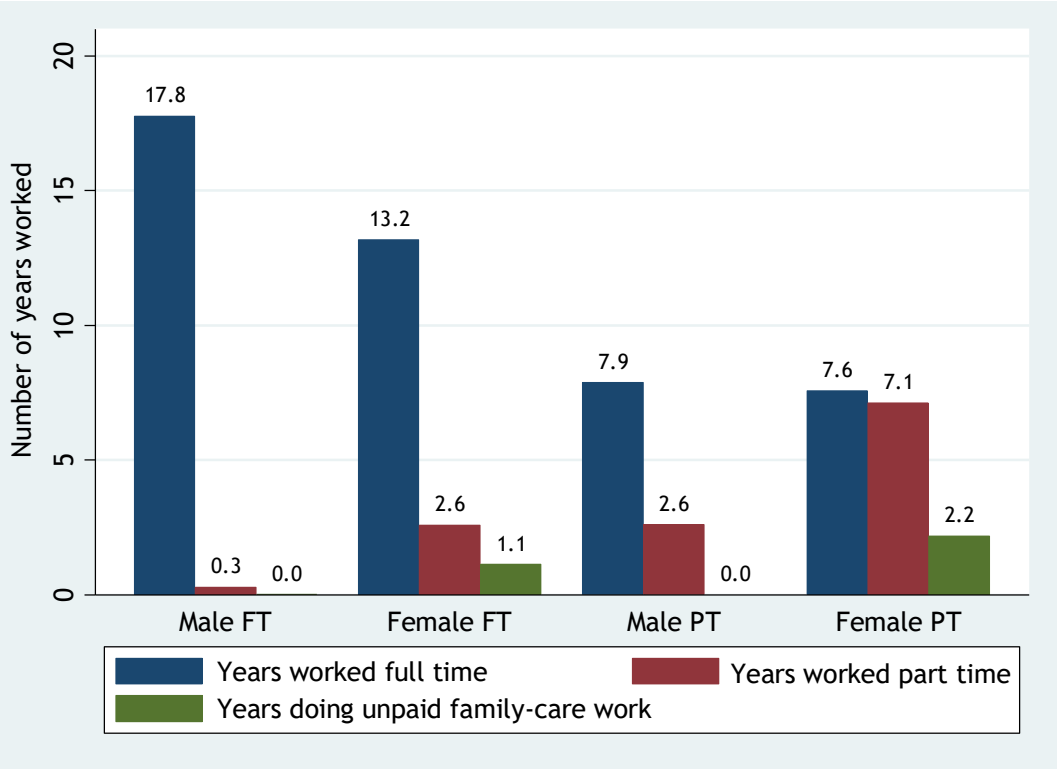
Notes: Our sample selection consists of those aged 16-65 years of age. We excluded those earning less than 1 pound an hour and those earning more than 100 pounds an hour and those who work for less than 5 hours a week. This table uses wave 6 of the UKHLS. The data is weighted by the relevant cross-sectional weight and includes proxy interviews. We exclude the Immigrant and Ethnic Minority Booster (IEMB) sample. The data is relevant to the 2014/2015 time period.

Work history characteristics

Figure 2 below presents the distributions of key work-history variables for women and men according to their working-time status. They reflect ongoing differences in male and female labour force attachment; men are frequently typified as having full-time and continuous careers whilst women have been described as having intermittent careers (Blossfeld *et al.* 2001). We find that men in full-time employment have longer full-time work-histories than women in full-time employment, 17.8 years compared to 13.2 years and that men in full-time jobs tend to have had little to no exposure to part-time employment nor to unpaid care work. Women in full-time jobs

also have long full-time work-histories, but they also have on average 2.6 years of part-time work history and 1.1 years spent in unpaid care work. Women in part-time jobs accrue the longest part-time working history, 7.1 years on average, and they also have the longest periods spent in unpaid care work: 2.2 years. Finally, men in part-time jobs have almost ten years less full-time work history than men in full-time jobs, and considerable prior experience of part-time work.

Figure 2: Work-history characteristics for men and women by working-time status



5. The gender pay gap in 2014/2015

Table 3 presents calculations of gross hourly pay by gender and working-time status. It reveals an average hourly pay of £10.47 for women in the UK and of £12.09 for men in 2014/2015, and a gross wage difference per hour of £1.62. Table 3 also presents our first, and most simple, calculation of the Gender Pay Gap (GPG). Here, we look at the percentage differences in hourly pay for men and women and we reported it in three ways. Firstly, we present two versions of the overall GPG. One has men's full-time wage as the denominator, and the second has men's overall wage as the denominator. Secondly, we also present a GPG for full-time workers only. The overall pay gap in 2014/2015 was 13.4%.

Compared to our findings in the 2010 report, which found an overall GPG of 19%, we have found a decline in the GPG over time, this is a welcome development. However, it is vital to note that this decline has come at the expense of wage growth for both men and women. Further discussion of the role of declining wages of the gender pay gap can be found in section 8 of this report.

Table 3: The gender pay gap in hourly earnings by working-time

	Female hourly pay in £	Male hourly pay in £	Full-time pay gap	Overall pay gap (1): *full-time male denominator*	Overall pay gap (2): *all male denominator*
Full-time	10.85	12.34	12.1%		
Part-time (<30 hrs a week)	9.77	10.07			
All employees	10.47	12.09		13.1%	13.4%

Notes: We apply the following general formula to calculate the gender pay gap: $(\overline{y}_m - \overline{y}_f)/\overline{y}_m$. The full-time pay gap is defined as the percentage difference between full-time women's and full-time men's hourly pay. (Its denominator is full-time men's mean hourly pay.) Two versions of the overall pay gap are presented. The first has full-time men as the denominator while the second has all working men as the denominator and is also the ONS standard definition. The wage data used here excludes those earning less than 1 pound an hour and those earning more than 100 pounds an hour and those who work for less than 5 hours a week. This table uses wave 6 of the UKHLS. The data is weighted by the relevant cross-sectional weight and includes proxy interviews. We exclude the Immigrant and Ethnic Minority Booster (IEMB) sample which was first collected in wave 6 of the UKHLS. The data is relevant to the 2014/2015 time period. The table presents estimates of mean hourly pay in GBP. Our sample consists of those aged 16-65 years, who are employees. We include paid overtime in our assessment of hourly pay.

6. Primary predictors of wage rates

Table 4 shows our regression analysis, which reveals the central predictors of hourly pay for our work-history sample. Once we control for multiple predictors of pay we find a non-significant pay penalty for women, who earn 4% less compared to men at the mean (β= -0.037), holding all other factors equal. This does not mean that women do not earn less than men, but that the other variables we control for in the model account for the lower wages that they hold. Other covariates associated with lower wages include: having fewer qualifications, working in the private sector, and working in small firms. There is also a pay penalty associated with unemployment experience, unpaid care work, as well as other forms of non-market activity. Pay premiums are found for workers with long within-firm tenure, as well as those who work in occupations with higher concentrations of male workers.

Table 4: Regression analysis, the primary predictors of hourly earnings

Variable	Coefficient	Standard error
Female	-0.037	(0.026)
Years of education	0.041***	(0.004)
Insider: In current job>4 years=1	0.189**	(0.063)
Outsider: In current job<1 year=1	0.070	(0.186)
Occupational segregation (male % * 10)	0.013**	(0.005)
Firm size 25-49	0.028	(0.032)
Firm size 50-499	0.070**	(0.026)
Firm size 500+	0.116***	(0.032)
Public sector employment	0.103***	(0.024)
Union membership	0.025	(0.023)
SIC0: Agriculture, forestry and fishing	-0.311*	(0.156)
SIC1: Energy and water supplies	0.252**	(0.089)
SIC2: Primary manufacturing	0.594***	(0.172)
SIC3: Manufacturing	0.126**	(0.039)
SIC4: Construction	0.249***	(0.074)
SIC5: Hotels and catering	-0.088*	(0.037)
SIC6:Transport, storage and communication	0.094	(0.051)
SIC7: Banking and financial services	0.117***	(0.034)
North East	0.040	(0.071)
North West	-0.080	(0.042)
Yorkshire & Humber	-0.040	(0.047)
East Midlands	-0.074	(0.051)
West Midlands	-0.006	(0.059)
East of England	-0.013	(0.055)
London	0.081	(0.061)
South East	0.054	(0.044)
Wales	-0.061	(0.039)
Scotland	-0.005	(0.040)
Full-time years	0.028***	(0.003)
Full-time years squared	-0.000***	(0.000)
Part-time years	0.008	(0.004)
Part-time years squared	-0.000	(0.000)
Months unemployed	-0.001*	(0.001)
Family care years	-0.008**	(0.003)
Months sick	-0.001	(0.001)
Months on maternity leave	0.001	(0.001)
Constant	1.172***	(0.092)

Notes: * p<0.05, p<0.01, *** p<0.001. Standard errors in parentheses. Base categories: SIC (SIC8: Other services); Firm size (firms with under 25 employees); Region (South West); Our sample consists of those aged 16-65 years, who are employees. We include paid overtime in our assessment of hourly pay. The data is weighted by the relevant cross-sectional weight. The analysis is based on Great Britain only.**

7. Drivers and protective factors in 2014/2015

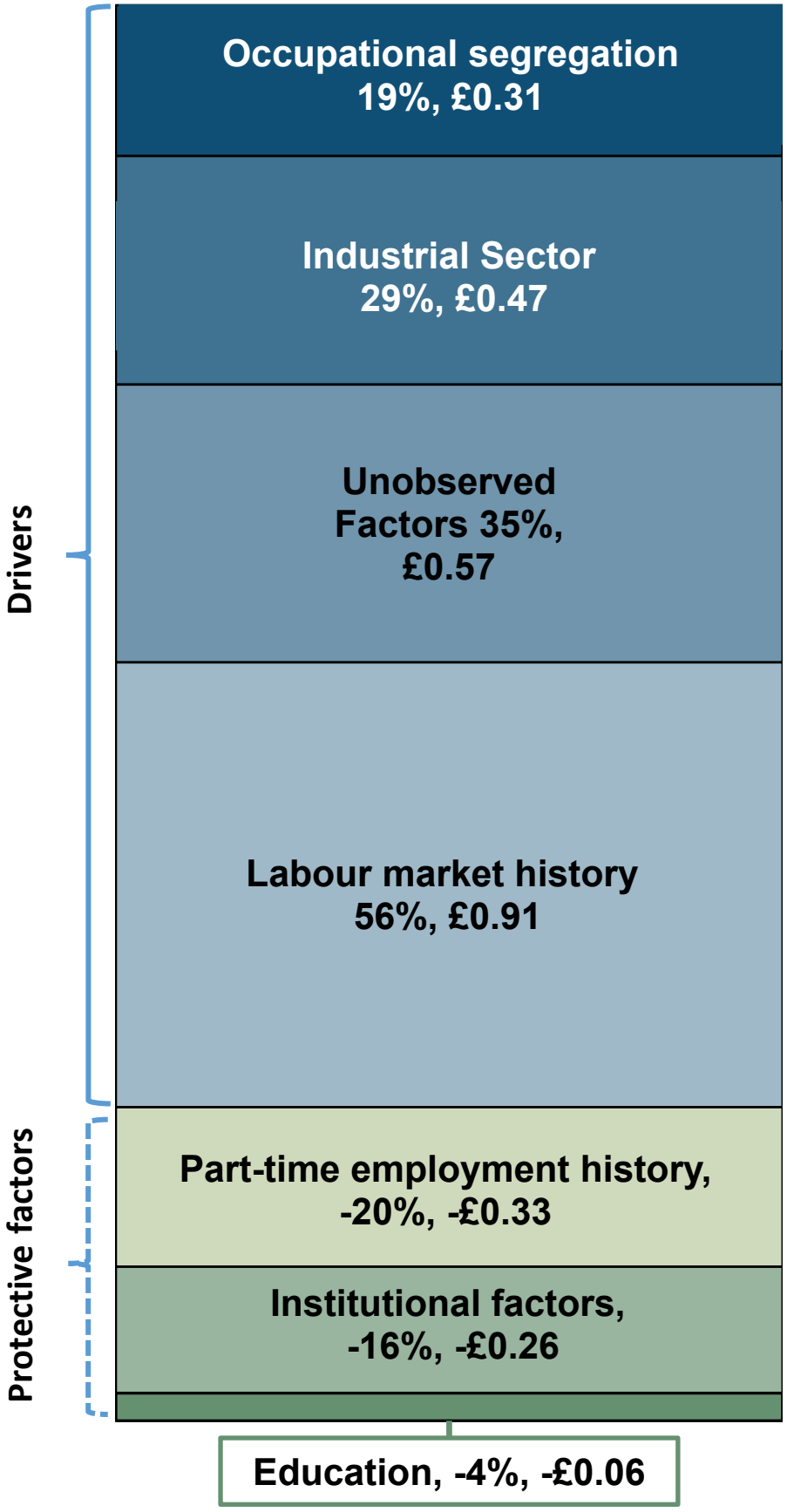
Figure 3 details the constituent parts of the GPG in 2014/2015, the sum total of which is £1.62 an hour. Figure 3 presents the main *drivers* and the main *protective factors* of the gender pay gap, as our analysis suggests there are both push and pull factors that can explain the average pay differential between men and women. The drivers of the gender pay gap are displayed as positive percentages whilst the protective factors of the gender pay gap are displayed below the axis as negative percentages. Figure 3 also identifies the monetary value of each factor.

The biggest driver of the GPG in 2014/2015 concerns differences in the labour market history of men and women, which accounts for 56% of the pay gap, or £0.91 per hour of the hourly pay differential between women and men. This driver is a combined category of differentials in full-time work history for women and men (43.6%) and differentials in unpaid care work for women and for men (12.7%). We find that if women had similar amounts of full-time work history as men then the size of the gender pay gap would decrease by 43.6%. Using data from 2007, pre-crisis, we found full-time work history accounted for 20.9% of the drivers of the GPG in 2007. The proportion of the gender pay gap which is attributable to a prior history of unpaid family care work is the same in 2014/2015 as it was in our report using 2007 data. We find that if men and women took similar amounts of unpaid family leave the size of the gender pay gap would decrease by 13%.

The next biggest factor behind the GPG concerns all observed and unobserved characteristics systematically associated with being female, accounting for 35% of all drivers of the GPG. This is equivalent to women earning £0.57 less per hour because of observed and unobserved factors associated with them being women. While we are unable to definitively identify why 'unobserved' criteria continue to be such a large driver of the gender pay gap, it is likely to be a function of an unknown combination of discrimination and gendered behaviour (constrained or otherwise). Pay differentials associated with industrial sectors are the next biggest drivers, with men's disproportionate employment in manufacturing and construction accounting for 29% of the gender pay gap.

Finally, we find occupational segregation to account for 19% of the drivers of the GPG. Our measure of occupational segregation is the same as in our previous estimations: the variable measures the percentage of workers in the UK who are male for each occupational category, according to a two digit Standard Occupational Classification (Table A1 in the appendix presents the distribution of this variable). We find higher percentages of men in skilled construction and building trades and a higher concentration of women – involving small percentages of male co-workers –in secretarial and caring occupations. This variable captures both pay differentials by occupational level and women's differential occupancy of occupational groups.

Figure 3: Main drivers and protective factors of the pay gap in the UK



Drivers

1. **Occupational Segregation:**
   Women are more likely to work in occupational groups with high proportions of female co-workers, these jobs tend to be less well paid. This reflects ongoing vertical and horizontal segregation within the workplace.

2. **Industrial Sector:**
   Industries driving the gender pay gap*:* **Manufacturing: 16.8%, Construction: 11.5% and Banking and Financial services: 0.6%. Women are more likely to work in lower paid and lower skilled** industries such as the Human, Health and Social Work sector, whereas **males tend to work in higher paid sectors.**

3. **Unobserved:**
   Includes discrimination, preferences, choices (constrained or otherwise)
   This driver captures things that are not measured in our data. It is likely to include things like social norms and attitudes which shape the work that men and women do; discrimination or bias in employment practices; and choices that individuals make, whether freely or constrained by social norms and structures.

4. **Labour market history:**
   Males and females continue to participate differently in the labour market and therefore accumulate different work histories. This drives 56% of the GPG. Breaking this down, females have:
   a. **Fewer years of full-time work compared to men, which accounts for 43.6% of GPG**
   b. **More years of unpaid care work compared to men, which accounts for 12.7% of GPG**

Protective factors

1. **Part-time employment history:**
   Women's part-time employment history is a new protective factor of the gender pay gap. Women's history of part-time employment decreases the wage gap by approximately 20% when compared to men's history of part-time work. This finding underscores the poor calibre of male part-time work.

2. **Institutional factors:**
   We found a strong protective effect from public sector employment; which offset 20% of the GPG. **Union membership** also tends to reduce GPG although the effect was very small at 1.2%. However, not all institutional factors help narrow the GPG. The overall protective effect is 16% due to other institutional factors, which tend to widen the GPG by 5%. They include **tenure of the current employment** and **large firms with employees 50 or greater**.

3. **Education:**
   With women's advancement in educational attainment, women now have slightly more years of education than men, more highly educated women have access to jobs that offer high levels of pay. As such, **the level of education is found to offset the GPG by 4%.**

Figure 3 also presents the top three factors that *decrease* the gender pay gap, we call these protective factors. Analyses of the latest available data suggest that some, but not all, of the factors previously identified, remain important. We previously found institutional factors to decrease the gender pay gap. As in our 2010 report, these institutional factors are an aggregated category of: public sector employment, union membership, firm size, and job tenure. We again find public sector employment to protect against the gender pay gap, as does union membership. The effect of firm size and job tenure are marginal in this aggregate category in 2014/2015 however. Using data from 2014/2015, we find education to *reduce* the pay gap and find that differentials in educational attainment between women and men account for 3.5% of the protective factors of the GPG. While in our 2010 report, differentials in education increased the pay gap, accounting for 5% of the overall GPG. This can be attributed to the increase in overall educational attainment for both genders to nearly 13 years (men: 12.90, women: 12.99 years respectively, see Table A2) from just over 12 years (men: 12.34, women: 12.18 years in 2007, Olsen et al., 2010a). Additionally, highly educated women also benefit from a narrow wage gap if they engage in public sector employment and male-dominant occupations, which can lead to compounding effects on the wage gap.

One of the biggest differences in our findings using 2014/15 data concerns the impact of part-time work history. In our 2010 report, prior history of part-time work was a driver of the gender pay gap; it accounted for 5% of the pay differential between men and women using 2007 data. Using the latest available data, we find prior exposure to part-time work to *protect* female pay and to *decrease* the gender pay gap. Specifically, we find that if women held similar amounts of the type of part-time work history that men have, the gender pay gap would increase by 20% and that women earn £0.33 more than men given their superior part-time employment

history. Why do we observe such a change? It appears that there has been a calibre shift in the quality of part-time employment for men and women. For men, since 2007, there has been an increase in male part-time employment from 9.7% in 2007 to 11.9% in 2015 (OECD, 2016: 227-228) at a time of recession when job quality and wages tend to be in decline. This is also reflected in the rise in men who are involuntary part-time from 1.8 to 3.5% of all male employment between 2007 and 2014 (OECD, 2016: p.228).

We also note that the calibre of part-time work for men, the majority of whom avoid reduced-hour employment, is rather poor. For our sample, we find that 18% of men in part-time jobs are on temporary contracts, compared to 8% of women in part-time jobs (see Table 2 of this report). Indeed, the poor quality of part-time employment for men is clearly illustrated in the negative part-time gender pay gap (found when comparing female part-time wages to male part-time wages) using ASHE data (ONS, 2016b). For women, there has been no similar rise in female part-time employment between 2007 and 2015 (OECD, 2016). Rather there is some evidence that some women in part-time posts have comparatively good job quality (e.g. Gash and Inanc, 2013). These women may be 'retention part-time workers', those with valued and highly remunerated human capital, who are some of the few able to negotiate reductions in their hours with their employers in their pursuit of work-life balance. We may also be identifying the effects of changes in employment law concerning the Right to Request Flexible Working, which support workers with care responsibilities in their pursuit of reduced-hour employment. This policy is likely to improve the quality of part-time employment if it increases employees' chances of negotiating reduced-hour employment with their employers.

Changes in the drivers and protective factors

Overall, we have found a slight decline in the gender pay gap in the UK, and have found that many of the primary predictors of the GPG, both positive and negative, to be the same. However, there were also some notable differences in our findings, which suggest real changes in wage incentive structures since our 2010 report. One of the most significant differences concerns the change in the effect of a prior history of part-time work on the gender pay gap. In our earlier work, we found a history of part-time work to drive the gender pay gap, accounting for 5% of the pay differential between men and women in 2007. Using the latest available data we find prior exposure to part-time work to protect female pay and decrease the gender pay gap. We attribute this change, firstly, to the rise in male part-time employment, which is of poor quality and, secondly, to increased proportions of female 'retention part-time workers'. This suggests that policies to improve the quality of part-time work, especially for men, might be necessary. It also underscores the ongoing tendency for women, and not men, to reduce their working-hours to support work-life balance.

Policies supporting men in their pursuit of reduced-hours employment might also be useful here. Another noticeable change concerns the role of education. While in 2007 educational differentials increased the gender pay gap in 2014/15 it has become a protective factor helping women access higher wages. This is due in part to increased levels of education overall among both men and women compared to 2007.

Finally, there have been considerable changes in the UK labour market since our last report in 2010, which had 2007 as its final data point, a time period that was pre-crisis. 2008 saw a dramatic decline in the employment rate in the UK and strong increases in unemployment (OECD, 2016). There has also been a strong decline in real wages since 2009, with a 10% fall of average hourly pay after 2007 (ibid). Inevitably, some of the changes in the predictors of the gender pay gap observed in this report reflect the different landscape of remuneration in the UK today.

8. Addendum: Recent changes in the gender pay gap

We present Table 5 to provide additional context to our estimates of the decline in the gender pay gap by showing estimates of the GPG in 2009/2010 (we also include the estimates of the GPG for 2014/2015 for ease of reference). It is very important to note here that real wage levels for 2014/2015 are *lower* than they were in 2009/2010. Typically, outside recessionary periods, we would expect a rise in real wages over time.

Our analysis of the GPG in 2009/2010 and 20014/2015 shows the GPG to have declined over time, which is a welcome development. However, it is vital to note that *this decline has come at the expense of wage growth for both men and women*, and in particular at the disproportionate expense of men's real hourly pay. This means that part of the gender pay gap victory in recent years has due to declining real wages for both genders, with men being the biggest losers in terms of pay rates. This finding is consistent with findings from the ONS using the Monthly Wages and Salaries Survey, published in their labour market statistical bulletin (ONS, 2016a).

As with Table 3, we present two versions of the overall GPG. One has men's full-time wage as the denominator and the second has men's overall wage as the denominator. The pay gap during 2009/2010 and 2014/2015 declined from 14% to 13%. By ONS measurement methods, the decline is from 20% to 19.3% over the same time period (ONSb, 2016).

Table 5 Comparing the gender pay gap over time

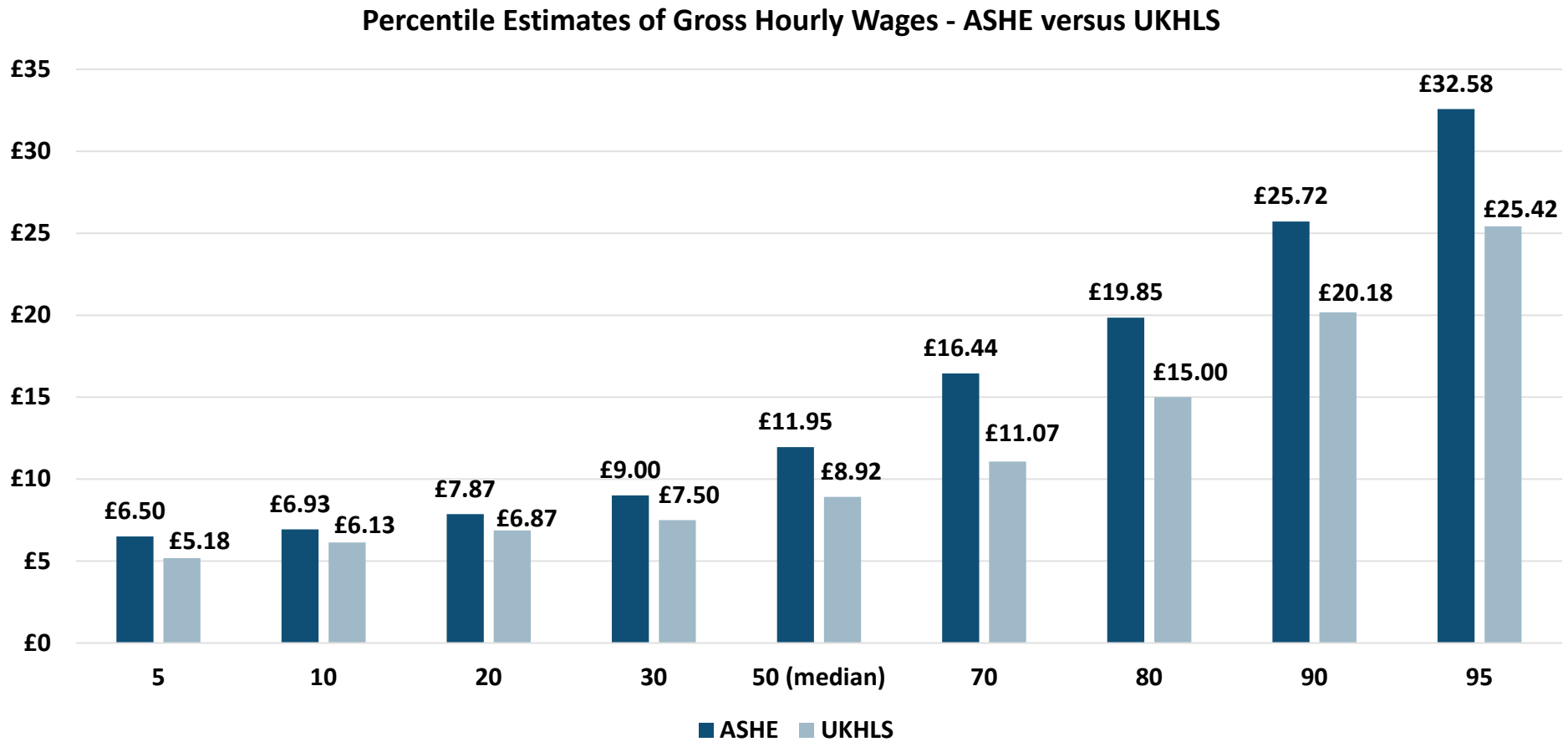
	Female hourly pay in £	**Male hourly pay in £**	**Overall pay gap (1): *full-time male denominator***	**Overall pay gap (2): *all male denominator***
UKHLS Wave 6, 2014/2015				
Full time	10.85	12.34		
Part-time (<30 hrs a week)	9.77	10.07		
All employees	10.47	12.09	13.1%	13.4%
UKHLS Wave 1, 2009/2010				
Full time	11.08	12.76		
Part-time (<30 hrs a week)	9.89	9.98		
All employees	10.66	12.46	14.1%	14.4%

Notes: We apply the following general formula to calculate of the gender pay gap: $(\overline{y}_m - \overline{y}_f)/\overline{y}_m$.

Where Ym is the mean of all male wages and Yf is the mean of all female wages. The first (1) has full-time men as the denominator while the second (2) has all working men as the denominator, and (2) is the ONS standard definition. The wage data used here excludes those earning less than 1 pound an hour and those earning more than 100 pounds an hour and those who work for less than 5 hours a week. This table uses waves 1 + 6 of the UKHLS. The data is weighted by the relevant cross-sectional weight, and includes proxy interviews. We exclude the Immigrant and Ethnic Minority Booster (IEMB) sample which was first collected in wave 6 of the UKHLS The table presents estimates of mean hourly pay in GBP. Our sample consists of those aged 16-65 years, who are employees. We include paid overtime in our assessment of hourly pay.

Appendix

Figure A: Point estimates of gross hourly wages by key percentiles of interest.



Notes. Both data have been weighted by the relevant cross-sectional weights and both select on: those aged 16-65 years of age. We excluded those earning less than 1 pound an hour and those earning more than 100 pounds an hour and those who work for less than 5 hours a week.

Table A1: Percentage Male by SOC 2-digit Category Name

Seq.	SOC2-digit Category Name	Percentage Male (2014/5)
1	Skilled construction and building trades	98.9
2	Skilled metal and electrical trades	98.5
3	Transport and mobile machine drivers and operatives	94.2
4	Skilled agricultural trades	86.5
5	Elementary trades, plant and storage related occupations	84.3
6	Science and technology professionals	83.5
7	Process, plant and machine operatives	79.2
8	Science and technology associate professionals	74.4
9	Protective service occupations	74.1
10	Corporate managers	61.7
11	Textiles, printing and other skilled trades	60.2
12	Culture, media and sports occupations	58.1
13	Managers and proprietors in agriculture and services	56.5
14	Business and public service professionals	55.3
15	Business and public service associate professionals	52.7
16	Health professionals	44.6
17	Elementary administration and service occupations	41.7
18	Customer service occupations	32.7
19	Teaching and research professionals	32.2
20	Sales occupations	30.6
21	Leisure and other personal service occupations	30.2
22	Administrative occupations	28.6
23	Health and social welfare associate professionals	15.8
24	Caring personal service occupations	11.1
25	Secretarial and related occupations	5.3

Table A2: Decomposition by Simulation 2014/5 Details

NOTE: Positive Value Shows Male Advantage

	X_m	X_f	β_m	β_f	(Xm-Xf)*βm	(βm-βf)*Xf		(Xf—Xm)* βoverall	$\beta_{overall}$			
	Men's average	Women's average	Men's coefficient	Women's coefficient	Effect of levels (Quantities): A	Effect of returns (Slopes): B	Net effect =A+B	Simulation effect	Overall coefficient	Simulation as a % of the reduced gap	Graphed figures as a % of the reduced gap	
Female	0.000	1.000	0.000	0.000	0.000	0.000	0.000	-0.037	-0.037	35.2%	Female	35.2%
Full-time years	17.944	11.294	0.036	0.022	0.237	0.149	0.385	-0.189	0.028	179.0%	Full years	43.6%
Full-time years squared	526.631	237.565	-0.001	0.000	-0.180	-0.058	-0.238	0.143	0.000	-135.4%		
Years of education	12.896	12.986	0.041	0.041	-0.004	0.007	0.003	0.004	0.041	-3.5%	Educ.years	-3.5%
Insider: In current job>4 years	0.966	0.956	0.192	0.178	0.002	0.013	0.015	-0.002	0.189	1.8%	Institutions*	-15.9%
Outsider: In current job<1 year	0.004	0.012	-0.185	0.128	0.002	-0.004	-0.002	0.001	0.070	-0.6%		
Occupational segregation (male % * 10)	6.029	3.440	0.001	0.024	0.003	-0.079	-0.076	-0.020	0.013	19.1%	Segregation	19.1%
Firm size 25-49	0.135	0.153	0.143	-0.054	-0.003	0.030	0.028	0.001	0.028	-0.5%		
Firm size 50-499	0.338	0.313	0.087	0.061	0.002	0.008	0.010	-0.002	0.070	1.7%		
Firm size 500+	0.190	0.163	0.111	0.124	0.003	-0.002	0.001	-0.003	0.116	2.9%		
Public sector employment	0.239	0.445	0.033	0.149	-0.007	-0.052	-0.058	0.021	0.103	-20.1%		
Union membership	0.291	0.341	-0.014	0.055	0.001	-0.023	-0.023	0.001	0.025	-1.2%		
SIC3: Manufacturing	0.186	0.045	0.155	0.089	0.022	0.003	0.025	-0.018	0.126	16.8%	SIC3+SIC4	28.3%
SIC4: Construction	0.058	0.009	0.290	0.115	0.014	0.002	0.016	-0.012	0.249	11.5%		
SIC7: Banking/financial services	0.144	0.138	0.117	0.106	0.001	0.001	0.002	-0.001	0.117	0.6%	SIC7	0.6%
Part-time years	0.594	4.362	-0.003	0.006	0.010	-0.039	-0.029	0.030	0.008	-28.7%	Part years	-20.2%
Part-time years squared	3.665	56.625	0.002	0.000	-0.108	0.123	0.016	-0.009	0.000	8.5%		
Family care years	0.002	1.695	-0.075	-0.006	0.128	-0.118	0.010	-0.013	-0.008	12.7%	Family years	12.7%
											Total	100.0%

Source: UKHLS wave 6 (BHPS sample only).

Base: All individuals aged 16-65 who are employed.

Institutions include insider, outsider, firmsize, public sector employment and union membership.

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