Wage & Employment Dynamics

THE WED PROJECT

# POLICY PAPER NUMBER 1

## Using ASHE to examine trends in low pay: initial exploration of the data


### Abstract

Using the Annual Survey of Hours and Earnings (ASHE) 2004-2019 we report consistent time-series estimates of the percentage of jobs on and around the minimum wage; low paid jobs above the minimum; and 'high paid' jobs. In doing so we report on some important methodological considerations including the construction of hourly pay in ASHE; the identification of 'main' and 'other' jobs; the incidence of missing data; and the use of rounding. We show the percentage of jobs paying around the minimum wage has risen over the period, but so too has the number of 'high paid' jobs.



Alex Bryson, Van Phan, Lucy Stokes, Felix Ritchie, John Forth, Arusha McKenzie, Damian Whittard

# Contents

Abstract ..... iii

Executive Summary ..... iii

1. Introduction ..... 1

2. Measuring hourly pay ..... 2

   2.1. Missingness ..... 5

3. Assessing “compliance” with the NMW/NLW ..... 7

   3.1. Survey timing ..... 7

   3.2. Definition of pay for NMW/NLW purposes ..... 8

   3.3. Implications of rounding ..... 8

4. Main jobs and other jobs ..... 10

5. Wage distribution ..... 12

   5.1. The Distribution of Hourly Earnings Around the Statutory Minima ..... 12

   5.2. The Proportion of Jobs Below, At and Above the Statutory Minima ..... 14

6. Discussion and Conclusion ..... 16

7. References ..... 17

8. Disclaimer ..... 17

9. Acknowledgements ..... 17

A. Appendix ..... 18

# List of figures

Figure 2.1: Nominal hourly pay and NMW/NLW, adult group ..... 4
Figure 3.1: Percentage of jobs paying at or below NMW/NLW, all ages ..... 9
Figure 3.2: Percentage of jobs paying at or below NMW/NLW, age 25+ ..... 9
Figure 4.1: Main jobs and other jobs paying at/under and above NMW, 2004-2019, age 25+ ..... 11
Figure 4.2: Main jobs and other jobs paying at/under NMW, 2004-2019, age 25+ ..... 11
Figure 5.1: Distribution of hourly earnings, 2004 ..... 12
Figure 5.2: Distribution of hourly earnings, 2012 ..... 13
Figure 5.3: Distribution of hourly earnings, 2019 ..... 13
Figure 5.4: Percentage of jobs paying under, at nmw, low paid and high paid, age 25+ ..... 14
Figure 5.5: percentage of jobs paying under, at NMW, low paid, age 25+ ..... 15
Figure A.1: Distribution of hourly earnings, pooled 2004-2019, all ages ..... 26
Figure A.2: Distribution of hourly earnings, pooled 2004-2019, age 25+ ..... 26

# List of tables

Table 2.1: Components of Gross Weekly Earnings ..... 2
Table 2.2: Missingness on hourly pay variable ..... 5

Table 4.1: Percentage of jobs that are 'other' jobs among those aged 25+ ..... 10
Table A.1: Regression results, missingness on hourly pay, industry..... 17
Table A.2: Regression results, missingness on hourly pay, occupation ..... 19
Table A.3: Regression results, earnings affected by absence, industry and occupation ..... 21 Table A.4: Regression results, earnings affected by absence, industry and occupation, plus controls 23

## Abstract

Using the Annual Survey of Hours and Earnings (ASHE) 2004-2019 we report consistent time-series estimates of the percentage of jobs on and around the minimum wage; low paid jobs above the minimum; and 'high paid' jobs. In doing so we report on some important methodological considerations including the construction of hourly pay in ASHE; the identification of 'main' and 'other' jobs; the incidence of missing data; and the use of rounding. We show the percentage of jobs paying around the minimum wage has risen over the period, but so too has the number of 'high paid' jobs.

## Executive Summary

Using the Annual Survey of Hours and Earnings (ASHE) 2004-2019 we report consistent time-series estimates of the percentage of jobs on and around the minimum wage; low paid jobs above the minimum; and 'high' paid jobs. In doing so we report on some important methodological considerations in relation to the construction of hourly pay; the identification of 'main' and 'other' jobs; the potential importance of missing data; and the use of rounding.

Our chief findings are as follows:

- Adult minimum wages have risen more quickly than median and mean hourly pay, and more quickly than hourly earnings at the first and third quartiles of the wage distribution.
- Although hourly pay is missing for only a small percentage of jobs, missingness is non-random with respect to low paid employment, raising questions about the advisability of treating missingness as if random in analyses of low pay.

- Alternative methods for rounding up the minimum wage threshold result in different estimates of the percentage of jobs at or below the minimum wage. Nevertheless, the percentage of jobs at or below the minimum wage has risen substantially since 2004, regardless of the rounding method used.
- The percentage of all jobs that are not main jobs (what we call 'other' jobs) has been rising over time. These jobs are more likely to jobs paid at or below the minimum wage than main jobs. However, most of the growth in jobs paying at or below the minimum wage comes from main jobs. Among employees aged 25 or over, the percentage of all jobs that are main jobs paid at or below the minimum wage has doubled to around 5% since 2004.
- Among employees aged 25 or more the percentage of jobs paid at the minimum wage has risen from 1% in 2004 to 2.5% in 2012 and 3% in 2019.
- Whilst the percentage of jobs paid at or below the statutory minimum has risen so too has the number of 'high paid' jobs paid at or above two-thirds median earnings (from 83.3% to 93.3% of all adults' jobs by 2019).

# 1. Introduction

Since the introduction of the National Minimum Wage (NMW) in 1999 the Low Pay Commission (LPC) has been charged with estimating the incidence of low pay in the economy and the percentage of employees and jobs paid below, at or above age-specific statutory minima including the recentlyintroduced National Living Wage (NLW) for those aged 25 or more. The task is an important part of the evidence-base required to estimate the role of minimum wages in the economy, and their impact on important economic and social outcomes such as wage levels, the wage distribution, and the links between minimum-wage induced wage change and other outcomes such as employment, productivity and firm profits.

The LPC is reliant on the Annual Survey of Hours and Earnings (ASHE) and its predecessor the New Earnings Survey (NES) to track the number of jobs and individuals paid below, on, and above the minimum wage. It is a valuable data source because the data are based on a panel of roughly 1 percent of employees in employment (sampled according to the last two digits of their National Insurance number), offering high-quality wage and hours data provided by the employers of sampled individuals. However, there are a range of challenging issues analysts face when using ASHE and the NES for these purposes. These include, but are not confined to, sample coverage[1]; item non-response and thus the use of imputed values; data rounding; and sample attrition. Data issues are sometimes compounded when trying to construct consistent data over time, to derive trend data over time based on repeat cross-sections, or in the production of panel data to track individuals or jobs over time.

This briefing paper is an early output from the Wage and Employment Dynamics study (www.wagedynamics.com) funded by ADR UK which, in its first phase, will construct a timeconsistent ASHE/NES wage spine. The resultant spine will be continually updated with computer code made available to all analysts through ONS's Secure Research Service (SRS) as a public good available to all bona fide analysts. We are collaborating with the Office for National Statistics (ONS) to this end, undertaking substantial quality assurance tests on the data, which include cleaning existing variables, quality assuring them, and supplementing them with additional data items (for example, in relation to unique longitudinal identifiers for individuals, employers and jobs). In the near future we will be creating longitudinal versions of the data to permit panel analyses of transitions in and out of low pay, for example. In a second phase these data will be matched to other data sources such as the 2011 Census to enrich the ASHE data with additional covariates, such as education and family circumstances, which are only available in the Census.

This paper is a modest contribution to the evidence base, simply presenting evidence on the incidence of low pay between 2004 and 2019, and the proportion of jobs below statutory minima, those at the minima, the proportion of jobs that are low paid but above the minima, and the proportion of 'high paid' jobs, by which we mean jobs paying at or above two-thirds median hourly earnings. However, before doing this, it is necessary to show how we get there. This means addressing the following issues that may be of interest to the LPC:

- the derivation of hourly pay;
- the role of rounding in identifying the percentage of jobs on and below the NMW;

[1] ASHE/NES under-samples those with earnings below the National Insurance Contributions Lower Earnings Limit, which includes a disproportionate number of low-paid workers.

- the identification and incidence of 'main' jobs and 'other' jobs.

Detailed consideration of these issues is valuable because, as we show, they can have substantial effects on estimates of low pay incidence.

The remainder of this paper proceeds as follows. Section Two discusses the measurement and derivation of hourly wages. We report nominal hourly wages over time using our preferred measure, including trends in different parts of the wage distribution, and how they relate to the adult minimum wage. The section also includes a discussion of data missingness and how this might relate to being low paid. Section Three reports the proportion of all jobs paid at the statutory minima, and below the statutory minima, and how this has changed over time. We show how these proportions vary with the method one uses to 'round' hourly pay in order to account for potential measurement errors including employer rounding. Section Four outlines how to distinguish 'main' jobs from 'other' jobs in ASHE, points to a growing incidence in 'other' jobs, identifies the proportion of low paid jobs that are 'main' and 'other' jobs, and shows the incidence of jobs at and below the statutory minima among main and 'other' jobs. Section Five examines the distribution of hourly earnings around the statutory minima, and how this has changed over time, and shows the proportion of jobs below the minima, at the minima, low paid above the minima, and 'high' paid. Section Six concludes with discussion of the implications of the analysis and the future work we will be undertaking.

## 2. Measuring hourly pay

Since 2015, the ASHE dataset has included a variable capturing hourly pay (hrpayx), as used by the LPC in their own analyses. This is based on gross pay excluding overtime and shift premium payments. In analysing trends in hourly pay, it is first useful to understand how this measure is constructed.

**Table 2.1: Components of Gross Weekly Earnings**

| | Question | Notes to respondents |
|---|---|---|
| Basic pay (bpay) | How much basic pay, before deductions, did the employee receive in the pay period? | Include: all basic pay, relating to the pay period, before deductions for PAYE, National Insurance, pension schemes, student loan repayments and voluntary deductions. Include paid leave (holiday pay), maternity/paternity pay, sick pay and area allowances (e.g. London). Exclude: pay for a different pay period, shift premium pay, bonus or incentive pay, overtime pay, expenses and the value of salary sacrifice schemes and benefits in kind |

| | | |
|---|---|---|
| Bonus or incentive payments relating to work carried out in the reference period (ipayin) | How much bonus or incentive payments did the employee receive in the pay period? How much of the bonus or incentive pay in [] above related to work carried out in the pay period? | Include: profit sharing, productivity, performance and other bonus or incentive pay, piecework and commission.<br>Exclude: basic, overtime and shift premium pay |
| Pay received for other reasons (othpay) | How much pay did the employee receive for other reasons in the pay period? | Include: for example, car allowances paid through the payroll, on call and standby allowances, clothing, first aider or fire fighter allowances.<br>Exclude: paid leave (holiday pay), basic, overtime, shift premium, maternity/paternity, sick, bonus or incentive pay, redundancy, arrears of pay, tax credits, profit share and expenses |

Note: wording reflects that used in the 2019 questionnaire. ASHE variable names in parentheses.

ASHE asks about earnings and hours in relation to the pay period that includes the reference date given in the survey; for example, in the 2019 ASHE, employers are asked about the pay period including the 10th April 2019.[2] Employers are asked for the length of the pay period (such as weekly or monthly), and are then asked to report various elements of earnings and hours on the basis of this pay period. This should enable employers to report the information in a way that is easiest for them. On the dataset, to aid consistency, this information is provided in the form of variables that give data on weekly pay and hours, regardless of the original pay period specified.

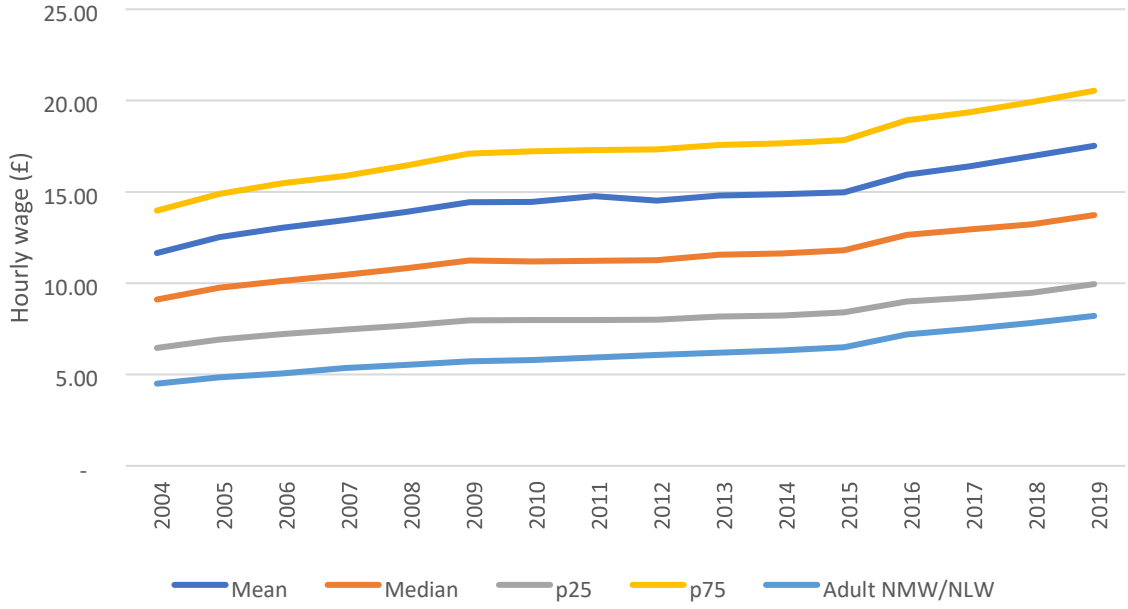
The variable hrpayx is therefore created as gross weekly earnings excluding overtime and shift premium payments, divided by basic weekly hours (excluding overtime hours). Gross weekly earnings comprise three components identified in Table 2.1 above.

We check that we can replicate hrpayx for the years for which this variable is available on the dataset – which we can - and then extend this backwards to 2004, the start of our analysis period. We do this in two ways – "top down" – whereby we subtract overtime and shift premium payments from gross pay, and "bottom up" – whereby we add together the relevant components. All approaches give consistent results. A "bottom up" approach arguably gives greater clarity over how pay is defined. Furthermore, in extending the analysis back prior to 2004 (something we plan to do next), changes in the ASHE questionnaire over time will mean it will be even more important to understand how "total" hourly pay is measured.

Based on our derived hourly pay measure, Figure 2.1 shows nominal hourly pay across time for those employees eligible for the adult rate of the NMW/NLW. Note that the relevant age group has changed over time, as described in the note to the chart.

[2] Employers are also asked some questions relating to earnings in the previous financial year, which we will also be exploring in future work.

**Figure 2.1: Nominal hourly pay and NMW/NLW, adult group**




Note: adult group, 22+ for 2004-2009, 21+ for 2010-2016, 25+ for 2016-2019

Over the period nominal median hourly earnings among adults have risen from £9.11 to £13.73, a rise of 51%. Over the same period earnings at the lower quartile and upper quartile rose by similar percentages (54% and 47% respectively). However, the adult minimum wage – initially for those aged 22 or more, then 21 or more from 2010-2016 and, since the introduction of the National Living Wage (NLW) in 2016, those aged 25 or more – has risen from £4.50 in 2004 to £8.21 in 2019, a rise of 82%. In 2004 this was the equivalent of 49.4% of adult median earnings, rising to 55.1% in 2015 and 59.8% in 2019. Although earnings at the lowest decile (not shown) rose strongly over the period (by 63.5% from £5.20 to £8.50) the adult minimum wage rose more sharply such that it was equivalent to 96.6% of earnings at the lowest decile in 2019 compared to 86.5% back in 2004.

It should be noted that this hourly earnings measure does not perfectly capture whether someone is paid the minimum wage or not – partly due to issues of survey timing since 2016, but also because it is not perfectly aligned with how pay is defined for minimum wage purposes (although it is likely to be as close as is feasible with the ASHE data). We discuss these issues further in Section 3 below.

## 2.1.Missingness

It is not possible to derive an hourly wage for some ASHE jobs. The incidence of missingness is relatively small, typically less than 1% in most years, except in 2004 when this approaches 3% (**Table 2.2: Missingness on hourly pay variable**Table 2.2).

**Table 2.2: Missingness on hourly pay variable**

| Year | N non-missing observations | N missing observations | % missing |
|---|---|---|---|
| 2004 | 159,189 | 4,412 | 2.7 |
| 2005 | 164,350 | 569 | 0.35 |
| 2006 | 165,938 | 293 | 0.18 |
| 2007 | 138,458 | 217 | 0.16 |
| 2008 | 138,280 | 462 | 0.33 |
| 2009 | 168,815 | 795 | 0.47 |
| 2010 | 171,792 | 956 | 0.55 |
| 2011 | 181,339 | 1,279 | 0.7 |
| 2012 | 175,512 | 1,319 | 0.75 |
| 2013 | 178,162 | 1,426 | 0.79 |
| 2014 | 183,662 | 1,383 | 0.75 |
| 2015 | 181,501 | 1,087 | 0.6 |
| 2016 | 177,027 | 1,047 | 0.59 |
| 2017 | 177,088 | 1,025 | 0.58 |
| 2018 | 178,469 | 939 | 0.52 |
| 2019 | 175,829 | 679 | 0.38 |
| Total | 2,715,411 | 17,888 | 0.65 |

While the incidence of missingness is low, it is still important to consider the reasons for missingness for two reasons. First, if missingness is associated with one's status as a low paid employee this needs to be taken into account when estimating the incidence of low paid and its correlates. If one ignores missingness and it is correlated with low pay status then the assumption one makes in simply ignoring such cases that they are 'missing at random' is not appropriate and one may wish to account for missingness when conducting analyses of low pay incidence and its correlates. Second, it is valuable to understand the incidence and causes of missingness which examining individuals' earnings trajectories over time, including movements in and out of low pay, rather than simply ignoring cases with missing pay observations.

To explore characteristics associated with missing hourly pay, we run a regression of whether hourly pay is missing on whether someone is in a low paying industry or low paying occupation, plus age, gender, region (of workplace), survey year: results are shown in Appendix **Error! Reference source**

**not found.** (focusing on low pay industries) and A.2 (focusing on low pay occupations). We run separate models for industry and occupation due to concerns over collinearity. In all cases we run linear regression models for the (0,1) outcome 'hourly pay is missing'.

We run four model specifications in each case; the first specification simply regresses whether hourly pay is missing according to whether someone is employed in a low-paying industry (occupation) or not. We then extend this (column 2) to look at type of low-pay industry (occupation), and then add additional controls for age, gender, workplace region and the 2004 survey year (column 3) and finally adding an indicator for earnings affected by absence (column 4).

It is apparent that hourly pay is not missing at random: missingness is correlated with covariates in the models such that models (4) account for around 12% of the variance in missingness in the case of both the industry and occupation models (as indicated by the adjusted R-squared at the foot of the tables).

The notable shift in the adjusted r-squared as one moves from models (1)-(3) to models (4) is due to the introduction of the dummy variable identifying those whose earnings have been affected by absence in the reference period (this is indicated by the lop marker in ASHE). This variable dominates the model which is unsurprising since all but 16 cases out of those 17,888 where hourly pay is missing have pay affected by absence.

In all models missingness is lower among men than it is among women and falls with age. Missingness also varies somewhat by region, and the dummy variable for 2004 confirm that missingness is most apparent in this year.

But perhaps of particular interest given our concern about the relationship between low pay and missing data on hourly pay is the relationship between being in a low paying occupation and/or low paying industry and having missing hourly wage data. Both occupation and industry prove important but, as the models indicate, it is not sufficient to simply distinguish in broad terms between being in a low paying sector/occupation or not. This is because the correlations vary even within the low paying sectors/occupations.

Beginning with industrial sector in Appendix Table A1, it is apparent that hourly wage data are more likely to be missing in the following low paying sectors when compared to those industries that are not low paying: Food Processing; Hospitality; Social Care; Leisure; Employment Agencies. Employees in Retail have a lower probability of having missing hourly wage data than their counterparts in nonlow paying industries regardless of model specification.

Turning to occupations in Appendix Table A2, compared to those occupations that are not low paying, the following low paid occupations have a higher probability of hourly pay being missing: Social Care and Leisure. Those with a lower probability of having missing pay data are occupations in: Agriculture and Retail. In other cases the sign on the coefficient flips around depending on the model specification, and sometimes once we include the indicator for earnings being affected by absence.

We then run additional models to explore the relationship between having earnings affected by absence according to whether employed in a low pay sector or occupation. Appendix Table A.3 shows various specifications for including low pay industry and/or occupation, while Appendix Table A.4 introduces additional controls for age, gender, region and year. Thie analyses show that earnings were more likely to be affected by absence for those working in low pay sectors and occupations. This was the case across almost all low paying industries, compared to working in a non-low paying sector, with the exception of employment agencies where this relationship was reversed. Without

exception those in low-paying occupations were more likely to have pay affected by sickness absence than those not in low-paying occupations.

The investigation above suggests that the relationship between industrial sector, occupation and having missing hourly pay data is potentially quite complicated but is worthy of further investigation. In future work we will explore whether there is potential for imputation for these cases, however, for now we do not impute values for these cases where hourly pay is missing.

# 3. Assessing "compliance" with the NMW/NLW

In Section 2 we noted that our measure of hourly pay cannot perfectly capture whether someone is paid at the minimum wage or not. Key issues relate to survey timing, and to how pay is defined.

## 3.1. Survey timing

The ASHE takes place in April each year. As others have previously highlighted (for example, Dube, 2019; LPC, 2019), when examining whether a job is paid at the NMW/NLW or not, it is important to bear in mind when upratings in the NMW and NLW come into effect.

Throughout most of the period we consider in our analysis, NMW upratings took effect in October of each year; this applies for 2004 to 2015 inclusive. So, for example, for the 2012 ASHE, the applicable NMW is that set in October 2011. Given there is such a lag between the setting of the NMW and the survey, there should be no concerns about employers not having yet adjusted wages to reflect the uprating during that period of our analysis.

However, in 2016, with the introduction of the NLW, this changed. The NLW came into effect on 1st April 2016. In ASHE that year, employers were asked to report figures for the pay period including 13 April. If an employee's reference pay period had begun prior to 1st April, they may be observed as being paid below the new NLW, when actually, this would still be compliant (if paid at the previous applicable NMW rate). Since this point, upratings have generally occurred in April of each year (the exception being that in 2016, NMW youth rates and apprentice rates increased in October 2016, rather than April). Note that when the NMW or NLW increases on the 1st April, the new rate only starts to apply from the next pay reference period (see example on Acas website: https://www.acas.org.uk/national-minimum-wage-entitlement/when-your-rate-increases).

The ASHE questionnaire asks for both the length of the pay reference period (e.g. weekly, monthly etc. with the variable "payp") and the start date of the pay period (variable "ppstart"). It is therefore possible to see if the start date of the current pay period is after the 1st April, in which case this gives us more of an idea as to whether the derived hourly rate for an employee is compliant or not. In fact, there is a variable ("nlpflag") available on the ASHE data set for recent years which "identifies those employees whose pay period started before 1 April and whose derived rate is below the current NMW/NLW but who are paid at least the previous NMW/NLW rate and therefore are classified as not low paid for the purposes of low pay statistics" (Annex E of the ASHE user guide). We follow a similar approach in our analysis, using information on whether the pay period started in March.

Nevertheless, it is important to note that the purpose of our analysis is to look at the low-paid, and not specifically the underpaid. While we present some figures separating out this group, for most of this briefing we focus on a measure looking at those at or below the minimum wage.

## 3.2. Definition of pay for NMW/NLW purposes

The LPC's report on non-compliance (LPC, 2019) acknowledges that one reason ASHE estimates may not be an accurate measure of the extent of underpayment is because of the treatment of commission/bonuses. As noted above, the hourly pay measure in ASHE includes incentive or bonus pay that was paid in the pay period asked about in the survey and related to work carried out in that pay period. However, a worker may have, for example, earned commission in that period, but the amount may not be calculated and paid until the following pay period. This amount counts for the purpose of calculating the minimum wage (BEIS, 2020), however, it would not be captured in the ASHE measure. Thus, an employee could appear as underpaid, when in fact they are not.

Another reason an employee could appear as underpaid in ASHE when they are not is if the employer is providing accommodation. The accommodation offset is a notional daily amount that can count towards minimum wage pay (full details are provided in the BEIS 2020 guidance). ASHE does not record whether the employee is provided with accommodation, therefore it is not possible to adjust estimates for this (the questionnaire does ask about the value of benefits in kind, but does not ask for further details as to which benefits this includes). Other reasons noted as to why employees may appear underpaid when they are not including rules relating to piece rates and potential under-recording of apprentices. At the same time, the LPC report notes that ASHE could also understate the extent of underpayment since employers are unlikely to indicate they are noncompliant and given the survey will not capture the informal economy.

There is perhaps also potentially a grey area over whether all pay classified as "pay received for other reasons" would necessarily count as pay for minimum wage purposes (for example, an on call allowance may not necessarily count towards minimum wage pay except in some circumstances).[3,4]

While the ASHE measure does not perfectly capture pay as calculated for the purpose of the minimum wage, it is as close as is likely to be feasible with the available data. Furthermore, the purpose of our analysis is to look at the low-paid, and not specifically the underpaid, and to show the sensitivity of results to differing assumptions about how low pay may be defined.

## 3.3. Implications of rounding

Analyses of jobs paying at and under the NMW/NLW often allow for some element of rounding by employers.

The LPC has adopted a practice whereby 5p is added to the NMW/NLW to identify underpayment. The LPC method is considered a conservative approach to deal with spurious accuracy in the derivation of a precise hourly wage. However, Fry and Ritchie (2013) argue that rounding up to next 10p is appropriate because this is what many employers do in practice with their employees' pay.

[3] There is a box for employers to specify what items they are referring to. As part of our future quality assurance work we will investigate whether and, if so, how these verbatim responses appear in the data and whether ONS uses this information to adjust the "other" pay amount before entering it in the data.

[4] A further issue we have yet to investigate is the use of the variable "pcflag" (available from 2016 only) which identifies employees who are paid according to a payroll calculation (weekly hours x stated hourly rate x 52 weeks)/12 months) which differs slightly from the calculation stated on the ASHE questionnaire for calculating the paid hours worked. This results in their derived hourly rate coming out below the NLW/NMW" (ASHE user guide).

These different methods of rounding can result in different estimates for the percentage of employees paid below the minimum wage. Let's take a simple example where £4.93 is assumed the NMW. The LPC would take those paid up to £4.98 to be paid on or below the NMW, whilst Fry and Ritchie would take those paid up to £5.00 to be paid on or below NMW. The implication of rounding up the NMW to identify underpayment may vary and depend on actual NMW with one method or another proving more 'conservative' depending on the actual minimum. In case of a NMW at £4.98, for example, the LPC threshold (i.e. £5.03) would be higher than Fry and Ritchie's £5.00.

We illustrate these points with the following two graphs. Figure 3.1 shows the percentage of jobs paid at or below the minimum wage for employees of all ages, where the minimum wage threshold has been set to be age and year specific. There are three lines showing estimates of the percentage of jobs at or below the age-specific minimum. The red line takes the employee's hourly wage without any rounding; the blue line adopts of the LPC practice of rounding up the hourly wage by 5p;

---

while the yellow line adopts the Fry and Ritchie practice of rounding up to the nearest 10p. Whichever method is deployed it is apparent that the percentage of jobs on or below the minimum wage rose each year through to 2017 before dropping a little. However, for any given year, the rounding strategy adopted can make a substantial difference to estimates of the percentage of jobs at or below the minimum wage, a difference that has increased over time, as indicated by the growth in the dispersion of the three lines over time. In 2004 between 2-3% of jobs were estimated to be paid at or below the minimum wage but this has risen to 5-6% by 2019. Across most of the period, the Fry and Ritchie rounding method tends to result in a higher percentage of jobs paid at or below the minimum wage than the LPC approach, except in 2013. Figure 3.2 illustrates these points but confines the analysis to employees aged 25 or over.

In the remainder of the paper we adopt the LPC's rounding method.

**Figure 3.1: Percentage of jobs paying at or below NMW/NLW, all ages**

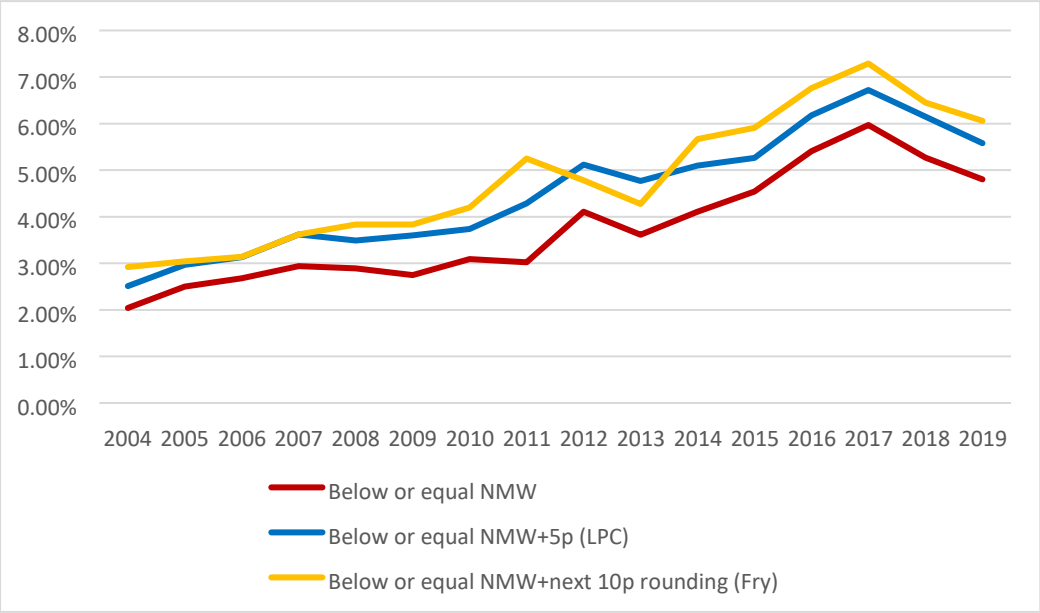
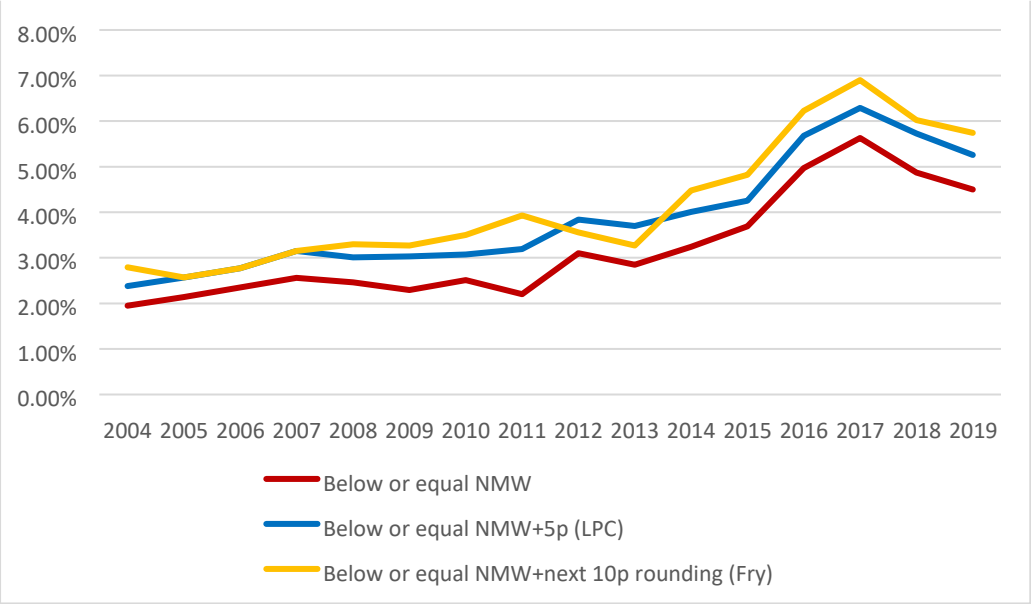


**Figure 3.2: Percentage of jobs paying at or below NMW/NLW, age 25+**




## 4. Main jobs and other jobs

It is not uncommon for people to have more than one job. Although there are some markers in ASHE (variables "mjob" and "djob") which try to identify such jobs, we have chosen to investigate the issue as part of our quality assurance because some users have expressed doubts about the value of the ASHE markers.

If employees in ASHE have more than one job, details of all jobs are recorded (providing the employer responds). Where individuals have multiple jobs, we follow a set of rules for identifying their main job:

- If they have one job then it is the main job
- If they have more than one job then the main job is identified as the one with most hours worked.
- If there is a tie on hours worked then the main job is identified as the one with the highest earnings. If there is still a tie we undertake a case-by-case check[5]

This set of rules appears straightforward when undertaking cross-sectional analyses, but may be less so when following individuals and their jobs over time in panel analyses. We will be returning to this issue in future work.

**Table 4.1: Percentage of jobs that are 'other' jobs among those aged 25+**

| Year | Other jobs as % of all jobs |
|---|---|
| 2004 | 1.5 |
| 2005 | 1.7 |
| 2006 | 1.7 |
| 2007 | 1.6 |

[5] These cases are rare - typically affects between 50 and 250 jobs per year unweighted.

| | |
|---|---|
| 2008 | 1.7 |
| 2009 | 1.8 |
| 2010 | 2.1 |
| 2011 | 2.4 |
| 2012 | 2.4 |
| 2013 | 2.3 |
| 2014 | 2.3 |
| 2015 | 2.2 |
| 2016 | 2.0 |
| 2017 | 2.1 |
| 2018 | 2.0 |
| 2019 | 2.4 |

Table 4.1 indicates that, among employees aged 25 or more, the percentage of all jobs that are 'other' jobs has been rising year on year – from 1.5% of all jobs in 2004 to 2.4% in 2019.

Figure 4.1 shows the percentage of main and other jobs by whether they pay at or under the NMW/NLW or above the NMW/NLW. Most of the jobs in the economy are main jobs above the minimum wage but this percentage has fallen from 96.2% in 2004 to 92.6% in 2019. This has been due primarily to growth in the percentage of jobs that are main jobs paid at or under the minimum wage – these jobs have doubled from 2.3% to 5.1% of all jobs. Most of the growth in other jobs is in other jobs paying above the minimum wage.

**Figure 4.1: Main jobs and other jobs paying at/under and above NMW, 2004-2019, age 25+**

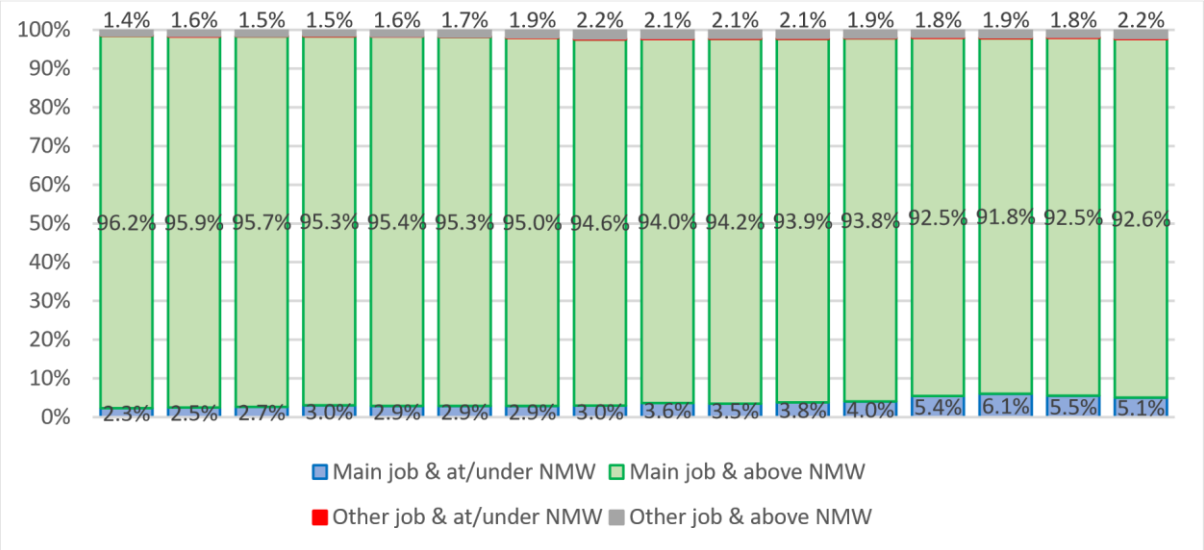
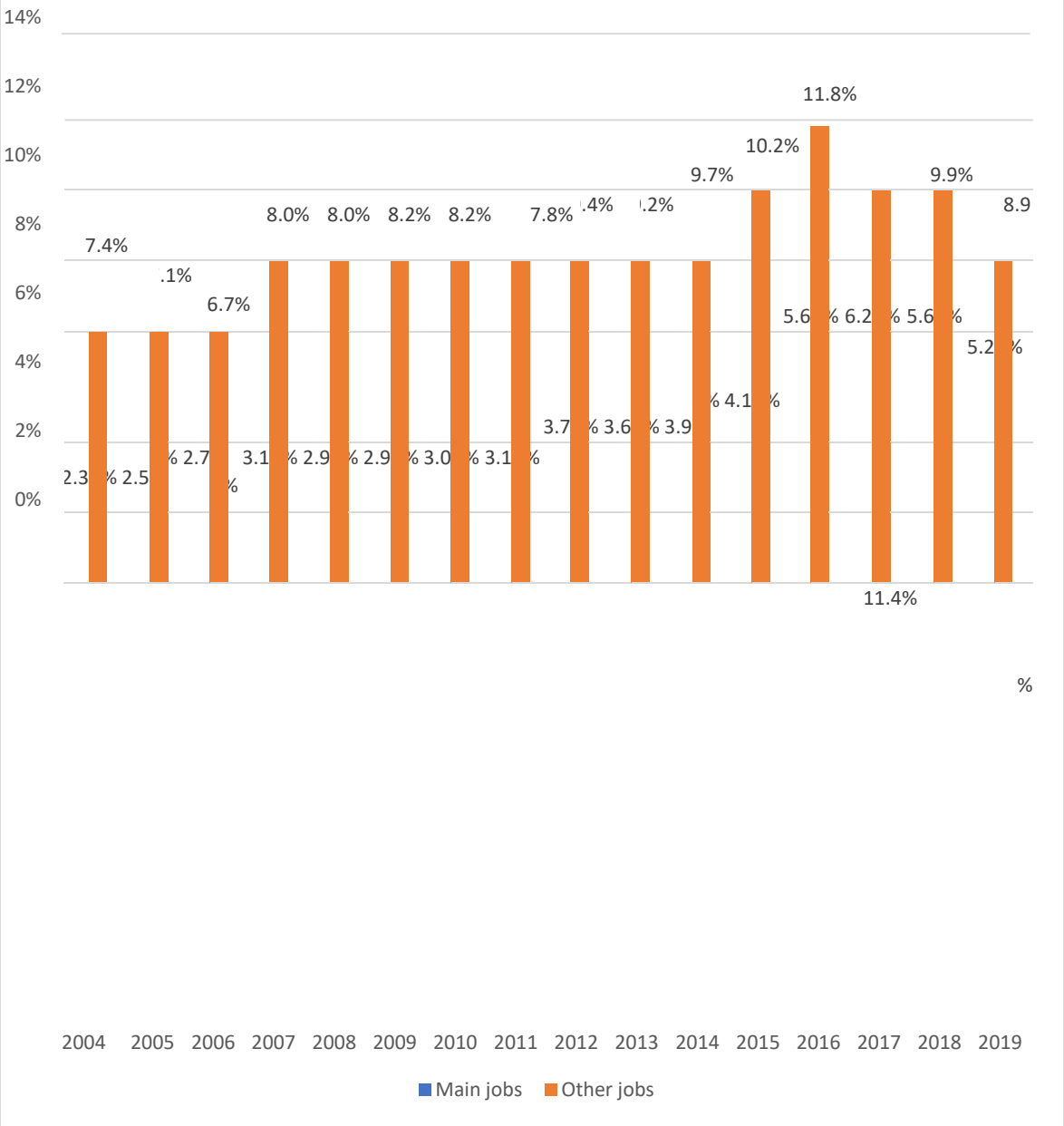


Figure 4.2 shows that other jobs are more likely to be minimum wage jobs than main jobs. In 2019, among employees aged 25 or over, while around 5 per cent of main jobs were paid at or below the NLW, this applied for nine per cent of other jobs.

**Figure 4.2: Main jobs and other jobs paying at/under NMW, 2004-2019, age 25+**




## 5. Wage distribution

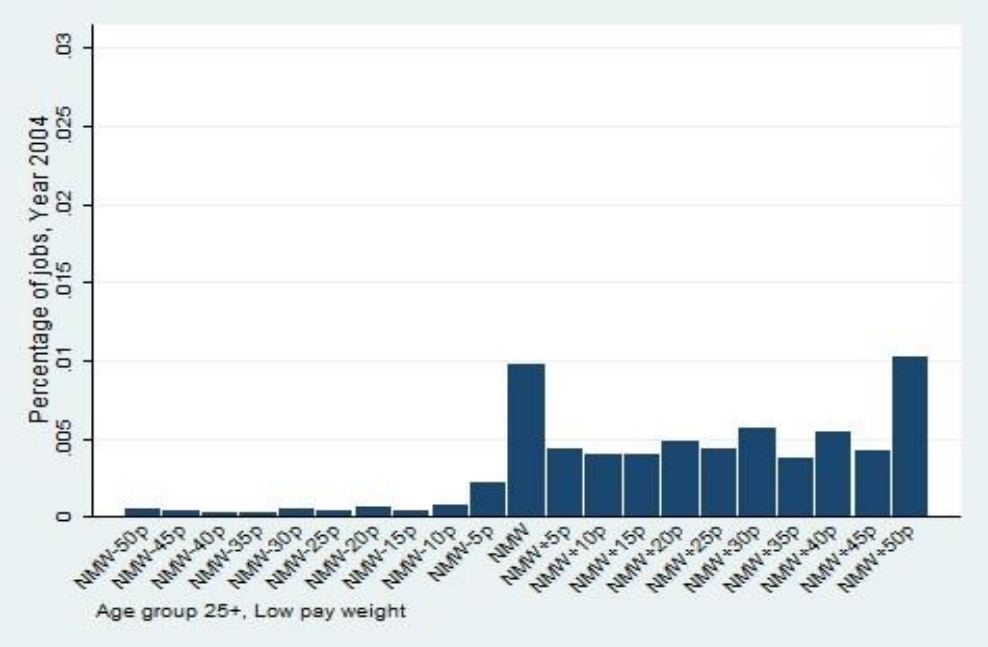
In this final substantive section we examine more carefully the distribution of hourly earnings around the statutory minima before turning to categorising jobs according to their position in that earnings distribution.

### 5.1. The Distribution of Hourly Earnings Around the Statutory Minima

The figures below show the distribution hourly earnings around the highest statutory minimum wage applying to adults in 2004, 2012 and 2019, for employees aged 25 and over (Figure 5.1,

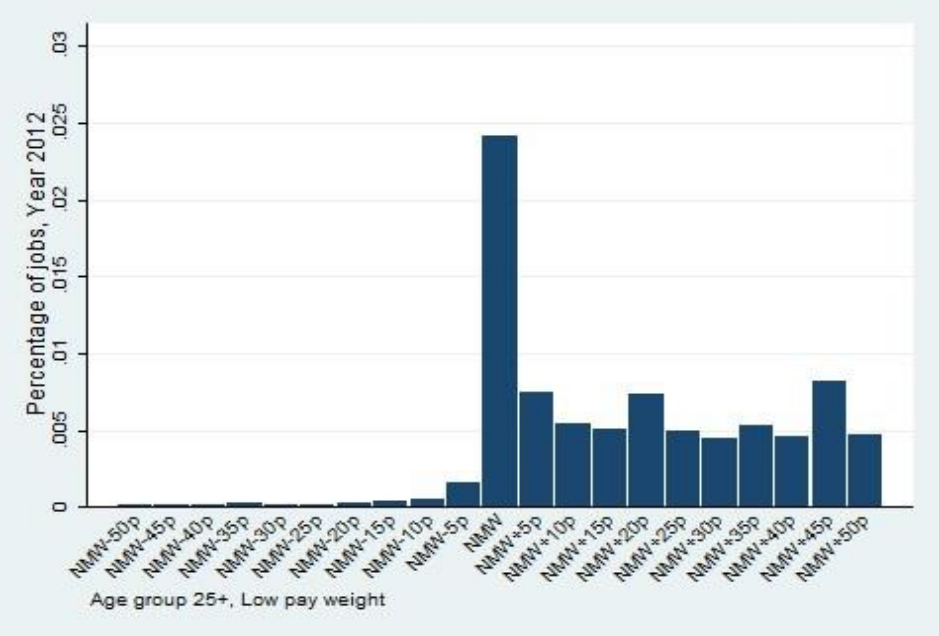
**Figure 5.2**, and Figure 5.3 respectively). These show a clear increase in the size of the spike paying at the NMW/NLW over this time period, from 1 per cent in 2004 to around 2.5 per cent in 2012 and up to just above 3 per cent in 2019. (Figures A.1 and A.2 in the appendix present similar information for all years pooled for those aged 25+ and all employees respectively).

**Figure 5.1: Distribution of hourly earnings, 2004**



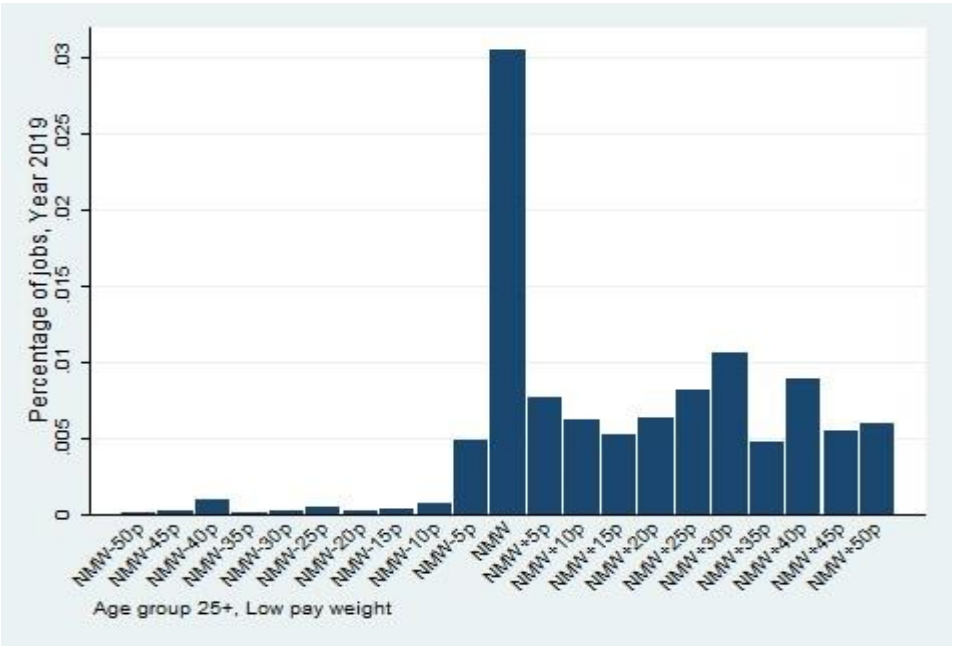

Note: The remaining 93 per cent of jobs were paid at more than the NMW + 50p

**Figure 5.2: Distribution of hourly earnings, 2012**




Note: The remaining 91 per cent of jobs were paid at more than the NMW + 50p

**Figure 5.3: Distribution of hourly earnings, 2019**




Note: The remaining 89 per cent of jobs were paid at more than the NMW + 50p

## 5.2. The Proportion of Jobs Below, At and Above the Statutory Minima

Having derived hourly pay for each job we define four mutually exclusive states:

(i) underpayment which refers to jobs paying under the NMW/NLW by more than 1p;

(ii) at and around the NMW which refers to jobs paying at the NMW/NLW and up to 5p above NMW according to LPC approach (mentioned in Section 3);

(iii) low paid employment which refers to jobs paying higher than the NMW/NLW+5p but less than two-thirds median earnings;

(iv) 'high paid' employment, that is, jobs paying at or about two-thirds median earnings.

Figure 5.4 shows, for employees aged 25 and over, the percentage of jobs that are under the NMW/NLW, at the NMW, low-paid (paying less than two-thirds of the median) and the remaining "high-paid" jobs. It is apparent that the percentage of jobs paying around the minimum wage has risen over the period, but so too has the number of 'high paid' jobs (from 83.3% of all jobs in 2004 to 93.2% in 2019). The percentage of low paid jobs – those above the minimum wage but below twothirds median earnings – has been squeezed. Back in 2004 they constituted 14.4% of all jobs but had virtually disappeared by 2019.

**Figure 5.5** zooms in on the low paid groups so these can be seen more clearly. As discussed earlier, while this suggests an increase in the number of jobs paying below the NMW/NLW since 2016, this cannot be interpreted as an estimate of non-compliance. Whilst the percentage of jobs above the NMW/NLW but below two-thirds median earnings has fallen dramatically we see some compensating rise in the percentage of jobs at or below the minimum wage.

**Figure 5.4: Percentage of jobs paying under, at nmw, low paid and high paid, age 25+**

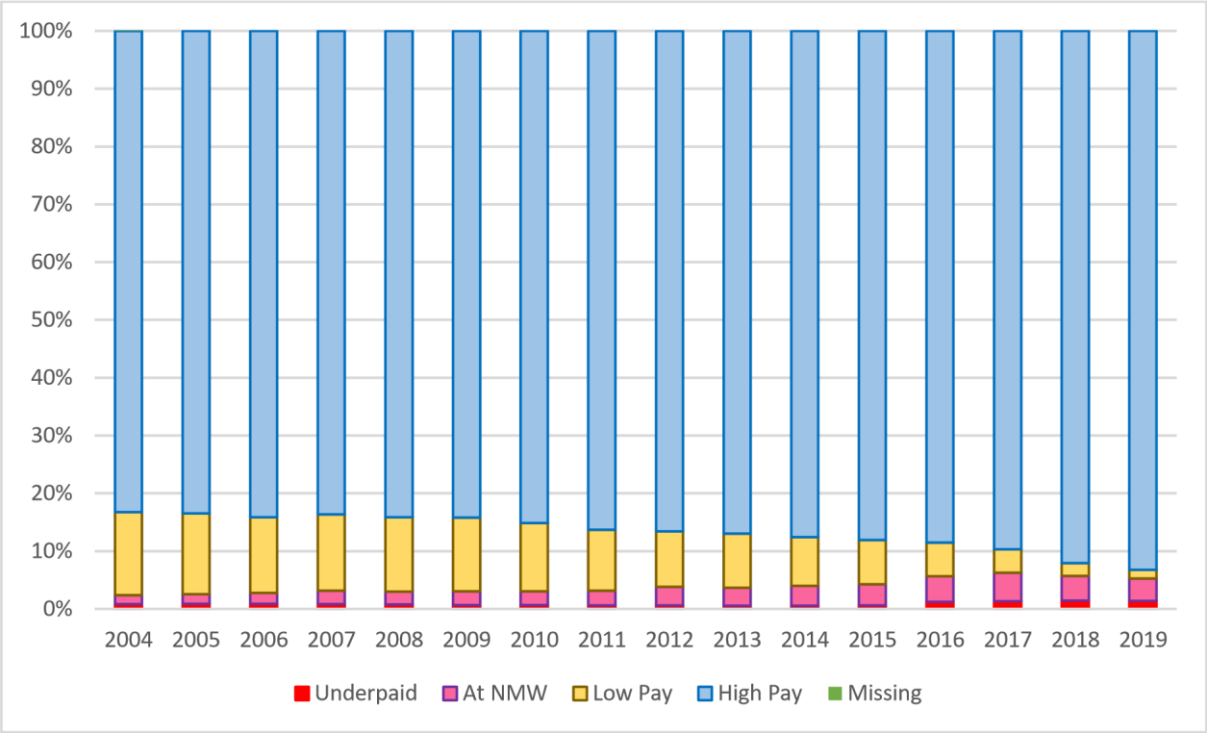
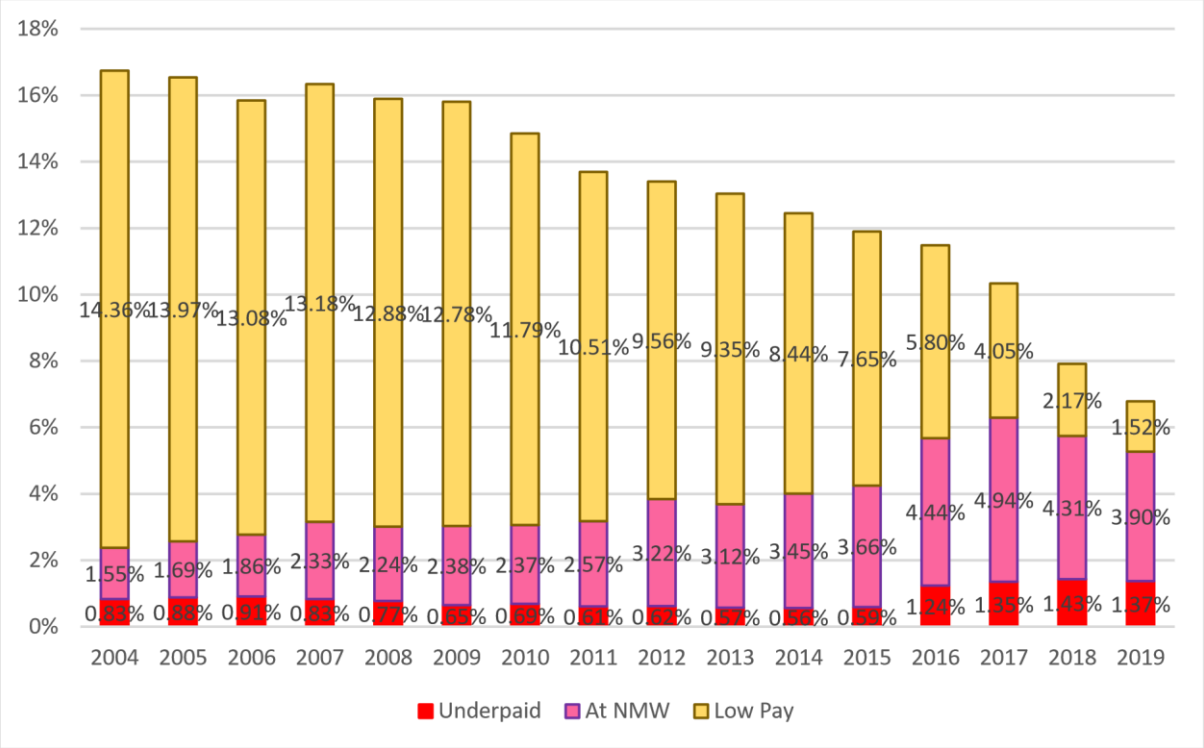


**Figure 5.5: percentage of jobs paying under, at NMW, low paid, age 25+**




Earlier we also noted that since 2016, a variable pcflag has been available on the ASHE data identifying those for whom hourly pay is calculated from payroll information that may understate the hourly rate. Nevertheless, if the figures presented above are adjusted to exclude those flagged in this way, the percentage of jobs underpaid would still be above 1% in each year (based on individuals aged 25 plus who are not in the first year of their apprenticeship).

## 6. Discussion and Conclusion

This policy briefing paper is the first output from the work we have been conducting as part of our Wage and Employment Dynamics project to produce a consistent wage spine based on the Annual Survey of Hours and Earnings and the New Earnings Survey. The project is in its early stages, as is apparent from the simple descriptive nature of our analysis, its cross-sectional nature, and the period covered (back to 2004). Nevertheless, we have drawn attention to some important trends, as well as key methodological considerations when compiling such statistics.

In future work to be undertaken shortly we will be:

- Rerunning these analyses on a new data download from ONS which contains additional information;
- Extending the analyses back in time as far as we can, to include the New Earnings Survey (NES) and, in the case of earnings trends and trends in the wage distribution, the period prior to the introduction of a NMW;
- Undertaking further quality assurance checks on the data, some of which are referred to in the text;
- Turning to panel data analyses tracking individuals and their jobs over time to examine wage dynamics, including transitions in and out of low pay; time spent in low paid

employment; and factors determining wage growth including within and across job wage growth within and between employers.

The above will be underpinned by the generation of new data and syntax which will be made available to analysts so that they can replicate and extend analyses in directions they wish to pursue. The intention is to create a framework in which both policy analysts and academics can continually update the wage spine in future.

We will also be linking this ASHE-NES wage spine to other data through data matching processes, with a link to the 2011 Census imminent.

## 7. References

Department for Business, Energy and Industrial Strategy (2020) National Minimum Wage and National Living Wage. Calculating the minimum wage https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/879132/calculating-minimum-wage-guidance-6-april-2020.pdf

Dube, A. (2019) Impacts of Minimum Wages: review of the international evidence https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/844350/impacts_of_minimum_wages_review_of_the_international_evidence_Arindrajit_Dube_web.pdf

Fry, S. and Ritchie, F. (2013) *Behavioural aspects of the national minimum wage: Measuring and interpreting behaviour in the low-wage labour market.* Working Paper. GOV. UK, UK. Available from: http://eprints.uwe.ac.uk/22501

Low Pay Commission (2019) Non-compliance and enforcement of the national minimum wage. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/797675/Non-compliance_and_enforcement_of_the_National_Minimum_Wage_WEB.pdf

## 8. Disclaimer

This work was produced using statistical data from ONS. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

## 9. Acknowledgements

We would like to thank ADR UK and the ESRC for funding (grant ES/T013877/1) and ONS for collaborating with us in quality assuring the data. We also thank participants at the Low Pay Commission Research Workshop for comments on an earlier version of the paper.

# A. Appendix

**Table A.1: Regression results, missingness on hourly pay, industry**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | | | | |
| Low-paying industry | 0.00212*** | | | |
| | (19.73) | | | |
| Industry (ref: not low paying) | | | | |
| Agriculture | | -0.000601 | 0.000314 | -0.000277 |
| | | (-0.86) | (0.45) | (-0.42) |
| Food processing | | 0.00571*** | 0.00629*** | 0.00167*** |
| | | (13.98) | (15.42) | (4.36) |
| Textiles | | 0.00279** | 0.00256** | -0.00345*** |
| | | (3.05) | (2.80) | (-4.02) |
| Retail | | -0.00111*** | -0.00226*** | -0.0111*** |
| | | (-7.60) | (-15.42) | (-80.09) |
| Hospitality | | 0.00391*** | 0.00250*** | 0.00119*** |
| | | (17.14) | (10.90) | (5.50) |
| Cleaning | | 0.00209*** | 0.00229*** | -0.00213*** |
| | | (4.67) | (5.12) | (-5.07) |
| Social care | | 0.00801*** | 0.00627*** | 0.00270*** |
| | | (30.30) | (23.63) | (10.85) |
| Childcare | | 0.0101*** | 0.00776*** | -0.00197** |
| | | (14.90) | (11.48) | (-3.10) |
| Leisure | | 0.00336*** | 0.00263*** | 0.00166*** |
| | | (8.43) | (6.62) | (4.45) |
| Hairdressing | | 0.0106*** | 0.00671*** | 0.000401 |
| | | (12.69) | (8.06) | (0.51) |
| Employment agencies | | 0.00224*** | 0.00283*** | 0.00368*** |
| | | (5.68) | (7.18) | (9.94) |
| | | | | |
| Age | | | -0.000171*** | -0.0000359*** |
| | | | (-44.52) | (-9.94) |
| Male | | | -0.00617*** | -0.00471*** |
| | | | (-62.74) | (-50.92) |
| Region (ref: London) | | | | |

| | | | | |
|---|---|---|---|---|
| North East | | | 0.000288 | 0.000144 |
| | | | (1.06) | (0.56) |
| North West | | | 0.000198 | -0.000244 |
| | | | (1.02) | (-1.34) |
| Yorkshire and Humberside | | | 0.000537* | -0.0000591 |
| | | | (2.55) | (-0.30) |
| East Midlands | | | 0.000879*** | 0.000145 |
| | | | (3.95) | (0.69) |
| West Midlands | | | 0.000979*** | 0.000239 |
| | | | (4.72) | (1.23) |
| South West | | | 0.000434* | 0.0000302 |
| | | | (2.08) | (0.15) |
| East | | | 0.000689*** | 0.000128 |
| | | | (3.37) | (0.66) |
| South East | | | -0.0000391 | -0.000318 |
| | | | (-0.21) | (-1.84) |
| Wales | | | 0.000386 | 0.0000128 |
| | | | (1.47) | (0.05) |
| Scotland | | | 0.000666** | 0.000591** |
| | | | (3.25) | (3.07) |
| | | | | |
| 2004 (relative to all other years) | | | 0.0218*** | 0.0167*** |
| | | | (106.48) | (86.56) |
| | | | | |
| Pay affected by absence | | | | 0.124*** |
| | | | | (603.02) |
| | | | | |
| Constant | 0.00593*** | 0.00593*** | 0.0144*** | 0.00393*** |
| | (102.22) | (102.25) | (68.59) | (19.83) |
| R-squared | 0.0001 | 0.0007 | 0.0070 | 0.1236 |
| N (unweighted) | 2733299 | 2733299 | 2733299 | 2733299 |

t-stats in parentheses

* p<0.05, ** p<0.01, *** p<0.001

**A.2 Regression results, missingness on hourly pay, occupation**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | | | | |
| Low-paying occupation | 0.00135*** | | | |
| | (12.54) | | | |
| Occupations (ref: not low paying) | | | | |
| Agriculture | | -0.00257*** | -0.000140 | -0.00149* |
| | | (-4.04) | (-0.22) | (-2.50) |
| Food processing | | 0.00647*** | 0.00696*** | -0.000709 |
| | | (14.97) | (16.11) | (-1.75) |
| Textiles | | 0.00418*** | 0.00373*** | -0.00406*** |
| | | (3.98) | (3.56) | (-4.13) |
| Retail | | -0.000858*** | -0.00253*** | -0.0122*** |
| | | (-5.12) | (-14.90) | (-76.37) |
| Hospitality | | 0.000816** | 0.000102 | -0.000864** |
| | | (2.75) | (0.34) | (-3.09) |
| Cleaning | | 0.000877*** | 0.000580* | -0.00250*** |
| | | (3.29) | (2.17) | (-9.96) |
| Social care | | 0.00890*** | 0.00820*** | 0.00481*** |
| | | (23.08) | (21.24) | (13.26) |
| Childcare | | 0.00636*** | 0.00323*** | -0.00232*** |
| | | (15.68) | (7.93) | (-6.08) |
| Leisure | | 0.00599*** | 0.00443*** | 0.00372*** |
| | | (11.13) | (8.26) | (7.37) |
| Hairdressing | | 0.0116*** | 0.00748*** | 0.000833 |
| | | (14.08) | (9.05) | (1.07) |
| Office work | | -0.000172 | -0.00201*** | -0.00240*** |
| | | (-0.45) | (-5.19) | (-6.60) |
| Non-food processing | | 0.00160*** | 0.00308*** | -0.00401*** |
| | | (4.31) | (8.26) | (-11.45) |
| Storage | | -0.000210 | 0.00288*** | -0.00473*** |
| | | (-0.52) | (7.16) | (-12.50) |
| Transport | | -0.000662 | 0.00288*** | -0.00150*** |
| | | (-1.74) | (7.54) | (-4.18) |
| | | | | |
| Age | | | -0.000176*** | -0.0000427*** |
| | | | (-45.99) | (-11.82) |
| | | | | |

**Table :**

| | | | | |
|---|---|---|---|---|
| Male | | | -0.00656*** | -0.00497*** |
| | | | (-64.83) | (-52.31) |
| Region (ref: London) | | | | |
| North East | | | 0.000144 | 0.000333 |
| | | | (0.53) | (1.30) |
| North West | | | 0.0000840 | -0.000173 |
| | | | (0.43) | (-0.95) |
| Yorkshire and Humberside | | | 0.000358 | 0.0000349 |
| | | | (1.70) | (0.18) |
| East Midlands | | | 0.000661** | 0.000196 |
| | | | (2.97) | (0.94) |
| West Midlands | | | 0.000826*** | 0.000355 |
| | | | (3.98) | (1.82) |
| South West | | | 0.000347 | 0.0000753 |
| | | | (1.66) | (0.38) |
| East | | | 0.000559** | 0.000128 |
| | | | (2.73) | (0.66) |
| South East | | | -0.000115 | -0.000324 |
| | | | (-0.63) | (-1.87) |
| Wales | | | 0.000174 | 0.0000846 |
| | | | (0.66) | (0.34) |
| Scotland | | | 0.000499* | 0.000634** |
| | | | (2.43) | (3.28) |
| | | | | |
| 2004 (relative to all other years) | | | 0.0218*** | 0.0164*** |
| | | | (106.34) | (84.81) |
| | | | | |
| Pay affected by absence | | | | 0.124*** |
| | | | | (602.36) |
| | | | | |
| Constant | 0.00615*** | 0.00615*** | 0.0150*** | 0.00449*** |
| | (106.40) | (106.42) | (71.83) | (22.72) |
| R-squared | 0.0001 | 0.0005 | 0.0069 | 0.1233 |
| N (unweighted) | 2733299 | 2733299 | 2733299 | 2733299 |

t-stats in parentheses

* p<0.05, ** p<0.01, *** p<0.001

**A.3 Regression results, earnings affected by absence, industry and occupation**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | | | | | |
| Low-paying industry | 0.0489*** | | 0.0331*** | | | |
| | (165.38) | | (99.55) | | | |
| Low-paying occupation | | 0.0498*** | 0.0345*** | | | |
| | | (167.75) | (103.41) | | | |
| Industry (ref: not low paying) | | | | | | |
| Agriculture | | | | 0.00325 | | -0.00312 |
| | | | | (1.70) | | (-1.52) |
| Food processing | | | | 0.0371*** | | 0.0111*** |
| | | | | (33.00) | | (9.07) |
| Textiles | | | | 0.0469*** | | 0.0262*** |
| | | | | (18.62) | | (9.97) |
| Retail | | | | 0.0769*** | | 0.0504*** |
| | | | | (192.21) | | (97.15) |
| Hospitality | | | | 0.0196*** | | 0.0175*** |
| | | | | (31.18) | | (23.96) |
| Cleaning | | | | 0.0338*** | | 0.0262*** |
| | | | | (27.39) | | (19.08) |
| Social care | | | | 0.0318*** | | 0.0303*** |
| | | | | (43.70) | | (38.66) |
| Childcare | | | | 0.0875*** | | 0.0655*** |
| | | | | (46.97) | | (32.74) |
| Leisure | | | | 0.0132*** | | 0.00975*** |
| | | | | (12.05) | | (8.58) |
| Hairdressing | | | | 0.0660*** | | 0.0331*** |
| | | | | (28.75) | | (8.74) |
| Employment agencies | | | | -0.00374*** | | -0.0145*** |
| | | | | (-3.45) | | (-13.27) |
| Occupation (ref: not low paying) | | | | | | |

**Table :**

| | | | | | | |
|---|---|---|---|---|---|---|
| Agriculture | | | | | 0.00581*** | 0.00798*** |
| | | | | | (3.32) | (4.26) |
| Food processing | | | | | 0.0620*** | 0.0549*** |
| | | | | | (52.13) | (42.34) |
| Textiles | | | | | 0.0613*** | 0.0508*** |
| | | | | | (21.18) | (16.81) |
| Retail | | | | | 0.0858*** | 0.0499*** |
| | | | | | (185.94) | (83.84) |
| Hospitality | | | | | 0.0147*** | 0.00356*** |
| | | | | | (18.02) | (3.75) |
| Cleaning | | | | | 0.0223*** | 0.0140*** |
| | | | | | (30.42) | (17.07) |
| Social care | | | | | 0.0281*** | 0.0152*** |
| | | | | | (26.49) | (13.29) |
| Childcare | | | | | 0.0525*** | 0.0406*** |
| | | | | | (47.03) | (33.86) |
| Leisure | | | | | 0.0147*** | 0.0134*** |
| | | | | | (9.92) | (8.77) |
| Hairdressing | | | | | 0.0694*** | 0.0452*** |
| | | | | | (30.52) | (12.04) |
| Office work | | | | | 0.00684*** | 0.00396*** |
| | | | | | (6.44) | (3.72) |
| Non-food processing | | | | | 0.0550*** | 0.0579*** |
| | | | | | (53.75) | (56.54) |
| Storage | | | | | 0.0572*** | 0.0530*** |
| | | | | | (51.78) | (47.57) |
| Transport | | | | | 0.0265*** | 0.0120*** |
| | | | | | (25.34) | (11.42) |
| | | | | | | |
| Constant | 0.0385*** | 0.0384*** | 0.0331*** | 0.0385*** | 0.0384*** | 0.0337*** |
| | (240.48) | (240.48) | (197.33) | (241.08) | (241.11) | (200.29) |
| R-squared | 0.0099 | 0.0102 | 0.0138 | 0.0148 | 0.0154 | 0.0198 |
| N (unweighted) | 2733299 | 2733299 | 2733299 | 2733299 | 2733299 | 2733299 |

t-stats in parentheses

* p<0.05, ** p<0.01, *** p<0.001

**A.4 Regression results, earnings affected by absence, industry and occupation, plus controls**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | | | | | |
| Low-paying industry | 0.0436*** | | 0.0284*** | | | |
| | (145.41) | | (84.93) | | | |
| Low-paying occupation | | 0.0465*** | 0.0338*** | | | |
| | | (155.46) | (101.11) | | | |
| Industry (ref: not low paying) | | | | | | |
| Agriculture | | | | 0.00475* | | -0.00307 |
| | | | | (2.49) | | (-1.50) |
| Food processing | | | | 0.0371*** | | 0.0112*** |
| | | | | (33.06) | | (9.14) |
| Textiles | | | | 0.0482*** | | 0.0273*** |
| | | | | (19.21) | | (10.42) |
| Retail | | | | 0.0709*** | | 0.0471*** |
| | | | | (175.83) | | (90.78) |
| Hospitality | | | | 0.0106*** | | 0.00962*** |
| | | | | (16.73) | | (13.11) |
| Cleaning | | | | 0.0355*** | | 0.0249*** |
| | | | | (28.85) | | (18.23) |
| Social care | | | | 0.0286*** | | 0.0270*** |
| | | | | (39.21) | | (34.39) |
| Childcare | | | | 0.0782*** | | 0.0608*** |
| | | | | (42.00) | | (30.48) |
| Leisure | | | | 0.00778*** | | 0.00631*** |
| | | | | (7.10) | | (5.56) |
| Hairdressing | | | | 0.0507*** | | 0.0272*** |
| | | | | (22.10) | | (7.21) |
| Employment agencies | | | | -0.00685*** | | -0.0179*** |
| | | | | (-6.31) | | (-16.36) |

**Table :**

| | | | | | | |
|---|---|---|---|---|---|---|
| Occupation (ref: not low paying) | | | | | | |
| Agriculture | | | | | 0.0109*** | 0.0130*** |
| | | | | | (6.21) | (6.92) |
| Food processing | | | | | 0.0616*** | 0.0548*** |
| | | | | | (51.86) | (42.34) |
| Textiles | | | | | 0.0626*** | 0.0516*** |
| | | | | | (21.72) | (17.13) |
| Retail | | | | | 0.0780*** | 0.0449*** |
| | | | | | (167.14) | (75.25) |
| Hospitality | | | | | 0.00776*** | 0.00230* |
| | | | | | (9.47) | (2.42) |
| Cleaning | | | | | 0.0247*** | 0.0174*** |
| | | | | | (33.71) | (21.26) |
| Social care | | | | | 0.0272*** | 0.0160*** |
| | | | | | (25.63) | (14.03) |
| Childcare | | | | | 0.0446*** | 0.0340*** |
| | | | | | (39.84) | (28.26) |
| Leisure | | | | | 0.00574*** | 0.00630*** |
| | | | | | (3.89) | (4.12) |
| Hairdressing | | | | | 0.0534*** | 0.0345*** |
| | | | | | (23.49) | (9.21) |
| Office work | | | | | 0.00313** | 0.00138 |
| | | | | | (2.95) | (1.29) |
| Non-food processing | | | | | 0.0569*** | 0.0595*** |
| | | | | | (55.58) | (57.99) |
| Storage | | | | | 0.0611*** | 0.0575*** |
| | | | | | (55.24) | (51.50) |
| Transport | | | | | 0.0352*** | 0.0212*** |
| | | | | | (33.50) | (20.03) |
| | | | | | | |
| Age | -0.00108*** | -0.00115*** | -0.00104*** | -0.00108*** | -0.00108*** | -0.00102*** |
| | (-102.78) | (-110.31) | (-99.23) | (-102.62) | (-101.84) | (-96.22) |
| | | | | | | |
| Male | -0.0122*** | -0.0122*** | -0.0111*** | -0.0118*** | -0.0127*** | -0.0120*** |

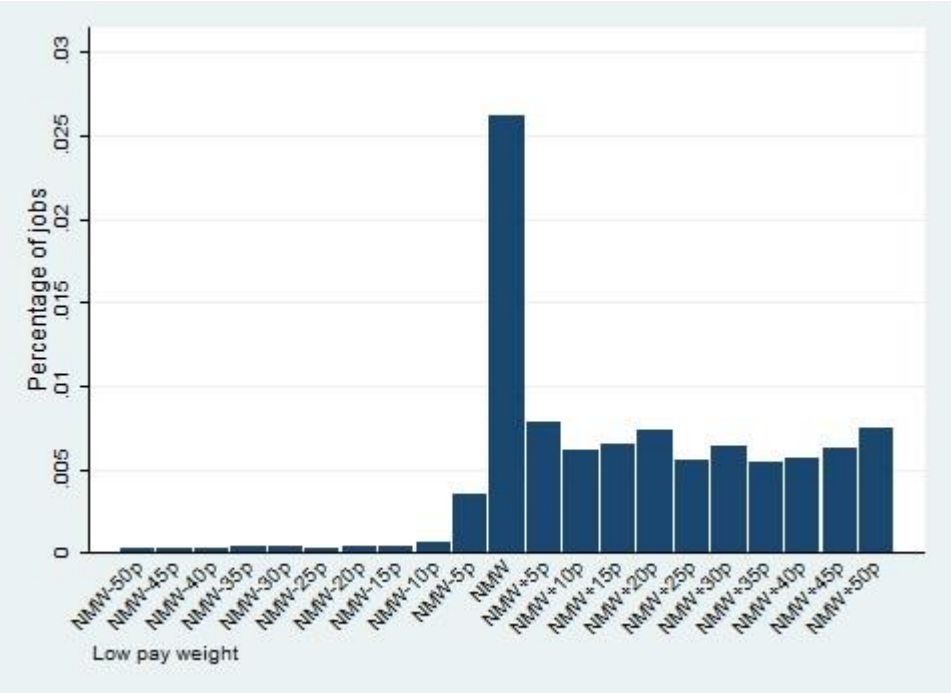
| | | | | | | |
|---|---|---|---|---|---|---|
| | (-45.45) | (-45.25) | (-41.36) | (-43.45) | (-45.73) | (-42.94) |
| Region (ref: London) | | | | | | |
| North East | 0.00222** | -0.000662 | -0.000289 | 0.00116 | -0.00152* | -0.00189* |
| | (2.95) | (-0.88) | (-0.38) | (1.54) | (-2.02) | (-2.52) |
| North West | 0.00454*** | 0.00292*** | 0.00256*** | 0.00354*** | 0.00207*** | 0.00110* |
| | (8.48) | (5.45) | (4.79) | (6.64) | (3.87) | (2.07) |
| Yorkshire and Humberside | 0.00576*** | 0.00330*** | 0.00327*** | 0.00479*** | 0.00260*** | 0.00182** |
| | (9.93) | (5.70) | (5.65) | (8.27) | (4.49) | (3.14) |
| East Midlands | 0.00651*** | 0.00475*** | 0.00398*** | 0.00590*** | 0.00374*** | 0.00249*** |
| | (10.62) | (7.75) | (6.51) | (9.63) | (6.10) | (4.07) |
| West Midlands | 0.00641*** | 0.00449*** | 0.00422*** | 0.00594*** | 0.00378*** | 0.00298*** |
| | (11.21) | (7.86) | (7.39) | (10.42) | (6.63) | (5.23) |
| South West | 0.00403*** | 0.00254*** | 0.00195*** | 0.00325*** | 0.00218*** | 0.000939 |
| | (6.99) | (4.40) | (3.39) | (5.64) | (3.79) | (1.63) |
| East | 0.00485*** | 0.00383*** | 0.00299*** | 0.00451*** | 0.00347*** | 0.00243*** |
| | (8.58) | (6.79) | (5.30) | (8.00) | (6.15) | (4.31) |
| South East | 0.00304*** | 0.00201*** | 0.00155** | 0.00224*** | 0.00168*** | 0.000599 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (5.99) | (3.97) | (3.05) | (4.42) | (3.31) | (1.18) |
| Wales | 0.00421*** | 0.00144* | 0.00158* | 0.00300*** | 0.000715 | -0.0000469 |
| | (5.83) | (1.99) | (2.19) | (4.16) | (0.99) | (-0.07) |
| Scotland | 0.00131* | -0.000853 | -0.000691 | 0.000602 | -0.00108 | -0.00157** |
| | (2.32) | (-1.51) | (-1.22) | (1.07) | (-1.92) | (-2.78) |
| | | | | | | |
| 2004 (relative to all other years) | 0.0424*** | 0.0445*** | 0.0446*** | 0.0413*** | 0.0438*** | 0.0430*** |
| | (74.89) | (78.65) | (78.89) | (73.20) | (77.59) | (76.19) |
| | | | | | | |
| Constant | 0.0836*** | 0.0872*** | 0.0779*** | 0.0843*** | 0.0849*** | 0.0791*** |
| | (145.01) | (153.21) | (134.58) | (145.58) | (147.22) | (135.15) |
| R-squared | 0.0165 | 0.0176 | 0.0202 | 0.0213 | 0.0221 | 0.0259 |
| N (unweighted) | 2733299 | 2733299 | 2733299 | 2733299 | 2733299 | 2733299 |

t-stats in parentheses

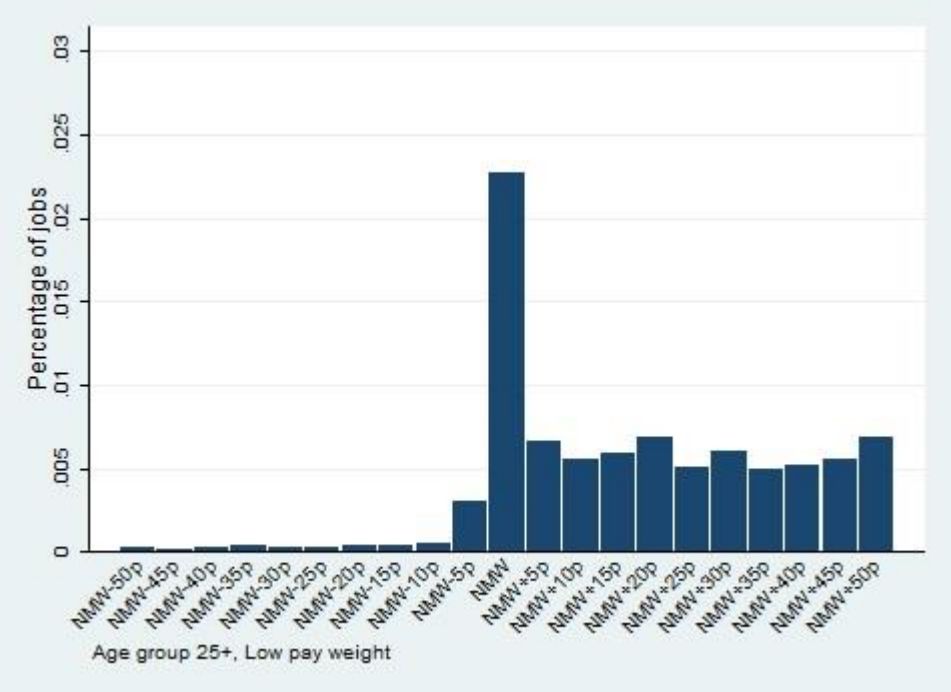
* p<0.05, ** p<0.01, *** p<0.001

**Figure A.1: Distribution of hourly earnings, pooled 2004-2019, all ages**



Note: The remaining 90 per cent of jobs were paid at more than the NMW + 50p

**Figure A.2: Distribution of hourly earnings, pooled 2004-2019, age 25+**




Note: The remaining 91 per cent of jobs were paid at more than the NMW + 50p