

New evidence on gender pay gaps in Great Britain

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This Data Insight presents new evidence on the size of the gender pay gap in Great Britain. First, we present revised estimates of the gender pay gap in hourly earnings for full-time employees on average and across the wage distribution from 2004 to 2023. The analysis uses new weights for the Annual Survey of Hours and Earnings (ASHE) that account for non-random missing employer responses to the survey. Second, for the tax year 2018-19, we show the differences in men's and women's weekly, monthly and quarterly employee earnings – aggregating across all jobs – using tax records from the linked ASHE- HM Revenue and Customs Pay-As-You-Earn (HMRC PAYE) dataset.

Summary

The Wage and Employment Dynamics (WED) team has developed revised cross-sectional sampling weights to address a limitation of the ASHE dataset. In the first half of this Data Insight, we use these weights to produce new estimates of the gender pay gap in Great Britain, comparing them to those that would be estimated using the Office for National Statistics (ONS) standard procedure to address non-random sampling of employees. In doing so, we find that UK national statistics have highly likely been underestimating the gender pay gap consistently over the past two decades. In the last few years (2021-2023), for the headline measure of the gender pay gap, namely comparing median hourly earnings for full-time employees, this underestimation is about one percentage point, giving a total gap of nine rather than eight percentage points.

In the second half of this Data Insight, we present estimates of gender pay gaps in weekly, monthly, and quarterly tax data for those with at least one employee job in the tax year 2018-2019. These estimates are new and are only available due to the linkage of ASHE to the HMRC's PAYE data, which record all earnings for all employee jobs subject to taxation in a tax year. These gender pay gaps at the median are roughly three-times larger than the median hourly gaps calculated with ASHE and also rise markedly with age.

Background

The ONS estimates the gender pay gap using the ASHE dataset. This is widely regarded as the most reliable source of information on earnings and hours, since this data is supplied by employers for the 1% of the population eligible for ASHE. As a result, ASHE data is also used by Eurostat and for other cross-country comparisons, such as those in the World Economic Forum's annual Gender Gap Report (World Economic Forum, 2024). While there has been convergence in men and women's earnings over time in Great Britain, this has slowed in recent years (ONS, 2023). Estimates of the size of the gap at a point in time also differ, depending on how earnings and hours are measured, as well as the data source used.

However, the ASHE dataset suffers from a non-random and high number of missing responses from employers. This leads to under-representation of smaller private sector firms – especially in the case of women – and over-representation of larger, public sector employers, where pay is generally higher and the gender pay gap within jobs tends to be smaller (Forth et al, 2024; Singleton, 2019).

As part of the ADR England-funded [Wage and Employment Dynamics](#) (WED) project, we have developed a revised and improved weighting scheme which restores the representativeness of ASHE and addresses employer-specific response biases (Forth et al., 2024). This enhanced ASHE is now available to accredited researchers. We use this data to provide new estimates of the gender pay gap for Great Britain only. Emphasising the importance of this work, the ASHE has been adopted recently by several studies which have generated new insights on the determinants of gender pay inequality in Great Britain, as well as the influence of specific policy measures in tackling this (e.g., Jewell et al., 2020; Duchini et al., 2022; Jones & Kaya, 2023; Phan et al., 2024; Pham et al., 2024; Galanakis & Gosling, 2024). In particular, the longitudinal employer and employer identifiers have allowed researchers to place firms robustly at the centre of any analysis of pay inequality, which was impossible with traditional household survey datasets.

Also, as part of the WED project, we have processed payslips from the HMRC's Pay-As-You-Earn (PAYE) micro-data for the 1% of employees in the UK who are also eligible for the ASHE. This data, which can be accessed by accredited researchers via the ONS Secure Research Service, can offer new insights into patterns of employment and earnings for individuals across the course of the whole year.

What we did

Our aim in this Data Insight is to provide two new perspectives on the gender pay gap in Great Britain among those aged 16-64, using two new datasets produced under the ADR England-funded Wage and Employment Dynamics project.

The first set of findings are estimates of hourly earnings gaps for full-time employees among the 1% of employees in the 'enhanced' ASHE over the period 2004-2023¹. The enhancement is from the new set of cross-sectional weights the WED team has developed to address non-response bias in ASHE (Forth et al, 2024), thus extending the original methodologies used by ONS to derive the current set of national statistics on the gender pay gap.

We explore the implications of our revised weights, which retain the representativeness of the ASHE according to the Labour Force Survey job totals, but also address employer-specific response bias, for some headline gender pay gap statistics².

The ONS headline measure of the gender pay gap compares the gross hourly earnings (excluding overtime; and henceforth referred to as the “wage”) of men and women observed working full-time in the ASHE dataset. The gender pay gap is obtained by subtracting the average (mean or median) wage of women from the average wage of men, and then dividing this difference by the average wage of men. In this Data Insight, we adopt the same procedure to obtain ONS-like estimates for Great Britain, but then repeat the exercise replacing the ONS weights with our new weights, which account for the substantial number of missing responses from employers in each annual edition of ASHE³.

Our second set of estimates are obtained from the new linked ASHE-HMRC PAYE data. We focus on a single tax year, 2018-19 in Great Britain for those holding at least one employee job in that tax year. We estimate earnings gaps for different periods of time, rather than a snapshot of the moment an employee is in employment in a particular job on a particular day. This means that the gaps are driven not simply by earnings differences in a specific job, but by the number and duration of employee jobs performed over a period, as well as the total hours actually worked. Again, the gender pay gap is the difference between average male and female earnings expressed as a percentage of male earnings. However, in this case, we include all sources of gross employee earnings (reported on payslips), which may include overtime pay, and the aggregate earnings for all the employee jobs undertaken by a person in a given period. Gaps are expressed in terms of total earnings: we do not construct measures of hourly pay with this data⁴. We present aggregated earnings for three separate periods, namely week four of the tax year 2018/19; the person-month observations for each of the first three months of the tax year; and finally, the earnings for the whole first quarter of the tax year. Before calculating any statistics, we trim the dataset for each period, by dropping the top and bottom one percent of earnings observations.

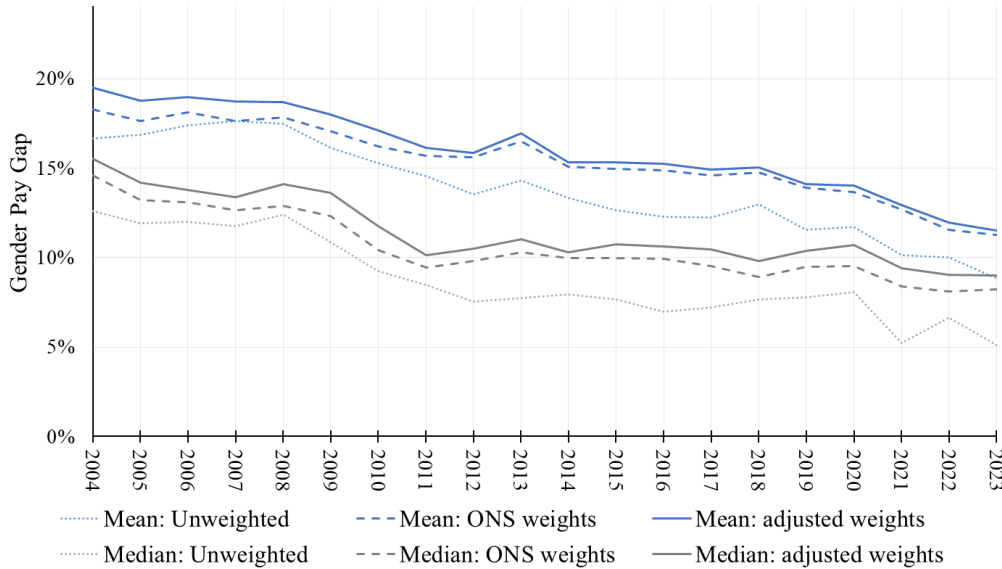
Throughout, we present unadjusted or “raw” gender pay gaps - that is, simple differences for mean or median earnings. In the case of ASHE-HMRC analyses, we extend the analysis across the earnings distribution, and also compare gender pay gaps for young (16-30 years), core working-age (31-45 years) and older (46-64 years) employees.

What we found

The impacts of addressing employer non-response bias in ASHE on national gender pay gap statistics

We begin with our analyses of the gender pay gap for full-time employees in ASHE over the period 2004-2023. Figure 1 shows the gender pay gap estimates in both mean and median earnings for three series, namely unweighted, weighted using ONS weights, and weighted using the WED-adjusted weights that additionally account for specific employer-level factors associated with survey non-response.

Figure 1: Gender Pay Gap in Great Britain for Median and Mean Gross Hourly Earnings (excl. overtime), full-time employees only



Note: All statistics do not use observations in ASHE where the employer reports a loss of pay for the employee in the April reference period. They also only use employees on an adult rate of pay. These are the same criteria applied by ONS when constructing national statistics using ASHE.

Revised sample weights result in larger gender pay gap estimates for Great Britain

All three series show convergence in the gender pay gap over this 20-year period. There is also a clear rank-order in terms of the size of the gender pay gap when it is estimated from ASHE in different ways. Gaps in mean pay are higher than those in median pay. The unweighted gaps are lower than those estimated with weights. The focus of our analysis is a comparison of the two weighted series for median pay. The gender pay gap moves in a similar way over time for both series, but the gender pay gap is always larger with the WED-adjusted weights than it is when using the ONS weights, by around one percentage point throughout. Table 1 underscores these points, focusing in on the period 2018-2023. The extent of the bias apparent in the full-time employee gender pay gap when using the ONS weights is roughly constant over time and is considerably larger for median hourly pay than it is for mean hourly pay.

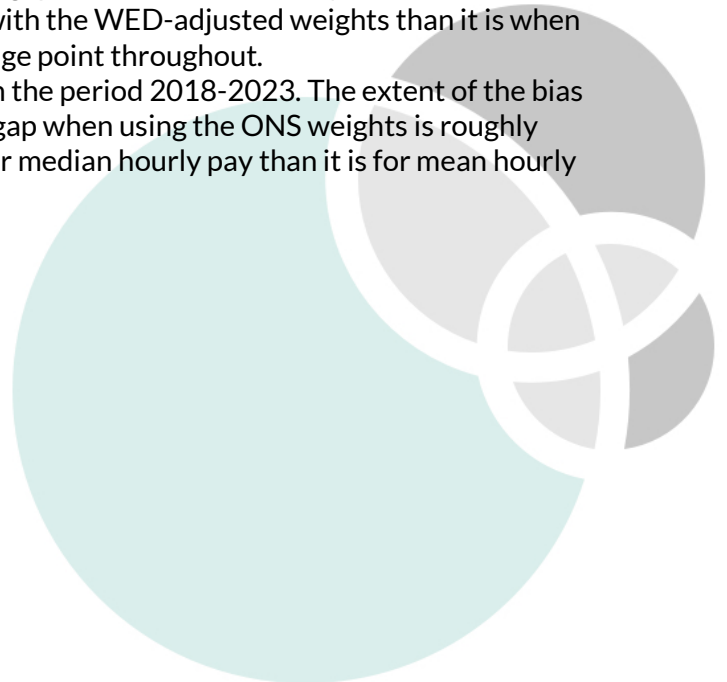
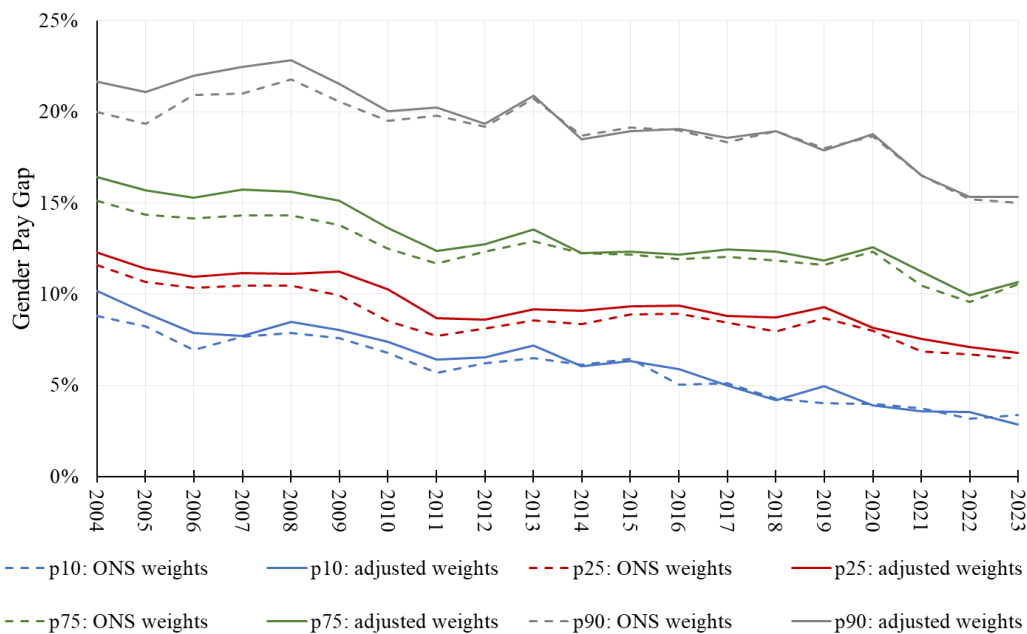


Table 1: Gender Pay Gap in Great Britain: Comparison between ONS weights and adjusted WED weights for mean and median gap statistics

Year	Mean GPG			Median GPG		
	ONS weights	Adjusted weights	Difference ("Bias") ppts	ONS weights	Adjusted weights	Difference ("Bias") ppts
2018	14.8%	15.0%	-0.3	8.9%	9.8%	-0.9
2019	13.9%	14.1%	-0.2	9.5%	10.4%	-0.9
2020	13.6%	14.0%	-0.4	9.5%	10.7%	-1.2
2021	12.7%	12.9%	-0.2	8.4%	9.4%	-1.0
2022	11.6%	12.0%	-0.4	8.1%	9.1%	-1.0
2023	11.3%	11.5%	-0.2	8.2%	9.0%	-0.8

Notes: The authors use the ASHE with the original ONS weights and the WED adjusted weights.

Figure 2: Gender Pay Gap in Great Britain: Comparison between ONS weights and adjusted WED weights using selected percentiles of the male and female wage distributions



Notes: The authors use the ASHE with the original ONS weights and the WED adjusted weights.

Figure 2 further compares trends in the hourly gender pay gap over the period 2004-2023, for different percentiles of the male and female hourly earnings distributions using the ONS weighted and adjusted WED weighted series. For both series, gender pay gaps increase as one moves up the respective earnings distributions. They are smallest between the 10th percentiles of the male and female earnings distribution, which is roughly where the National Minimum/Living Wage bites. The gender pay gap is two to three times larger between the 90th percentiles of the male and female earnings distributions than it is for the 10th percentiles. It is also apparent that the bias arising from failure to account for survey non-response is larger in earlier years and has largely disappeared for the top and bottom of the earnings distributions in recent years.

Aggregate gender pay gaps in a working week, month, or quarter

In the second part of our analyses of the gender pay gap in Great Britain, we examine the aggregate average earnings gaps between men and women in the 2018/19 tax year.

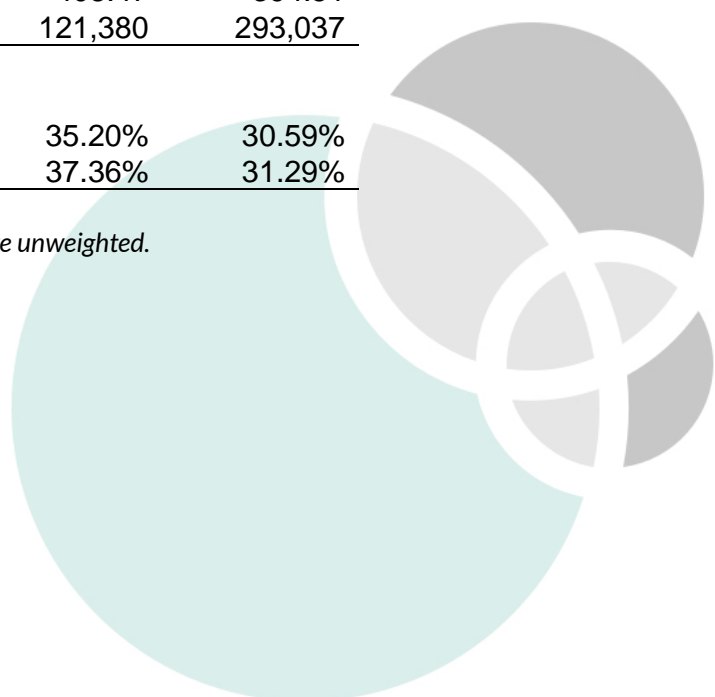
The gender pay gap for total weekly earnings across all an employee’s jobs is over 30%

Table 2 presents the gender pay gap for earnings in week four of the tax year 2018/19⁵. Mean and median earnings are presented separately for men and women, for all people aged 16-64 (column 4) and for three sub age groups (columns 1 to 3). The weekly gender pay gap of 31.3% in median earnings for all jobs in that week is three times as large as the gap in hourly pay derived from ASHE for the same year.⁶ This reflects gender differences in hours worked – which are accounted for in the ASHE numbers but not in the ASHE-PAYE figures. But it might also reflect differences in the number of jobs undertaken by men and women within a period and overtime, as well as the potential for sampling bias in the ASHE that is still not addressed by the weighting schemes.

Table 2: Averages of total employee taxable pay in week 4 of the 2018/19 tax year, Great Britain, by gender and age group

	<u>Age</u>			
	16- 30	31-45	46-64	Total: 16-64
<i><u>Gender:</u></i>				
<i>Female:</i>				
Mean	328.66	446.66	398.97	394.51
Median	303.32	363.76	324.72	327.76
N	41,125	46,631	61,701	149,457
<i>Male:</i>				
Mean	411.80	637.59	615.65	568.34
Median	371.14	542.14	518.37	477.02
N	38,237	45,664	59,679	143,580
<i>Total:</i>				
Mean	368.72	541.13	505.51	479.68
Median	335.56	450.50	408.47	394.51
N	79,362	92,295	121,380	293,037
<i>Gender Pay Gap:</i>				
Mean	20.19%	29.95%	35.20%	30.59%
Median	18.27%	32.90%	37.36%	31.29%

Note: author calculations using HMRC PAYE. All figures are unweighted.



The gender pay gap for total weekly employee earnings is greater among older workers

A second notable finding in Table 2 is the increase in the size of the gender pay gap by age. The gender pay gap in median weekly earnings is 18.3% for those aged under-31, but rises to 32.9% for core working-age workers between 31 and 45 years of age, and rises further, albeit more slowly, to 37.4% among the oldest age group aged 46 and above. This age pattern in the gender pay gap is apparent for both median and mean earnings. It is notable because it contrasts with the gender pay gap in hourly earnings, which exhibits a hump-shape by age, peaking in one’s 40s (Bryson et al., 2020).

Table 3: Averages of total employee taxable pay in a month, months 1-3 of the 2018/19 tax year, Great Britain, by gender and age group

	AGE			
	16- 30	31-45	46-64	Total: 16-64
<i>Gender:</i>				
<i>Female:</i>				
Mean	1524.50	2025.30	1769.81	1789.62
Median	1418.20	1666.67	1431.28	1492.92
N	29,906	37,930	51,055	118,891
<i>Male:</i>				
Mean	1913.16	2962.77	2767.70	2629.19
Median	1722.94	2524.86	2260.65	2169.24
N	25,060	34,367	46,778	106,205
<i>Total:</i>				
Mean	1701.70	2470.93	2246.94	2185.74
Median	1554.74	2057.76	1754.70	1768.89
N	54,966	72,297	97,833	225,096
<i>Gender Pay Gap:</i>				
Mean	20.32%	31.64%	36.05%	31.93%
Median	17.69%	33.99%	36.69%	31.18%

Table 4: Averages of total employee taxable pay in a quarter, first quarter of the 2018/19 tax year, Great Britain, by gender and age group

	Age			
	16- 30	31-45	46-64	Total: 16-64
<i>Gender:</i>				
<i>Female:</i>				
Mean	4514.93	5977.38	5189.82	5271.28
Median	4222.67	4972.20	4289.42	4462.29
N	89,696	113,815	153,713	357,224
<i>Male:</i>				
Mean	5670.16	8685.83	7929.08	7640.68
Median	5156.10	7548.27	6676.17	6480.00
N	75,562	103,559	140,992	320,113
<i>Total:</i>				
Mean	5043.15	7267.71	6500.33	6391.07
Median	4633.07	6139.94	5221.23	5282.08
N	165,258	217,374	294,705	677,337
<i>Gender Pay Gap:</i>				
Mean	20.37%	31.18%	34.55%	31.01%
Median	18.10%	34.13%	35.75%	31.14%

Note: author calculations using HMRC PAYE. All figures are unweighted.

Tables 3 and 4 replicate the analyses in Table 2, but this time for monthly and quarterly earnings respectively. The gender pay gaps are relatively insensitive to the period over which earnings are recorded. This suggests that, at least among those who have undertaken some paid work in the period, gender differences in intermittent employment are not a key contributor to the gender pay gap. However, it is possible that among those in intermittent employment, there might be gender differences in the likelihood of having a job at all in a given week, month or quarter, which would not be captured in these tables.

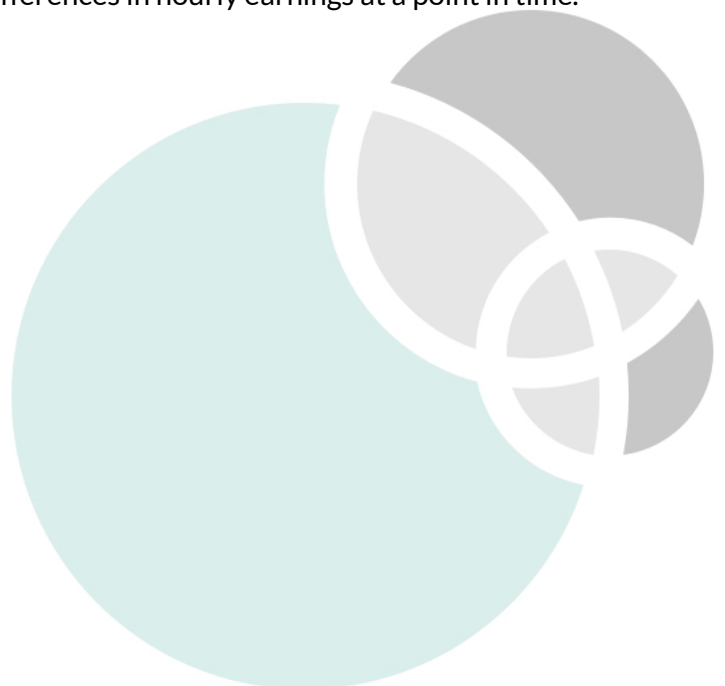
The large sample sizes of ASHE-HMRC data can support analysis of gender earnings inequality beyond simple averages. To illustrate this, Appendix Figures A1-A3 show the full distributions of male and female earnings underlying the average pay gaps described so far. These figures demonstrate how the full distributions of male and female earnings overlap or skew relative to one another, at weekly, monthly and quarterly frequencies.

Why it matters

These new analyses of the gender pay gap matter for a variety of reasons. First, the analyses of the 'enhanced' ASHE, with weights accounting for employer non-response sample bias, show that gap in median hourly earnings between men and women working full-time has most likely been underestimated in national statistics. This is probably explained for by the achieved ASHE sample under-representing employers with a larger gender pay gap, such as small private sector firms.

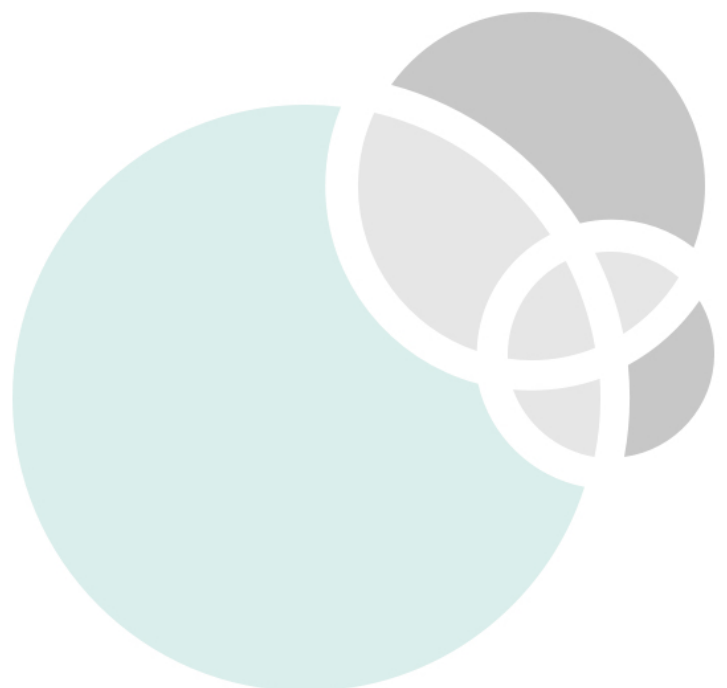
Second, the ASHE-PAYE analysis provide a new perspective on the gender pay gap, by estimating the gaps in total earnings across all the jobs that employees undertake in a given period. This indicates that earnings gaps between those with at least one employer in a single tax year are considerably larger than those estimated at a single point in time for full-time employees only.

However, for the simple average gender pay gap, earnings gaps estimates do not appear to be particularly sensitive to the length of the period used - whether it is one week, one month, or a quarter. This suggests that hours of work within a week rather than weeks of work and multiple job holding are the principal factors explaining average earnings gaps, though a deeper analysis looking beyond averages may reveal different patterns. Even so, since household consumption and well-being are reliant on total earnings received in a given period, this new perspective is a useful complement to the traditional focus on gender differences in hourly earnings at a point in time.



What next?

This data is now available to accredited researchers via the ONS Secure Research Service and can be used for much more sophisticated analyses than those presented here. The ASHE is linked to PAYE over the period 2014-2019, so can be used to examine trends over time in this high-frequency pay data. Further, the longitudinal employer identifiers in the ASHE dataset, as well as the longitudinal employee identifiers in both ASHE and the HMRC PAYE data, can be used to carry out analyses of what determines patterns of pay over the life-cycle of workers and the influence of employer-specific wage policies. The WED project has also made it possible to link this data with self-assessment returns to HMRC for the 1% ASHE- eligible population of Great Britain, so annual self-employment income can also be studied alongside pay from employee jobs



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Appendix

Figure A1: Distributions of total employee taxable pay in week 4 of the 2018/19 tax year, Great Britain, by Gender and Age group.

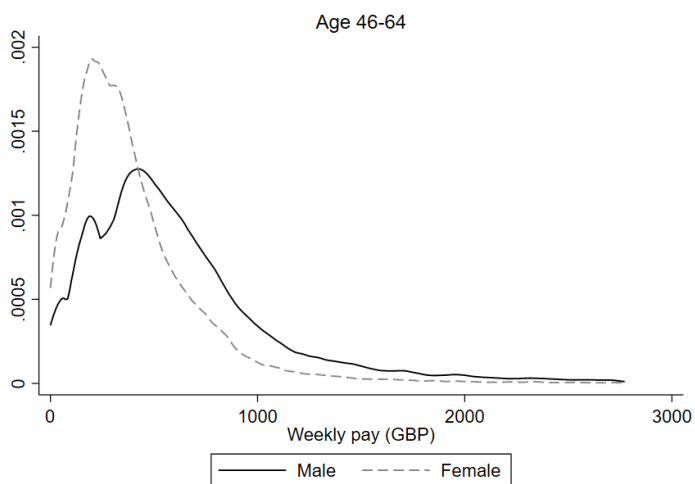
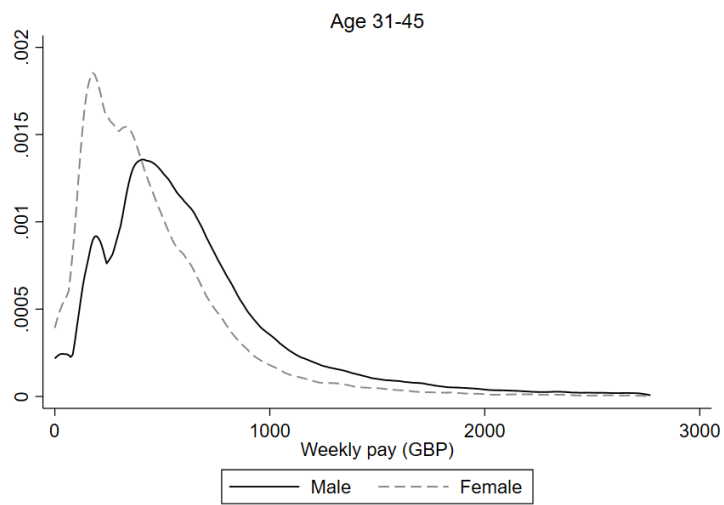
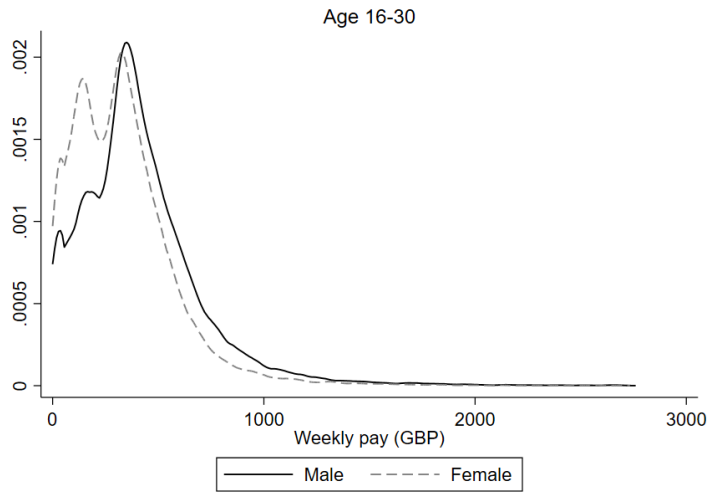


Figure A2: Distributions of total employee taxable pay in a month, months 1-3 of the 2018/19 tax year, Great Britain, by gender and age group.

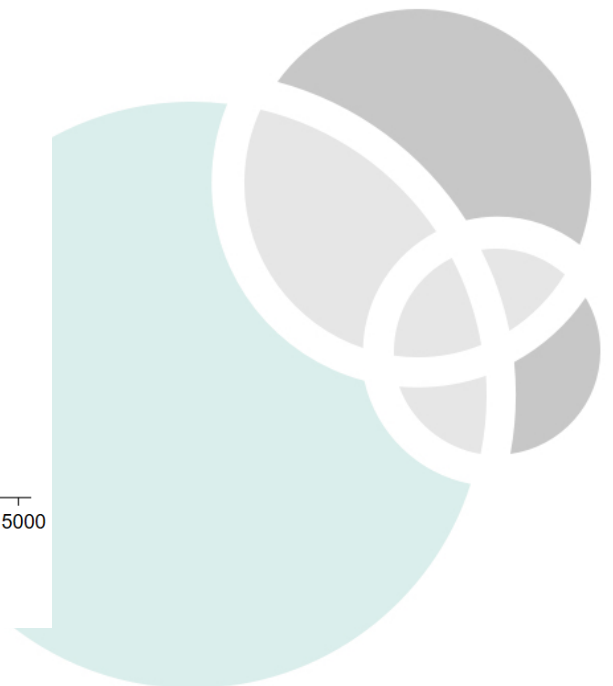
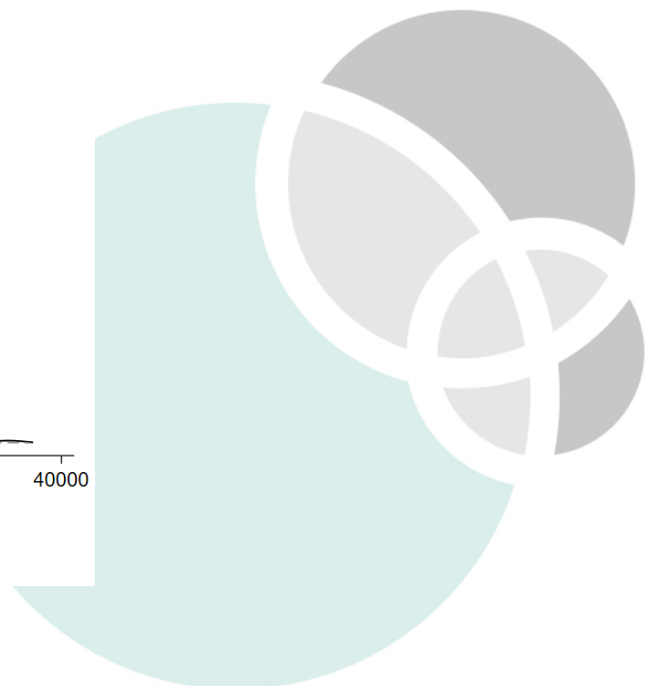
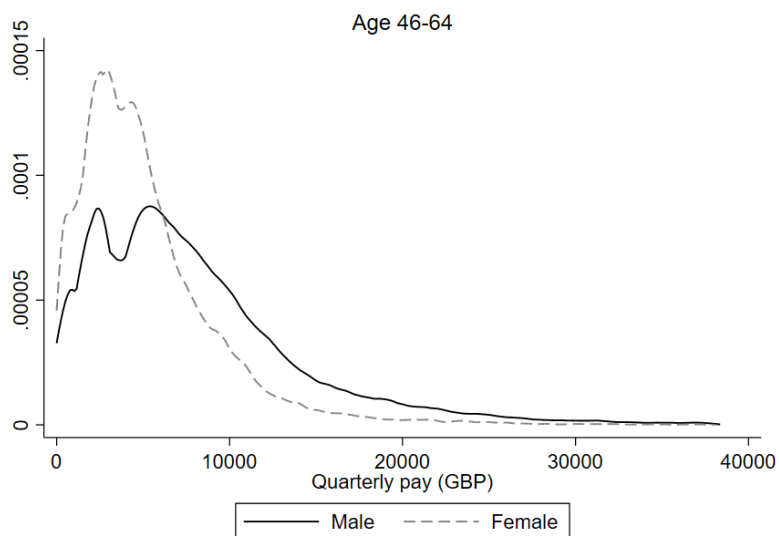
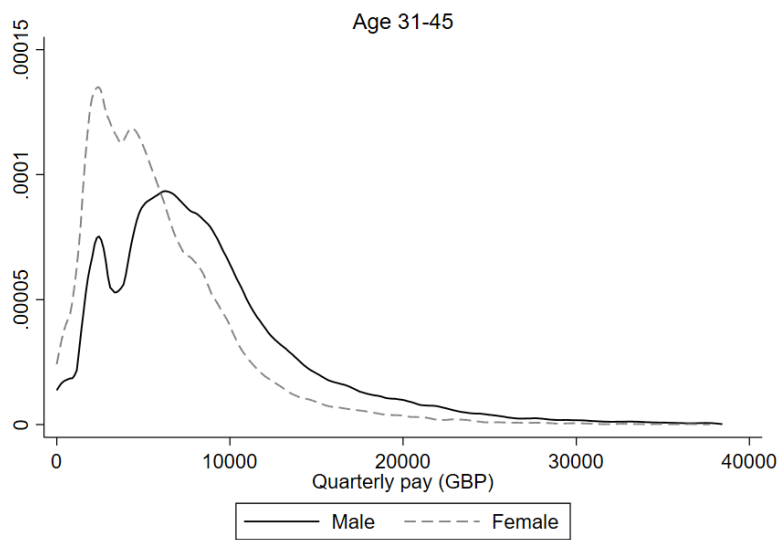
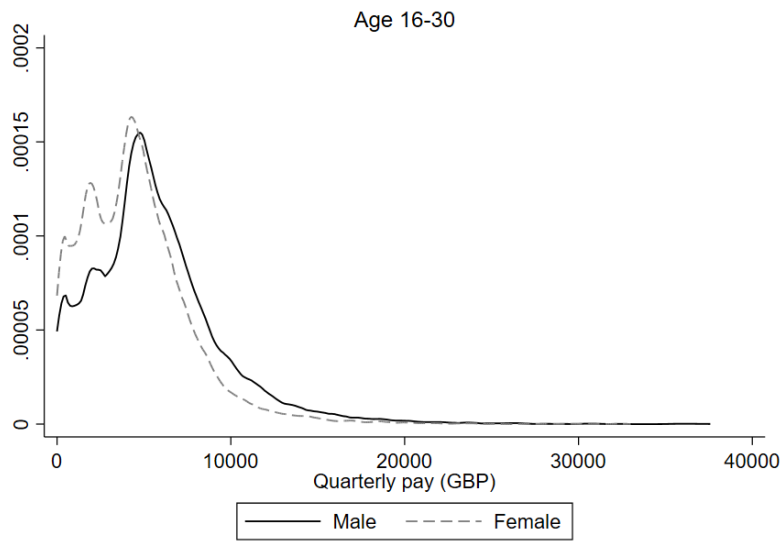


Figure A3: Distributions of Total Employee Taxable Pay in a quarter, first quarter of the 2018/19 tax year, Great Britain, by Gender and Age group.



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This work was produced using administrative data accessed through the ONS Secure Research Service. The use of the data in this work does not imply the endorsement of the ONS or data owners in relation to the interpretation or analysis. This work may not exactly reproduce National Statistics aggregates.

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¹ ASHE is based on an issued sample comprising around 1% of all employee jobs, taken from HMRC Pay As You Earn (PAYE) records. Employees are selected into the sample by virtue of the last two digits of their National Insurance (NI) number. ASHE only observes people when they have employee status. The survey is completed by employers. We focus solely on Great Britain, as ASHE responses from Northern Ireland are held in a separate dataset. The GB ASHE contains around 170,000 observations per year.

² ONS produces cross-sectional weights to make the weighted sample representative of the population of employee jobs by gender, age, occupation and region (using UK Labour Force Survey totals). However, not all employers respond (or do so quickly enough): responses are for around two-thirds of the one percent issued sample of employee jobs in a typical year. ONS weights do not adjust for this non-response. We link ASHE to the Business Structure Database, to identify whether specific types of employers are more or less likely to respond to ASHE, finding that larger organisations, public sector organisations and older organisations are significantly over-represented in the ASHE achieved sample. To remove these residual employer-related response biases, we use a raking procedure to construct an adjustment to the standard ONS cross-sectional ASHE weights (Forth et al., 2024).

³ We only compare estimates using the different weighting schemes for Great Britain, so cannot compare directly to the UK-level estimates that are published annually by ONS.

⁴ There is a categorical hours variable in the PAYE data that might have been used to approximate hourly earnings. Alternatively, we might have taken hours worked in the ASHE job over the ASHE survey period and assumed those hours were worked at other times of the year, thus using the ASHE hours to divide PAYE earnings to create an hourly pay variable. But we have chosen not to adopt this approach here.

⁵ The tax year starts from 6 April. The week 4 of the tax year takes place between 27/4 to 3/5.

⁶ The gender pay gap in median hourly earnings adjusted for non-response for full-time workers in ASHE in 2018, in Great Britain, is 9.8%. In 2019 it is 10.4% (see Table 1).