THE IMPACT OF THE NATIONAL MINIMUM WAGE ON EMPLOYMENT AND HOURS

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EXECUTIVE SUMMARY

Aims

This paper reports the findings of a study into the impact of the uprating of the National Minimum Wage (NMW) on employment and hours through the recession and recovery. It considers the impact of the NMW on various groups of employees, including men and women, those working full-time and part-time, those in the public and private sectors, those working for firms of different sizes and older and younger employees. It also presents results for those eligible for the youth rates. Different methods of analyses and datasets are used to assess the robustness of the findings.

Data

The research questions were addressed using the Labour Force Survey (LFS) and the Annual Survey of Hours and Earnings (ASHE) microdata. Difference-in-differences methods were used to assess the impact of the introduction and uprating of the NMW, with a particular focus on the impact of uprating the NMW during the recession of 2008 to 2009 and the recovery from 2010 onwards. ASHE has the benefit of offering larger sample sizes than the LFS, as well as being based on data drawn from Pay-As-You-Earn records. However, the LFS covers the unemployed, as well as those in work, and contains a richer set of control variables.

Methods

The individual-level analysis of employment retention and hours used a comparison group composed of those who earned up to 10 per cent more than the NMW in the period before and after each uprating and compared outcomes for them with outcomes for those who would have been directly affected by the uprating. The analysis of job entry focused on how the probability of entering employment from unemployment was affected by the predicted wage rate for the unemployed person (having predicted wages from the wage distribution of those who did enter employment over the course of a year).

As well as producing estimates using both ASHE and the LFS, a number of other approaches were used to assess the sensitivity of the results to changes of specification. These included varying the choice of comparison group, using 2009 (a year when the increase in the adult NMW was smallest in percentage terms) as the base period and adjusting the definition of the recession to be the period when the employment level was below the March-May 2008 peak. A local area analysis was also used to supplement the analysis of individual-level data as a further means of assessing the robustness of the results, as well as to identify any spillover effects that are seen higher up the wage distribution. This approach involved exploiting the fact that the impact of the NMW is likely to vary across the country, as it is higher relative to average wages in certain areas. The main focus in the analysis was on weighted results, including control variables, but the sensitivity of the results to removing the weights and controls was also tested.

Results

In common with Dickens et al. (2014), the individual-level analysis presented in this report suggests that the uprating of the NMW has resulted in a reduced likelihood of female part-time employees remaining in employment. Papps and Gregg (2014) also found negative employment effects from the NMW across all employees when considering the period to 2010. In addition to this, the local area analysis in the current study showed that the employment rate for female part-time employees fell in response to the uprating of the NMW, whereas a positive impact was apparent for female full-time employees. However, the sensitivity testing of the individual-level analysis brought the finding of negative effects for female part-time employees into doubt, at least in the years since 2009.

Male full-time employees appeared to have a lower rate of employment retention during the years from 2010 onwards. Dickens et al. (2014) also found some negative employment effects for this group in the shorter run of data that they were able to use (to 2009), but this was not evident in the LFS analysis presented in the current study and it is uncertain whether this finding is robust.

Past research has found only limited evidence of the NMW having any impact on hours. This was generally true in the current study, once differences in the results for the impact of the NMW on hours when trying alternative specifications are taken into account. Whilst the hours of female full-time employees appeared to fall in response to the uprating of the NMW during the recovery, this finding was not robust to changes in model specification. The local area analysis also found that the NMW did not affect the total number of hours worked by men or women. However, those on the youth development rate appeared to work fewer hours in response to the uprating of the NMW during the recovery period.

Whilst there was little evidence that the probability of job entry for low-wage women was affected by the uprating of the NMW, low-wage men did appear more likely to find work in the recovery period. This is perhaps consistent with lower retention rates for men if they leave a minimum wage job, are unemployed for a spell and then re-enter a minimum wage job. It is possible that the general lack of wage growth during the recession and recovery explains the negative employment effects for some minimum wage employees, as for much of this period, only those on the NMW would have experienced pay increases, potentially making them relatively less attractive to employers than those earning slightly more.

There were notable variations in the apparent impact of the NMW on particular subgroups of employees. Firms of different sizes responded differently to the uprating of the NMW in terms of both employment and hours, whereas differences between younger and older employees were concentrated on employment retention, rather than the adjustment of hours. None of the findings for those eligible for the 16-17 year old rate were statistically significant.

Policy Implications

The questionable robustness of some of the results makes it difficult to draw firm policy conclusions, but the study does suggest that any impacts from the uprating of the NMW are unevenly distributed between different groups of employees and are affected by their gender, the number of hours worked, their age and the size of their employer. This variation in the potential impact of the uprating of the NMW in an uncertain economic climate implies that a cautious approach will be needed in future rate-setting.

1. INTRODUCTION

1.1. Aims

The aim of this research is to explore the impact of the uprating of the National Minimum Wage (NMW) on employment and hours through the recession and recovery. There is a particular interest in how recent upratings have affected firms of different sizes and whether there have been differential impacts for certain age groups.

The main questions addressed by the current research are:

- What impact have the recent upratings of the NMW had on employment and hours?
- What impact has uprating during and following the recession had on those initially unemployed?
- Has the impact of recent upratings on employment and hours differed for those of different ages?
- Has the impact varied for firms of different sizes?

1.2. Background

Past research has established that the NMW has a positive effect on earnings for the low-paid and therefore might be expected to result in an offsetting negative effect on employment and hours (Dickens et al. 2012). However, the analysis which has been carried out since the NMW was first introduced in April 1999 has generally found little evidence that the NMW has had negative employment effects. Although Neumark and Wascher (2006) note some of the flaws inherent in past studies of the NMW in the UK, including the dangers of focusing on short-run employment effects, they also acknowledge that the evidence for negative employment effects is weaker in the UK than in the US. By analysing data on 33 countries over the period from 1976 to 2008 and weighting estimates in proportion to the population size of each country, Dolton and Rosazza Bondibene (2011) found that the negative employment effects of the NMW were not robust across countries. Likewise, Dickens et al. (2009) concluded that there was little evidence to suggest that large increases in the NMW had a negative impact on job retention, entry or employment rates. However, Dickens et al. (2012) found some evidence of a negative effect on employment retention for female part-time employees in large firms, highlighting the need to also consider how the impact of uprating varies for firms of different sizes. Also, a recent paper by Brochu and Green (2013) based on analysis of the Canadian Labour Force Survey found that low-skilled employees who had been in employment for less than a year were less likely to leave their job following an increase in the minimum wage, whilst this was not the case for those with longer job tenure. This indicates the importance of considering how the impact of the NMW on job retention varies for employees of different tenure, as well as with other characteristics.

The evidence on the link between increases in the NMW and the number of hours worked is also fairly weak, although Stewart and Swaffield (2004) found that the introduction of the NMW resulted in a reduction of between one and two hours a week in total and basic hours for low-paid employees. It also seems that some groups of employees experienced a reduction in hours in response to larger increases in the NMW in 2001 and 2003 (Dickens et al. 2009).

Turning to the impact of the NMW during an economic downturn, Dickens and Dolton (2011) did not find any evidence that upratings for low-paid employees (by the Wages Councils) through the recessions of the 1980s and 1990s had a negative impact on employment. However, hours did appear to be cut to offset higher wages. They also noted the difficulties of making predictions about the impact of upratings given that economic downturns and their impact on

particular sectors, are likely to vary. This highlights the value of addressing the question of how the uprating of the NMW has affected outcomes such as employment and hours during the recent recession and recovery, now that these can be observed in contemporary data. Riley and Rosazza Bondibene (2013), found little evidence that the NMW had an effect on employment during the recent economic downturn in their analysis of firm-level data. Bryan et al. (2013), in their analysis of individual-level data, also found little clear evidence that the uprating of the NMW had an impact on employment retention or hours during the recession.

Dickens et al. (2012) highlighted the importance of considering impacts for women working part-time and full-time separately, since negative employment effects were found only for female part-time employees. For this reason, the analysis explores whether the impact of the NMW on employment and hours varies for women working part-time and full-time, as well as men.

Similarly, Bryan et al. 2012 and 2013 found that there was a more pronounced reduction in hours for young employees following the 2010 uprating than for other groups. Also, Dickens et al. (2010) explore the impact on low-skilled young employees of moving from eligibility for the youth to the adult rate of the NMW and find a positive employment effect of around 5 percentage points, which is likely to be explained by young employees increasing their labour supply in response to the higher NMW rate. Fidrmuc and Tena (2011) find that on average, there is a negative employment effect in the year before young employees become eligible for the adult rate, although employment effects vary for firms of different sizes and in different sectors (Fidrmuc and Tena 2013). Brochu and Green (2013) also found that whilst they observed a negative impact on hiring rates from minimum wage increases across the age distribution, this relationship was more pronounced for teenagers. This indicates that it is important to consider how the impact of NMW upratings vary for those eligible for different rates of the NMW and in different parts of the age distribution (including older employees).

2. DATA

2.1. Overview

The research questions are addressed using the Labour Force Survey (LFS) and the Annual Survey of Hours and Earnings (ASHE) microdata. Difference-in-differences methods are used to assess the impact of the introduction and uprating of the NMW, with a particular focus on the impact of uprating during the recession of 2008 to 2009 and the recovery from 2010 onwards. The impact of the recession is assessed by extending the standard difference-in-differences model by adding a term to capture the interaction between the impact of the NMW and the state of the economy.

Employers are required to complete the ASHE survey in April of each year and are asked to report on earnings over the tax year prior to the reference date. As the NMW is uprated in October of each year, this means that it is possible to observe earnings six months before the uprating and six months afterwards. Respondents to the LFS are tracked for a period of five successive quarters, but wages are only observed in the first and last waves, so the timing of the observation in relation to the uprating of the NMW varies depending on when the individual enters the survey.

A number of approaches are used to assess the robustness of the results, including producing estimates using both ASHE and the LFS, varying the choice of comparison group, trying an alternative specification which uses 2009 (a year when the increase in the adult NMW was smallest in percentage terms) as the base period and adjusting the definition of the recession to the period when the employment level was below the March-May 2008 peak. A local area analysis was also used to supplement the analysis of individual-level data as a further means of assessing the robustness of the results, as well as to identify any spillover effects higher up the wage distribution. The main focus in the analysis was on weighted results, including control variables, but the sensitivity of the results to removing the weights and controls was also tested. The text concentrates on results which were found to be statistically significant at the 5 per cent level or better.

2.2. Reasons for using alternative data sources

Unlike ASHE, the LFS provides coverage of the unemployed, as well as employees, and as sampled individuals are tracked for a period of five quarters, it is possible to observe changes in employment status. Therefore, the LFS can be used to look at the impact of the NMW on a greater range of outcomes than is possible with ASHE. Whether ASHE provides a representative sample of all low-wage employees is open to question, given that it is drawn from Pay-As-You-Earn (PAYE) records. The fact that employers are not obliged to supply P14 data for employees earning less than the PAYE threshold means that some employees paid the NMW and working few hours will be unlikely to be sampled for ASHE. A further advantage that the LFS offers is that it provides a wide range of background information on individuals. This can be used to improve the reliability of impact estimates by controlling for characteristics which might determine the outcomes experienced by the individual.

On the other hand, sample sizes are much smaller for the LFS than for ASHE and a relatively large proportion of responses (around one-third) are supplied by proxies. Also, the most accurate measure of hourly pay (HRRATE) available on the LFS does not exist for the period prior to the introduction of the NMW. As ASHE is essentially a one per cent sample of employees of working age, it is better-suited to analyses of subgroups within this population, as there is a lower likelihood that estimates of the impact of the NMW will appear statistically

insignificant because the number of cases for analysis is too small. For example, it is unlikely that an analysis using the LFS would yield conclusive evidence on whether the impact of the NMW varied by age, particularly when considering the age bands which correspond to 16-17 year old, youth development and adult rates. Whilst there may be some doubts as to whether ASHE provides representative coverage of younger employees, due to their greater probability of working part-time compared to older employees, there is a lower likelihood that any differences in the impact of the NMW between the age groups will appear statistically insignificant purely because of small sample sizes. As ASHE is completed by employers and participation is mandatory, the information collected is considered more reliable, as it is likely to be drawn from payroll records, rather than relying on recall.

Aside from the fact that it is necessary to combine aggregate information on the local area derived from both datasets to carry out the local area analysis, the main benefit of using two data sources is that this should address some of the weaknesses which might undermine the findings of an analysis based exclusively on either source. By using alternative sources of data, as well as different specifications, we are able to minimize the risk that the conclusions drawn are affected by the number of cases for analysis and measurement error.

2.3. Outcomes

The analysis considers the impact of uprating the NMW on the following outcomes:

i) employment entry from unemployment;

ii) employment retention;

iii) number of hours worked.

iv) employment rate

v) unemployment rate.

The employment and unemployment rates are standard measures of the proportion of the working age population in employment or actively seeking work in the local area, derived from the LFS. The derivation of the other measures is described in detail in the following sections.

2.3.1. Employment entry

The LFS was used to capture movements from unemployment to employment at any point from the individual joining the survey, in wave one, to wave five. The observed wage at wave five, for those who were employed by this point, was used to predict wages for the unemployed and to therefore estimate the probability that they entered work, given their probability of being paid the NMW. This mirrored the approach used by Bryan et al. (2013).

2.3.2. Employment retention

The main measure of employment retention in the ASHE data was whether an employee was observed to be in employment in successive years, even if they were doing a different job, or were with a different employer. The ASHE data also records whether individuals were in the same job, but this variable was not observed in 1997 and so it was not possible to look at the impact of the introduction of the NMW, and its uprating on an annual basis, on the probability of an employee being in the same job.

With the LFS it is possible to observe whether an employee who is in work when they first join the survey is still employed one year later. Again, this measure indicated whether the employee was with any employer, rather than whether they were in the same job or with the same employer.

2.3.3. Number of hours worked

The ASHE measure captured basic weekly paid hours (excluding overtime) in the job in which the employee worked most hours, observed one year apart. Where an employee worked the same number of hours in more than one job, the job that was identified as the main job was chosen. Whilst the measure focused on the hours worked in the main job at each point in time, it included employees who changed jobs or employers.

The LFS measure was total usual hours worked in the main job, excluding overtime, observed one year after the first wave in which the individual appeared. As with the ASHE variable, the LFS measure also included those who changed jobs. Therefore a change in the number of hours worked could be due to the employee changing jobs, rather than an existing employer adjusting working hours. For the local area analysis, the outcome variable was the log of the total number of usual hours worked in the local area.

Given that previous analysis has demonstrated that the impact of the NMW on each of these outcomes can vary for different sections of the workforce, the analysis explored the impact of the NMW on a range of different subgroups separately. These subgroups are described in the following section.

2.4. Wages

ASHE provides information on average gross weekly earnings, excluding overtime, over the tax year. This was divided by basic weekly paid hours worked to compute hourly earnings excluding overtime. As there was no NMW prior to April 1999 (or October 2003 for the 16-17 rate), the average weekly earnings index was used to identify those who would have been likely to have fallen into either the treatment or comparison groups in the period before the NMW was introduced.

Respondents to the LFS are asked their gross pay from their main job on the last occasion when they were paid, as well as the period that this covered. This was used to derive weekly pay and then divided by the number of hours they usually work in their main job each week (including overtime) to derive gross hourly pay. These variables were then used to distinguish between respondents who were paid the NMW or less and those who were paid more than the NMW, taking into account whether the respondent was eligible for the adult or youth rates, based on their age.

2.5. Control variables

As noted above, the ASHE data contain a more limited set of potential control variables than the LFS. However, real wage cubed and age and age-squared at the pre-uprating observation were included as controls. Whilst the LFS offers a much richer choice of control variables, the more limited sample sizes imposed some practical constraints on the number of controls which could be included. The analysis therefore controlled for the age of the individual, their highest educational qualification, whether they were married, whether they had a child under the age of five, their ethnicity, whether they had a health problem which had lasted more than 12 months, and in the case of employment retention and hours, the number of months that the employee had been continually employed, region of usual residence and whether they were employed in the public sector. For the unemployed, the analysis controlled for whether the individual had ever been employed, and if so, whether they were an employee in their last job. Where information on any of the control variables was missing, individuals were assigned to the most prevalent category. All of these controls were observed at the pre-uprating observation. The

local area analysis controlled for local area characteristics, such as the skill composition of the population, industry composition of employment and international migration[1].

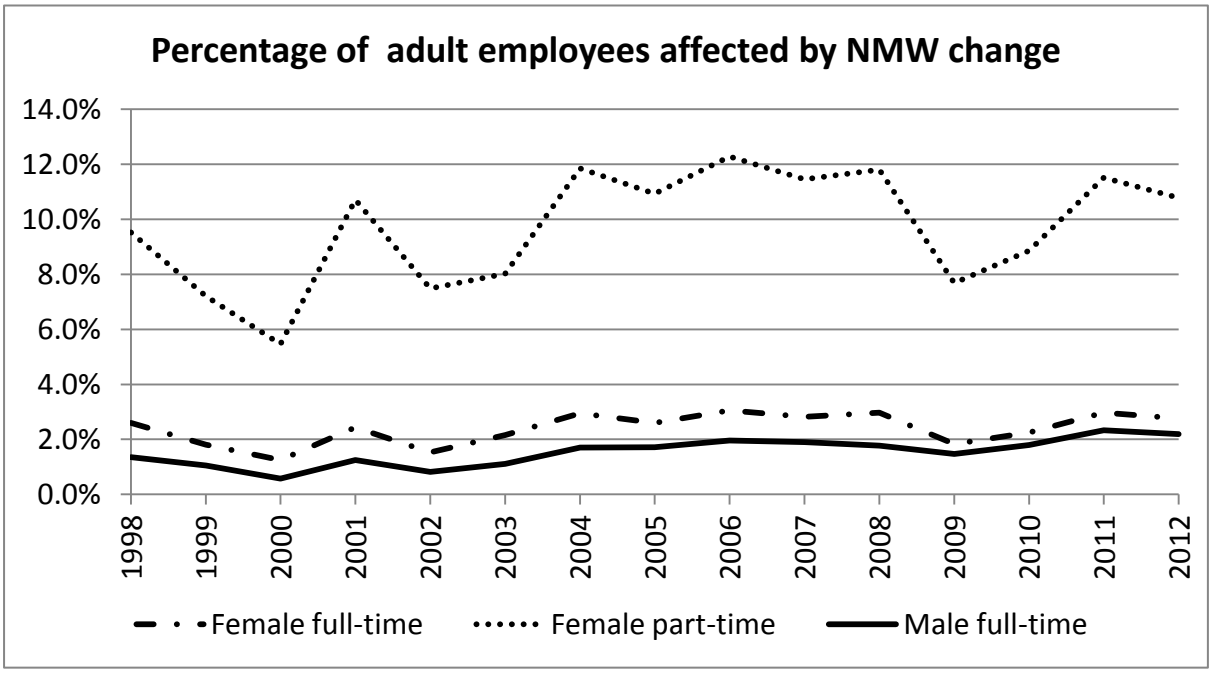
2.6. Subgroups

The analysis considers the impact of the uprating of the NMW on the following groups of employees:

- adult men working full-time;
- adult women working full-time;
- adult women working part-time.

Adult men are defined as those aged between 22 and 63, whilst adult women are those aged between 22 and 58. Previous analysis has indicated that impacts from the NMW which are apparent when these groups are considered separately are masked in an analysis of all adults or all women (Dickens et al. 2014). This is because the proportion of those within each of these groups who are affected by changes in the NMW rate differs between the three groups. Figure 1 illustrates this point, showing that female part-time employees are much more likely to be affected by changes in the NMW because they are more likely to be paid less than the uprated NMW in the period before it is introduced than full-time employees of either gender, but that male full-time employees are the group least likely to be affected. Therefore, it is important to consider both the gender of the individual and whether they work full-time or part-time in seeking to observe the impact of the uprating of the NMW. However, as only a small number of men work part-time, it is not feasible to produce impact estimates for this group on their own.

Figure 1 Coverage of the adult rate of the NMW



Source: ASHE 1998-2012. Based on a minimum of 33,673 annual observations for female full-time employees, 21,904 annual observations for female part-time employees and 52,860 annual observations for male full-time employees.

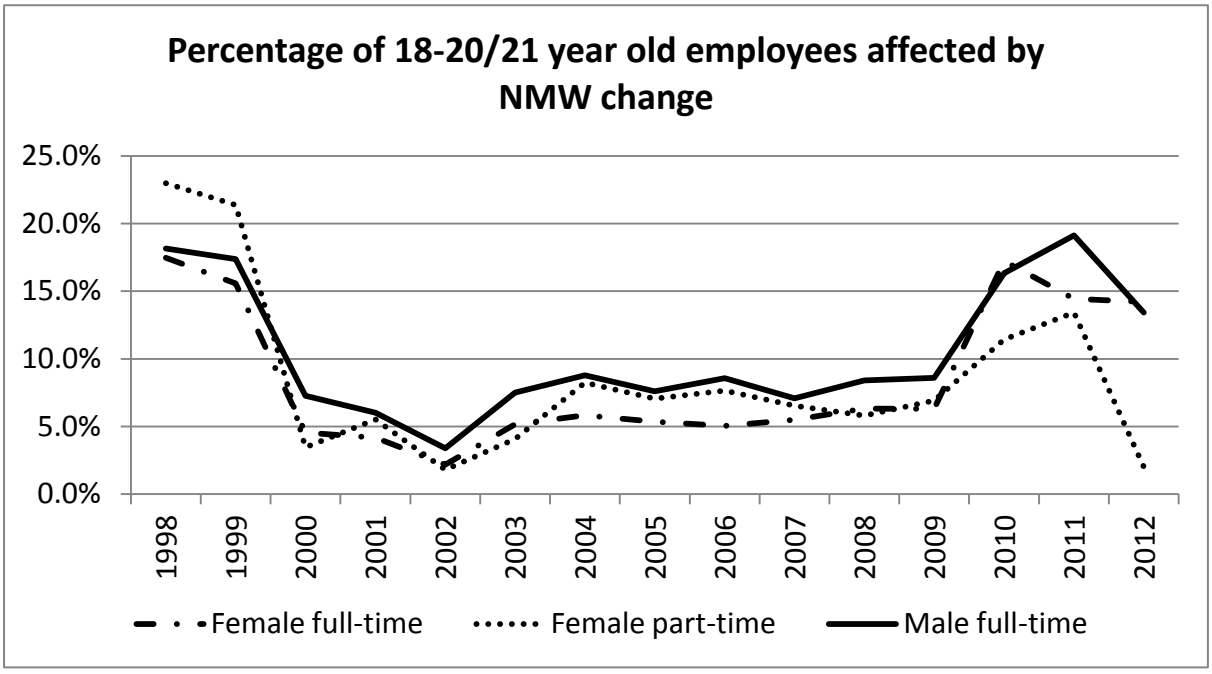
It is problematic to produce analyses for those eligible for the youth development rate of the NMW for the three subgroups listed above, due to the small numbers of individuals in each of

[1] These consisted of the stock of non-UK born residents in an area and the change in the stock of non-UK born residents in an area (proxying net international migration).

[2] Whether the individual had ever been employed and if so, whether they were an employee in their last job were included as

the three categories. Those eligible for the youth development rate are defined as young people aged between 18 and 21 in the period before 1 October 2010 and aged between 18 and 20 in the period from 1 October 2010 onwards. Even if the uprating of the NMW were to have an impact on any of the outcomes of interest for those eligible for the youth development rate in each of the subgroups, this impact may not achieve statistical significance. However, in practice, there is less reason to expect the impact of the NMW to vary by gender and hours worked for those on the youth development rate, as the proportion of those within the relevant age range who are affected by the uprating of the NMW is less likely to vary by gender or hours worked. This is illustrated by Figure 2.

Figure 2 Coverage of the youth development rate of the NMW



Source: ASHE 1998-2012. Based on a minimum of 507 observations for female full-time employees, 957 observations for female part-time employees and 678 observations for male full-time employees.

The figure shows that the proportion of all three groups affected by the uprating of the youth development rate is similar for much of the period considered, although there is greater divergence during the recovery i.e. after 2009. It is also apparent that there is much more volatility in the proportion of each subgroup affected by the uprating of the NMW for those eligible for the youth development rate than for adults, but this is likely to be partly due to the much smaller sample sizes. The greater homogeneity in pay levels between younger employees means that it is more acceptable to pool results for the three subgroups, as well as following the approach of Bryan et al. (2012) and (2013) in pooling data across years. A similar approach is taken for those aged 16-17, although the NMW was not extended to this group until 2004, meaning that a longer run of pre-intervention years could be used for this group in the analysis. However, due to small sample sizes, it was not possible to include controls for 16-17 year olds.

By pooling years, we are also able to estimate the impact of the NMW on those aged 50 or more and for those working in the public and private sectors, as well as for firms of different sizes. Neither the LFS, nor ASHE, contains a direct measure of firm size. We therefore replicate the approach used in Dickens et al. (2012) of using the size of the reporting unit (for ASHE) as a proxy for firm size. This is preferable to using the LFS data, as changes over time in the way data on firm size are collected on the LFS mean that it is only possible to distinguish between firms with fewer than 50 employees (i.e. small) and those with 50 or more employees (classed as

medium or large according to the Low Pay Commission categorisation). By contrast, with ASHE it is possible to separate out impacts for all three groups i.e. also distinguishing between medium (50-249 employees) and large (250 or more employees) firms.

2.7. Defining the recession

The main definition of the recession used in the analysis is a period of two or more successive quarters of contraction in GDP. On this measure, the recession began in quarter two of 2008 and ended in quarter three of 2009. Therefore, if the recession had an impact on the adjustments employers made to employment and hours in response to upratings of the NMW, one would expect to see these adjustments being made in response to the 2008 and 2009 upratings. However, arguably the drop in employment levels from the March to May quarter of 2008 onwards may be more strongly related to employer adjustments to the uprating of the NMW than the contraction in GDP. It was not until the June to August quarter of 2012 that employment levels exceeded the 2008 peak, and so if one considered this period to be the recession, the 2008 to 2011 upratings could all be considered to have taken place in the context of recession (as Bryan et al. (2013) did). Therefore the sensitivity of the results to using an alternative definition of recession, which included the 2010 and 2011 upratings and treated the years from 2012 onwards as the recovery, was also explored. Finally, it has been suggested that the impact of the recession in the public sector was relatively weak until after the austerity cuts were announced in June 2010. This is said to have resulted in the main effects of the recession being felt later in the public sector. Given the fairly small numbers of low-paid employees in the public sector, it is difficult to observe the impact of the public sector recession on employer responses to the NMW. However, the two sectors are considered separately in the subgroup analyses to explore any obvious differences in employers' responses between the sectors.

3. METHODS

3.1. Individual-level analysis

Since the NMW applies to all employees of working age (albeit with different rates for different age groups), to estimate the counterfactual i.e. the outcomes that employees would have experienced had the NMW not been introduced or uprated, it is necessary to compare the change in outcomes between the periods before (known as time t) and after the rate change against those for some other group of employees not affected (either directly or indirectly) by the uprating. However, if there is a spillover in impact from those paid less than the uprated NMW before the October uprating to the comparison group used to estimate the counterfactual e.g. because employers adjust pay rates across the distribution to maintain wage differentials, this could reduce the ability to observe any impact from the NMW. For this reason, although regression-adjusted difference-in-differences analysis has been the main method used to determine the impact of the NMW in the past, it has been usual to explore the sensitivity of the results to varying the choice of comparison group (e.g. Dickens et al. 2009, Swaffield 2009; Stewart 2009; Fidrmuc and Tena 2011).

Dickens et al. (2012) note that those within a narrow band of the NMW could be expected to be more likely to experience similar outcomes to those directly affected by its introduction and uprating than those higher up the wage distribution. This is because other changes affecting the labour market, including welfare-to-work initiatives, which have occurred since the introduction of the NMW might be more likely to affect those at the lower end of the income distribution. However, any impact of the uprating of the NMW on wage differentials may be concentrated at the lower end of the wage distribution. Therefore, by considering a number of different comparison groups, the chances of detecting any impact from the NMW and establishing whether the size of the impact is sensitive to the method of estimation, are improved. For this reason, whilst our main focus is on a comparison group of those earning up to 10 per cent more than the uprated NMW, we also experiment with two alternative specifications:

i) those earning between 10 and 20 per cent more (Dickens et al. 2009).

ii) those earning between 20 and 30 per cent more (Swaffield 2009)

We estimate the impact of a change in the minimum wage using the following model:

$$y_{it+1} = f\{X_{it}\,\beta + \alpha + \gamma d_{t+1} + (\alpha_1 + \gamma_1 d_{t+1}).\, I(NMW_t \leq w_{it} < NMW_t^*)\}$$

where:

y_{it+1} = outcome measure

X_{it} = matrix of control variables

d_{t+1} = dummy variable indicating whether NMW in place at time t+1

w_{it} = wage for individual i at time t

NMW_t = minimum wage at time t

NMW_t^* = new minimum wage, not yet in place at t

γ_1 = impact of change in NMW on those directly affected by it

I is an indicator variable which takes the value of 1 if the condition specified in brackets is true and zero otherwise. The model produces a standard difference-in-differences estimator.

To address the question of whether the impact of the annual uprating of the NMW affected labour market outcomes differently during the economic downturn and recovery compared to earlier periods, we pool data across years spanning the pre-recessionary period, the upratings during the recession (focusing mainly on the period 2008 to 2009, but also using our alternative definition of 2008 to 2011) and the recovery period following the recession. By interacting a dummy variable (EC), distinguishing the upratings during the recession from those prior to this, with the NMW treatment effect, and a further dummy variable for the recovery years (UP) we assess whether the impact of NMW varies depending on economic conditions. In this part of the analysis, the difference-in-differences model is revised as follows:

$$y_{it+1} = f\{X_{it}^{'}\beta + \alpha + \gamma d_{t+1} + (\alpha_1 + \gamma_1 d_{t+1}).I(NMW_t \leq w_{it} < NMW_t^*) + \lambda d_{t+1}.I(NMW_t \leq w_{it} < NMW_t^*).EC + \lambda d_{t+1}.I(NMW_t \leq w_{it} < NMW_t^*).UP\}$$

where λ measures the sensitivity of the impact estimates to the economic environment. Of course, this analysis is based on the assumption that outcomes for the treatment and comparison groups are affected in a similar way by changes in the economic climate. If this is not in fact the case, the analysis would not yield an accurate estimate of impact.

For the LFS data, we assign individuals to treatment and comparison groups based on their wages over the twelve month period prior to each uprating (e.g. October 2011 to September 2012 for the October 2012 uprating). By observing their wages six months after this observation (i.e. between April 2012 and March 2013) the sample are split into those for whom t+1 fell before the uprating and those who were observed afterwards. As mentioned previously, the ASHE analysis focuses on wages observed in April of each year, for the 12 months prior to the survey.

The analysis of the impact of the NMW on employment retention uses a probit regression and marginal effects are reported, whilst the impact on hours is estimated using ordinary least squares (OLS). The analysis of the probability of entering employment considers the likelihood that someone who is unemployment in one wave of the LFS has entered work two quarters later. Having predicted wages for the unemployed (based on observed wages for those who are employed in wave five, but were unemployed in an earlier wave), a linear probability model is used to estimate the impact of each uprating of the NMW on the probability that an unemployed person is employed two quarters later, depending on their probability of gaining a minimum-wage job.

3.1.1. Adjusting the base year

There is no inherent reason why difference-in-differences estimates should be less accurate when there is a longer period of time between the pre- and post-intervention observations. Provided changes in outcomes over time are similar for treatment and comparison groups, a difference-in-differences analysis should provide an unbiased estimate of impact. However, there may be a suspicion that over longer periods of time, outcomes for the treatment and comparison groups would be more likely to diverge because of changes unconnected to the NMW. Since the primary purpose of the research is to assess the impact of NMW upratings over the period from October 2008 onwards, the difference-in-differences analysis which uses the period before the introduction of the NMW as the pre-intervention period will be supplemented by an analysis which instead uses a year in which the uprating of the NMW was minimal as the base year. In 2009 the adult NMW increased by 7 pence or 1.2 percent. This was the smallest change in the adult NMW, both in pence and in percentage terms, since the first uprating in October 2000. As the increase in the NMW in October 2009 was minimal, its expected impact on hours and employment could also be expected to be small. Therefore, 2009 is used as an alternative 'pre-

intervention' year in the sensitivity testing, to see if this affects whether the uprating of the NMW in subsequent years had a statistically significant impact on employment and hours.

3.2. Local area analysis

As mentioned earlier, another approach which has been used in the past is to exploit the fact that the proportion of the working age population affected by the uprating of the NMW varies between areas to assess whether the outcomes listed in section 2.3 were most strongly affected in those areas which experienced a stronger dose of the treatment. Since wage rates vary widely across different areas, the NMW will have a larger 'bite' (or impact) on wages in some areas than others. In those areas that experience a larger 'bite', larger changes in the use of employment are expected. Pooled cross-section time-series data are used to create a panel of local areas for the period to 2013. The estimates are then produced using the following specification:

$$E_{it} = \beta_0 + \beta_1 Min_{it-1} + \beta_2 LowPay_{it-1} + \beta_3 X_{it-1} + YearDummies + AreaFixedEffects + u_{it}$$

$i = \text{Area},\ t = \text{Year}$

where E_{it} is the economic variable of interest in area *i* in year *t*, Min_{it} is the measure of the 'bite' of the minimum wage captured by the Kaitz index (the ratio of the NMW to the median hourly wage), in area *i* and year *t*. *LowPay* is equivalent to Min_{it}, but applies in all years irrespective of whether the minimum wage existed. X_{it} is a set of control variables. The minimum wage treatment effect then varies both across areas and over time. Year dummies allow for aggregate differences from year to year, whilst the area dummies capture differences in the level of the outcome variable between areas.

Using this method of analysis, Dickens et al. (2009) found that the impact on employment, unemployment and hours was consistent with the findings of the individual-level analysis. As well as providing a further indication of the robustness of the findings of the individual-level analysis, the local area analysis allows us to identify any spillover effects from changes to the NMW (if they affect those higher up the wage distribution). Our main measure to capture the impact of the NMW is the Kaitz index (the ratio of the NMW in a particular year to median earnings in the local area). We also consider the coverage of the NMW by looking at the proportion of people in each area who were directly affected by the NMW in each year (i.e. paid less than the rate required by law, in the period prior to its introduction or uprating).

The analysis is based on the same 135 local areas using the derivation based on the classification of local authorities described in Dickens, Riley and Wilkinson (2009). However, the number of areas has been reduced to 130, as recent change in the local authority classification (ONS, 2013) means that it is no longer possible to separately identify the six former districts in Cornwall.

4. RESULTS

4.1. Individual-level analysis

Table 1 shows the impact of the introduction and uprating of the adult NMW on employment retention for female full-time, female part-time and male full-time employees. The table shows estimated difference-in-differences coefficients (marginal effects), with the standard error in parentheses, as well as the sample size. The models include controls for age, age-squared and real wage cubed. The year relates to the point in time when the sample was drawn. As the introduction of the NMW occurred in April 1999, the impact of its introduction is captured in the results reported for 1998, whereas in all other years the October uprating occurred 6 months after the sample was drawn (i.e. the uprating occurred in the sample year).

The first part of the table shows the impact of each of the annual upratings, whilst the lower part shows average results pooled across all years, and when subdivided into pre-recession, recession and post-recession years. The final part of the table shows results when the impact of the initial introduction of the NMW is excluded.

Table 1 shows that there is very little evidence that the introduction or uprating of the adult NMW had any impact on female full-time employees throughout the period from its introduction to the October 2012 uprating. However, there was evidence that the NMW had a negative impact on the likelihood that female part-time employees remained in employment from one year to the next and this negative impact was sustained for much of the period considered. There were also some signs that the NMW had a negative impact on employment retention for male full-time employees after the recession of 2008 to 2009. The size of the marginal effects is similar, regardless of whether the impact of the introduction of the NMW is included. Results were also similar when controls were excluded and the data were not weighted (see Annex for details).

Table 1 Impact of the adult NMW on employment retention, ASHE

	Female full-time	Female part-time	Male full-time
1998	-0.010	-0.038*	-0.039
	(0.031)	(0.020)	(0.035)
Base	3,464	7,893	2,890
2000	-0.037	-0.059**	0.017
	(0.040)	(0.024)	(0.047)
Base	2,810	6,866	2,279
2001	-0.012	-0.031	0.002
	(0.031)	(0.019)	(0.036)
Base	3,534	8,559	2,995
2002	-0.040	-0.033	-0.090**
	(0.037)	(0.021)	(0.042)
Base	3,159	7,879	2,606
2003	-0.029	-0.043**	0.022
	(0.032)	(0.020)	(0.036)
Base	3,524	8,291	2,907
2004	-0.029	-0.025	0.010
	(0.029)	(0.018)	(0.034)
Base	4,052	9,881	3,637
2005	-0.070**	-0.076***	-0.003
	(0.031)	(0.019)	(0.035)
Base	4,078	9,699	3,689
2006	-0.055*	-0.060***	-0.006
	(0.031)	(0.020)	(0.035)
Base	4,362	10,024	4,106
2007	-0.032	-0.055***	-0.054
	(0.031)	(0.020)	(0.035)
Base	3,997	9,222	3,692
2008	-0.056*	-0.042**	-0.014
	(0.030)	(0.019)	(0.035)
Base	4,162	9,210	3,791
2009	-0.047	-0.088***	-0.032
	(0.032)	(0.020)	(0.036)
Base	4,219	9,655	3,834
2010	-0.033	-0.049**	-0.072**
	(0.029)	(0.019)	(0.033)
Base	4,596	10,430	4,412
2011	-0.040	-0.060***	-0.060*
	(0.029)	(0.019)	(0.032)
Base	4,972	11,209	4,964

	Female full-time	Female part-time	Male full-time
2012	-0.029	-0.060***	-0.054*
	(0.030)	(0.019)	(0.033)
Base	4,837	11,025	4,799
Pooled – all years	-0.039*	-0.064***	-0.044
	(0.023)	(0.015)	(0.027)
Base	33,458	79,286	33,415
Pooled – base	-0.038	-0.059***	-0.032
	(0.023)	(0.015)	(0.028)
Recession (2008-2009)	-0.014	-0.019**	-0.010
	(0.016)	(0.010)	(0.017)
Recovery (2010-2012)	0.002	-0.010	-0.043***
	(0.012)	(0.008)	(0.013)
Base	33,458	79,286	33,415
Impact of upratings only:			
Pooled – all years	-0.044*	-0.067***	-0.046*
	(0.023)	(0.015)	(0.027)
Base	31,710	75,282	31,847
Pooled – base	-0.044*	-0.062***	-0.032
	(0.023)	(0.015)	(0.028)
Recession (2008-2009)	-0.012	-0.017*	-0.010
	(0.016)	(0.010)	(0.017)
Recovery (2010-2012)	0.004	-0.008	-0.043***
	(0.013)	(0.008)	(0.013)
Base	31,710	75,282	31,847

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

Table 2 reports results based on analysis of the LFS. It is not possible to estimate annual impacts for male full-time employees due to small sample sizes and poor model fit. The LFS analysis suggests that the uprating of the NMW had very little impact on the likelihood that low-paid employees were retained in employment from one year to the next. Similar findings were apparent when the analysis was run without control variables and without weights.

Table 2 Impact of the adult NMW on employment retention, LFS

	Female full-time	Female part-time	Male full-time
1998	-0.306	-0.031	-
	(0.215)	(0.123)	-
Base	1,551	3,524	-
2000	-0.226	0.408**	-
	(0.327)	(0.193)	-
Base	1,090	2,453	-
2001	-0.347	-0.089	-
	(0.267)	(0.158)	-
Base	1,131	2,516	-
2002	0.015	-0.205	-
	(0.321)	(0.188)	-
Base	1,048	2,345	-
2003	-0.027	0.056	-
	(0.261)	(0.161)	-
Base	1,159	2,515	-
2004	-0.130	0.132	-
	(0.259)	(0.152)	-
Base	1,207	2,593	-
2005	0.129	0.080	-
	(0.257)	(0.164)	-
Base	1,182	2,426	-
2006	-0.067	0.055	-
	(0.273)	(0.178)	-
Base	1,168	2,401	-
2007	-0.023	0.004	-
	(0.311)	(0.176)	-
Base	1,151	2,394	-
2008	-0.138	0.356*	-
	(0.280)	(0.205)	-
Base	1,158	2,291	-
2009	-	0.254	-
		(0.240)	-
Base		2,286	-
2010	0.520	0.486*	-

	Female full-time	Female part-time	Male full-time
	(0.472)	(0.254)	-
Base	1,082	2,258	-
2011	-0.217	0.032	-
	(0.349)	(0.207)	-
Base	1,107	2,197	-
2012	-0.164	-0.046	-
	(0.336)	(0.252)	-
Base	1,059	2,195	-
Pooled – all years	-0.081	0.068	-0.028
	(0.152)	(0.092)	(0.157)
Base	5,811	11,072	5,141
Pooled – base	-0.126	0.030	-0.126
	(0.155)	(0.094)	(0.162)
Recession (2008-2009)	0.297	0.249	0.257
	(0.219)	(0.154)	(0.191)
Recovery (2010-2012)	0.078	0.120	0.329
	(0.215)	(0.132)	(0.207)
Base	5,811	11,072	5,141
Impact of upratings only:			
Pooled – all years	-0.042	0.088	-0.048
	(0.156)	(0.094)	(0.160)
Base	5,057	9,342	4,495
Pooled – base	-0.082	0.046	-0.178
	(0.162)	(0.097)	(0.167)
Recession (2008-2009)	0.259	0.235	0.310
	(0.224)	(0.156)	(0.194)
Recovery (2010-2012)	0.032	0.105	0.375*
	(0.219)	(0.134)	(0.210)
Base	5,057	9,342	4,495

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

Table 3 reports the impact of the introduction and uprating of the adult NMW on basic hours worked, this time showing coefficients from the OLS analysis, rather than marginal effects. It shows some signs of an emerging negative effect on hours for female full-time employees during the recovery, although the impact in any given year was statistically insignificant. The hours of female part-time employees and male full-time employees were not affected by the introduction or uprating of the adult NMW. When the analysis was repeated without weights and control variables, there was stronger evidence of a positive impact from the NMW on the hours of female full-time employees before 2008. There was also some evidence that male full-time employees worked fewer hours from 2010 onwards.

Table 3 Impact of the adult NMW on hours, ASHE

	Female full-time	Female part-time	Male full-time
1998	-0.672	0.325	-0.657
	(0.719)	(0.520)	(0.881)
Base	2,488	5,257	1,906
2000	0.355	-0.012	0.626
	(0.897)	(0.663)	(1.127)
Base	2,045	4,615	1,517
2001	1.347**	-0.025	0.736
	(0.681)	(0.509)	(0.844)
Base	2,562	5,852	2,019
2002	-0.439	-0.650	1.242
	(0.873)	(0.608)	(1.227)
Base	2,296	5,439	1,751
2003	0.655	-0.104	0.632
	(0.785)	(0.540)	(0.987)
Base	2,597	5,735	2,024
2004	0.986	0.145	-0.313
	(0.712)	(0.486)	(0.846)
Base	3,007	7,038	2,510
2005	-0.018	-0.417	0.056
	(0.724)	(0.513)	(0.911)
Base	2,974	6,782	2,479
2006	0.388	-0.378	0.130
	(0.743)	(0.501)	(0.870)
Base	2,810	6,214	2,427
2007	0.196	0.190	-0.715
	(0.765)	(0.529)	(0.925)
Base	2,886	6,343	2,432
2008	-0.048	-0.235	-0.268
	(0.758)	(0.530)	(0.885)
Base	3,074	6,346	2,554
2009	-0.637	-0.303	-1.259

	Female full-time	Female part-time	Male full-time
	(0.846)	(0.556)	(0.932)
Base	3,113	6,587	2,597
2010	-1.457*	-0.334	-1.257
	(0.761)	(0.530)	(0.919)
Base	3,462	7,093	3,053
2011	-1.162	-0.374	-0.459
	(0.737)	(0.509)	(0.871)
Base	3,596	7,416	3,336
2012	-0.903	-0.939*	-0.648
	(0.752)	(0.513)	(0.871)
Base	3,523	7,240	3,257
Pooled – all years	0.225	0.054	-0.772
	(0.571)	(0.404)	(0.717)
Base	24,313	53,338	22,214
Pooled – base	0.668	0.136	-0.503
	(0.578)	(0.408)	(0.724)
Recession (2008-2009)	-0.547	-0.105	-0.544
	(0.414)	(0.261)	(0.405)
Recovery (2010-2012)	-1.554***	-0.325	-0.681*
	(0.335)	(0.214)	(0.356)
Base	24,313	53,338	22,214
Impact of upratings only:			
Pooled – all years	0.467	0.095	-0.776
	(0.577)	(0.409)	(0.725)
Base	23,065	50,744	21,204
Pooled – base	1.000*	0.168	-0.480
	(0.586)	(0.415)	(0.736)
Recession (2008-2009)	-0.673	-0.064	-0.557
	(0.418)	(0.263)	(0.410)
Recovery (2010-2012)	-1.671***	-0.283	-0.692*
	(0.340)	(0.216)	(0.364)
Base	23,065	50,744	21,204

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

Table 4 shows the impact of the uprating of the NMW on hours, according to analysis of the LFS. Again, there are few signs that the upratings affected the hours worked by women or men, although when years were pooled, there was some evidence that the hours of part-time female employees fell after 2009.

Table 4 Impact of the adult NMW on hours, LFS

	Female full-time	Female part-time	Male full-time
1998	1.188	-0.465	-0.408
	(0.901)	(0.632)	(1.219)
Base	1,433	3,097	1,184
2000	0.554	0.755	2.566
	(1.247)	(0.969)	(2.116)
Base	1,008	2,172	820
2001	0.144	0.278	-3.430**
	(1.016)	(0.742)	(1.532)
Base	1,046	2,227	844
2002	2.869**	1.166	-1.137
	(1.313)	(1.027)	(2.263)
Base	962	2,071	769
2003	1.851*	0.294	-1.212
	(1.117)	(0.755)	(1.329)
Base	1,067	2,229	870
2004	0.083	0.445	-0.357
	(1.005)	(0.756)	(1.348)
Base	1,123	2,296	956
2005	0.549	-0.919	-0.049
	(1.193)	(0.785)	(1.365)
Base	1,096	2,138	910
2006	0.064	0.578	0.026
	(1.010)	(0.792)	(1.320)
Base	1,084	2,140	912
2007	1.067	-0.229	-0.290
	(1.026)	(0.924)	(1.535)
Base	1,069	2,118	926
2008	1.043	0.018	-0.184
	(1.028)	(0.869)	(1.556)
Base	1,068	2,020	927
2009	0.915	0.452	-1.002
	(1.336)	(1.028)	(1.304)
Base	1,001	2,029	850

	Female full-time	Female part-time	Male full-time
2010	0.449	-1.636	2.711
	(1.499)	(1.015)	(2.260)
Base	1,002	1,995	853
2011	-1.462	-0.749	-
	(1.149)	(0.987)	
Base	1,028	1,934	
2012	-0.665	-0.631	0.977
	(1.423)	(1.146)	(1.577)
Base	984	1,942	828
Pooled – all years	0.680	-0.049	-0.369
	(0.708)	(0.486)	(0.948)
Base	5,442	10,011	4,754
Pooled – base	0.768	0.106	-0.443
	(0.721)	(0.496)	(0.968)
Recession (2008-2009)	0.625	0.181	-0.195
	(0.712)	(0.622)	(0.929)
Recovery (2010-2012)	-0.986	-1.281**	0.571
	(0.746)	(0.582)	(1.012)
Base	5,442	10,011	4,754
Impact of upratings only:			
Pooled – all years	0.579	0.031	-0.466
	(0.715)	(0.494)	(0.960)
Base	4,742	8,483	4,166
Pooled – base	0.659	0.253	-0.597
	(0.734)	(0.510)	(0.989)
Recession (2008-2009)	0.677	0.023	-0.064
	(0.724)	(0.633)	(0.948)
Recovery (2010-2012)	-0.901	-1.409**	0.692
	(0.760)	(0.595)	(1.028)
Base	4,742	8,483	4,166

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

Table 5 reports the impact of the uprating of the NMW on the probability that those eligible for the adult rate of the NMW enter employment within two quarters of being unemployed. Results are presented separately for men and women and whilst they include control variables, they are unweighted, as standard errors are bootstrapped. For women, there are signs that the uprating of the NMW reduced the likelihood that those with the highest probability of receiving the NMW entered work in a number of individual years, but on average there was no association between the likelihood of earning the NMW and the likelihood of entering employment over time. These results were sensitive to the inclusion of the control variables though, with negative effects on job entry in the pre-recessionary period when controls were excluded.[2] For men, the probability of entering employment from unemployment appeared higher in response to the uprating of the NMW during the recovery period. This finding remained when control variables were excluded, but the likelihood of job entry did appear to be lower in the recessionary period when the controls were left out of the model.

Table 5 Impact of the adult NMW on probability of entering employment from unemployment, LFS

	Female	**Male**
1998	-0.121	0.151
	(0.160)	(0.151)
Base	3,296	4,646
2000	-0.153	-0.407**
	(0.193)	(0.179)
Base	2,542	3,661
2001	-0.387**	0.018
	(0.196)	(0.231)
Base	2,600	3,578
2002	-0.226	0.006
	(0.174)	(0.196)
Base	2,569	3,581
2003	-0.155	0.037
	(0.180)	(0.197)
Base	2,287	3,284
2004	-0.298*	0.022
	(0.179)	(0.191)
Base	2,202	3,048
2005	-0.404**	0.145
	(0.188)	(0.197)
Base	2,266	2,910
2006	-0.142	0.600***
	(0.158)	(0.178)
Base	2,457	3,072

[2] Whether the individual had ever been employed and if so, whether they were an employee in their last job were included as control variables in all models.

	Female	Male
2007	-0.131	0.010
	(0.183)	(0.167)
Base	2,423	2,995
2008	-0.349**	0.010
	(0.174)	(0.160)
Base	2,327	2,995
2009	-0.263	-0.072
	(0.172)	(0.161)
Base	2,734	4,064
2010	-0.313*	0.069
	(0.166)	(0.160)
Base	2,970	4,091
2011	-0.260	-0.042
	(0.193)	(0.181)
Base	2,802	3,593
2012	-0.266*	0.338**
	(0.148)	(0.158)
Base	3,075	3,679
Pooled – all years	-0.223	0.084
	(0.136)	(0.140)
Base	27,645	36,129
Pooled – base	-0.226*	0.048
	(0.127)	(0.123)
Recession (2008-2009)	-0.020	-0.061
	(0.057)	(0.063)
Recovery (2010-2012)	0.021	0.154**
	(0.052)	(0.061)
Base	27,645	36,129
Impact of upratings only:		
Pooled – all years	-0.235*	0.082
	(0.142)	(0.137)
Base	25,034	32,487
Pooled – base	-0.240*	0.032
	(0.139)	(0.136)
Recession (2008-2009)	-0.017	-0.040
	(0.058)	(0.076)
Recovery (2010-2012)	0.023	0.175***
	(0.055)	(0.059)
Base	25,034	32,487

Notes: Unweighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

4.2. Alternative definition of recession

Table 6 and Table 7 present results using an alternative definition of the recession. This generally made little difference to the employment retention effects for women, but for men it resulted in the negative effect seen during the recovery years reducing, whilst it became more apparent for the recession years. However, this may be partly explained by the fact that there was only a single year following the recession using this definition, and so sample sizes were smaller.

Table 6 Impact of the adult NMW on employment retention, using alternative definition of the recession, ASHE

	Female full-time	Female part-time	Male full-time
Pooled – base	-0.037	-0.059***	-0.031
	(0.023)	(0.015)	(0.028)
Recession (2008-2011)	-0.009	-0.017**	-0.030**
	(0.012)	(0.007)	(0.012)
Recovery (2012)	0.011	-0.002	-0.036*
	(0.018)	(0.011)	(0.019)
Base	33,458	79,286	33,415
Impact of upratings only:			
Pooled – base	-0.044*	-0.062***	-0.032
	(0.023)	(0.015)	(0.028)
Recession (2008-2011)	-0.006	-0.015**	-0.030**
	(0.012)	(0.007)	(0.013)
Recovery (2012)	0.013	0.000	-0.037*
	(0.018)	(0.011)	(0.019)
Base	31,710	75,282	31,847

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

Table 7 Impact of the adult NMW on employment retention, using alternative definition of the recession, LFS

	Female full-time	Female part-time	Male full-time
Pooled – base	-0.125	0.029	-0.132
	(0.156)	(0.094)	(0.162)
Recession (2008-2011)	0.284	0.211*	0.305*
	(0.179)	(0.111)	(0.165)
Recovery (2012)	-0.156	-0.077	0.234
	(0.330)	(0.248)	(0.310)
Base	5,811	11,072	5,141
Impact of upratings only:			
Pooled – base	-0.082	0.045	-0.187
	(0.162)	(0.097)	(0.167)
Recession (2008-2011)	0.243	0.196*	0.355**
	(0.184)	(0.114)	(0.169)
Recovery (2012)	-0.198	-0.087	0.284
	(0.334)	(0.249)	(0.312)
Base	5,057	9,342	4,495

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

There are more obvious differences compared with using the standard recession definition for all three groups when looking at hours (Table 8). For full-time employees a negative effect from the uprating of the NMW on hours emerged during the recession, whilst in the model which included the impact of the introduction of the NMW, for female part-time employees there was a negative impact of the NMW on hours during the recovery which was not apparent in the model which treated the recovery as starting in 2010. No impact estimates were statistically significant in the LFS analysis (Table 9).

Table 8 Impact of the adult NMW on hours, using alternative definition of the recession, ASHE

	Female full-time	Female part-time	Male full-time
Pooled – base	0.670	0.136	-0.503
	(0.578)	(0.408)	(0.724)
Recession (2008-2011)	-1.154***	-0.135	-0.659**
	(0.310)	(0.200)	(0.327)
Recovery (2012)	-1.256**	-0.640**	-0.544
	(0.509)	(0.307)	(0.509)
Base	24,313	53,338	22,214
Impact of upratings only:			
Pooled – base	1.002*	0.168	-0.479
	(0.586)	(0.415)	(0.736)
Recession (2008-2011)	-1.278***	-0.093	-0.671**
	(0.316)	(0.202)	(0.334)
Recovery (2012)	-1.364***	-0.597*	-0.554
	(0.513)	(0.309)	(0.514)
Base	23,065	50,744	21,204

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

Table 9 Impact of the adult NMW on hours, using alternative definition of the recession, LFS

	Female full-time	Female part-time	Male full-time
Pooled – base	0.767	0.106	-0.443
	(0.721)	(0.496)	(0.968)
Recession (2008-2011)	-0.076	-0.616	-0.026
	(0.589)	(0.481)	(0.818)
Recovery (2012)	-1.256	-0.909	1.574
	(1.314)	(1.094)	(1.518)
Base	5,442	10,011	4,754
Impact of upratings only:			
Pooled – base	0.658	0.253	-0.597
	(0.734)	(0.510)	(0.989)
Recession (2008-2011)	-0.014	-0.755	0.099
	(0.607)	(0.495)	(0.839)
Recovery (2012)	-1.145	-1.054	1.705
	(1.313)	(1.107)	(1.519)
Base	4,742	8,483	4,166

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

Table 10 shows that the results for employment entry were not affected by changing the length of the period considered to be the recession. The increased likelihood of job entry for men in response to the uprating of the NMW during the recovery period was apparent even when only the 2012 uprating was regarded as the recovery.

Table 10 Impact of the adult NMW on the probability of employment entry from unemployment, using alternative definition of the recession, LFS

	Female	**Male**
Pooled – base	-0.225	0.050
	(0.140)	(0.144)
Recession (2008-2011)	0.013	0.022
	(0.050)	(0.051)
Recovery (2012)	-0.014	0.208***
	(0.061)	(0.080)
Base	27,645	36,129
Impact of upratings only:		
Pooled – base	-0.239*	0.034
	(0.140)	(0.144)
Recession (2008-2011)	0.015	0.043
	(0.051)	(0.049)
Recovery (2012)	-0.010	0.229***
	(0.064)	(0.076)
Base	25,034	32,487

Notes: Unweighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

4.3. Alternative base year

As the base period used in the analysis was prior to the introduction of the NMW, there is a concern that over time trends in outcomes for the treatment and comparison groups may have diverged, making the estimated impact of the uprating of the NMW increasingly inaccurate over time. To assess whether this might be the case, the analysis presented in Table 11 uses 2009 as the 'pre-intervention' period. This year was chosen because the adult NMW rate remained fairly static (an increase of 7 pence, or 1.2 per cent). The main difference compared with the analysis which used the period prior to the introduction of the NMW as the pre-intervention period is that the negative employment impacts for female part-time employees in 2010 to 2012 disappeared and instead became positive. Also, whilst the results for female full-time and male full-time employees remain largely statistically insignificant, the size of the negative coefficients fell. This suggests that generally any negative employment impacts that emerge over time should be regarded with caution as they may be due to measurement error.

Table 11 Impact of the adult NMW on employment retention, using 2009 as the base year, ASHE

	Female full-time	Female part-time	Male full-time
2010	0.007	0.040**	-0.020
	(0.026)	(0.016)	(0.027)
Base	5,383	12,307	5,602
2011	-0.002	0.023	-0.030
	(0.026)	(0.016)	(0.026)
Base	5,759	13,086	6,154
2012	0.016	0.046***	-0.017
	(0.026)	(0.016)	(0.026)
Base	5,624	12,902	5,989
Pooled – all years	0.006	0.036***	-0.022
	(0.022)	(0.014)	(0.022)
Base	11,760	26,763	12,721
Impact of upratings only:			
Pooled – all years	0.016	0.046***	-0.017
	(0.026)	(0.016)	(0.026)
Base	5,624	12,902	5,989

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

The impact of the uprating of the NMW on hours is less consistently affected when 2009 is used as the base year (Table 12). It was not possible to carry out a similar analysis using the LFS due to small sample sizes.

Table 12 Impact of the adult NMW on hours, using 2009 as the base year, ASHE

	Female full-time	Female part-time	Male full-time
2010	-1.043	-0.021	-0.074
	(0.752)	(0.433)	(0.702)
Base	4,095	8,354	3,858
2011	-0.798	-0.015	0.582
	(0.743)	(0.433)	(0.640)
Base	4,229	8,677	4,141
2012	-0.470	-0.473	0.450
	(0.752)	(0.433)	(0.669)
Base	4,156	8,501	4,062
Pooled – all years	-0.769	-0.161	0.324
	(0.643)	(0.369)	(0.557)
Base	8,734	17,684	8,659
Impact of upratings only:			
Pooled – all years	-0.470	-0.473	0.450
	(0.752)	(0.433)	(0.669)
Base	4,156	8,501	4,062

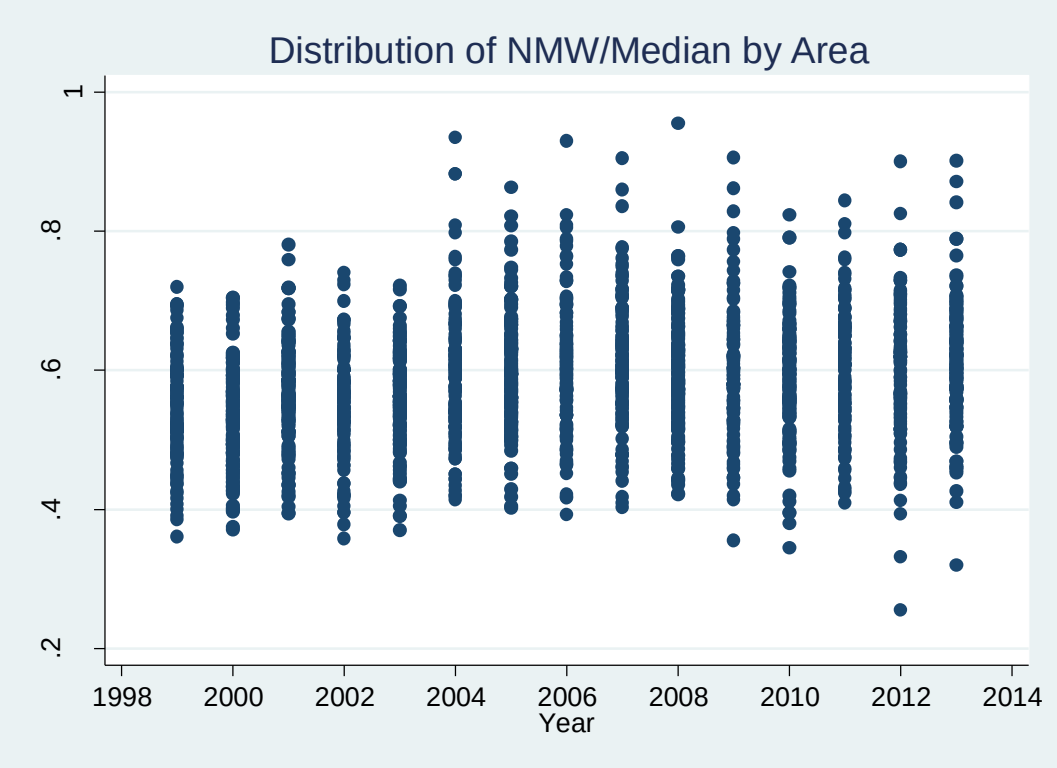
Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

As well as exploring the sensitivity of the results to using a more recent base year, the Annex reports results for alternative comparison groups. This demonstrates that the impact estimates shown in this chapter were sensitive to the choice of comparison group. Although to some extent this may be because a comparison group drawn from higher up the wage distribution provides a less robust estimate of the counterfactual, when this is coupled with the evidence that the results are also sensitive to using a more recent base year, this demonstrates that the estimates are unstable when changes are made to the specification.

4.4. Local area analysis

This section examines the impact of the NMW from a spatial perspective. As outlined in Section 3.2 we utilise the regional variation in the impact of the NMW to examine effects on labour market outcomes. A key requirement for identification here is sufficient variation in the impact of the NMW. This must vary over time, but also between the different areas. Figure 3 shows the distribution of the 'bite' of the NMW, as measured by the Kaitz index, for each area, in each year, from 1999 to 2013.

Figure 3 Annual Kaitz index by area, 1999 to 2013

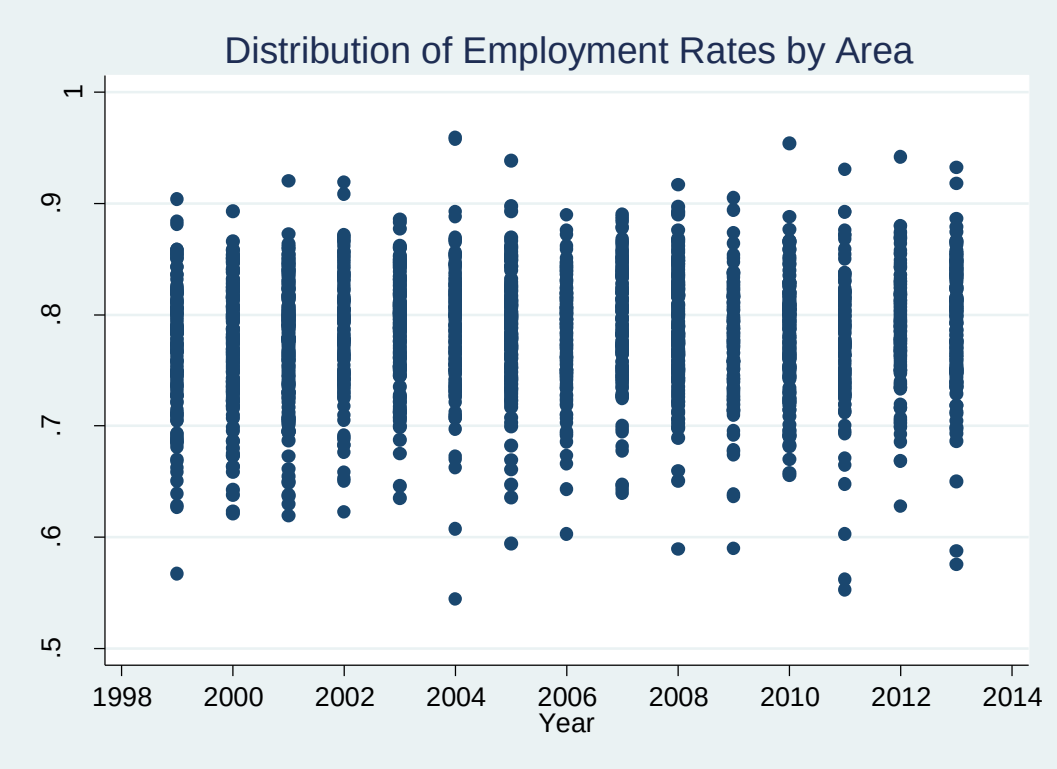


Source: Labour Force Survey

There is significant variation in the bite of the NMW across areas. While the average Kaitz index was around 50 per cent, in some areas it was below 35 per cent and in others it was more than 70 per cent. It is this variation that provides us with our way of identifying any potential minimum wage effects.

We also need to establish that our dependent variables vary between areas. Figure 4 presents the employment rate for each area and year. The employment rate for adults increased from 76 per cent in 1999 to 79 per cent in 2007, but then fell back to 77 per cent in 2009 and returned to 79 per cent in 2013. There is considerable variation across the areas: some had employment rates below 60 per cent, whilst others had rates around 90 per cent.

Figure 4 Employment rate by area, 1999 to 2013



Source: Labour Force Survey

Turning now to the estimated impact of the NMW on employment, we estimate the equation shown in section 3.2 on our area level panel data for the 130 area groupings. The regression output is shown in Tables 13 to 23. We report a number of different specifications, for all adult workers, adult males, adult females, adult female full-time workers and adult female part-time workers. Since the areas vary considerably in size, we report unweighted results and results using the population as a weighting variable.

It is important to note that the estimates come from difference-in-differences models. It is difficult to construct areas on a consistent basis for a period prior to 1997; hence the difference-in-differences approach only includes one year in the pre-NMW period and our results are sensitive to the relationship between employment and pay in that year. The NMW effect is captured using the toughness of the bite of the NMW measured by the log of the Kaitz index. Other models (not reported) which used the proportion of workers in each area paid below the NMW yielded similar results. We also estimated models including an instrument which seeks to control for the distribution of earnings across the areas prior to the introduction of the NMW, but this made no substantive differences to our results, hence these results are also not reported.

The employment rate we consider is the rate in the six month period after each up-rating. For example we associate the October 2009 up-rating with the employment rate between October 2009 and March 2010.

The estimates show the impact of the NMW on levels (of employment, unemployment and the log of total usual hours within an area) and all include year dummies, fixed effects and a variable that picks up the impact of the NMW throughout the estimation period i.e. also including the year before the NMW was introduced. This means that our model is essentially a difference-in-differences estimator in line with the estimates using individual-level data presented earlier. The year dummies control for aggregate changes in employment that affect all areas the same. The fixed effects control for area differences in the level of employment and the NMW variable identifies any common impact over time of low-paid employment on subsequent employment.

Table 13 reports estimates of the impact of the NMW on the employment rate for all adults. Column one reports the impact without controls. The estimated coefficient of 0.006 implies that a 10 per cent increase in the coverage of the NMW will increase the employment rate by 0.06 percentage points. Note, however, that the estimated coefficient is not statistically significant. The overall low pay indicator is negative and of a greater magnitude than the minimum wage indicator. This indicates that in all years, areas with a high proportion of low-paid people had lower employment rates.

The second column of Table 13 controls for the share of low qualification and no qualification individuals, and also the share of young workers and manufacturing employment in the area. We also include the percentage of people born outside the UK in the area and the change in this percentage to proxy net migration flows. The skill share variables are both significant, but the coefficient on the minimum wage impact variable is similar to column one and remains insignificant. The third column shows the impact of the NMW in each year between 2007 and 2013.[3] Here we find a mix of negative and positive coefficients, although none are statistically significant.

The next three columns report the same set of specifications but the regressions are weighted using the area population as the weight. In column four the NMW impact is positive and considerably larger than in the unweighted model, but it is not statistically significant. The overall low pay indicator is again negative and statistically significant. Once we include the control variables reported in column five, the coefficient on the NMW variable falls and in the final column we again find a mix of negative and positive coefficients. These results suggest that the NMW has had no systematic effect on the employment rate of adult workers across the whole period and also no impact during the recent recession and recovery.

[3] Coefficients for all years between 1999 and 2013 are estimated, but as the focus of this report is on the recent recession and recovery, we only report coefficients for the period from 2007 onwards.

Table 13 Employment Rate (proportion) 1998 to 2013, All Adults

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	0.006	0.009		0.045	0.025	
	(0.043)	(0.035)		(0.053)	(0.021)	
2007			0.010			0.032
			(0.045)			(0.025)
2008			0.016			0.009
			(0.047)			(0.027)
2009			-0.010			0.024
			(0.043)			(0.030)
2010			0.024			0.019
			(0.047)			(0.032)
2011			0.047			0.036
			(0.043)			(0.029)
2012			0.057			0.012
			(0.055)			(0.025)
2013			-0.013			-0.020
			(0.046)			(0.025)
Log of NMW toughness (t-1)	-0.105**	-0.032	-0.033	-0.096*	-0.080***	-0.080***
	(0.042)	(0.034)	(0.034)	(0.051)	(0.022)	(0.022)
Low Qual Share of Employment		-0.077***	-0.082***		-0.029	-0.020
		(0.025)	(0.025)		(0.020)	(0.020)
No Qual Share of Employment		-0.574***	-0.568***		-0.750***	-0.759***
		(0.038)	(0.038)		(0.028)	(0.028)
Youth Share of Employment		-0.238***	-0.238***		-0.251***	-0.245***
		(0.035)	(0.035)		(0.029)	(0.029)
Manufacturing share of Employment		0.007	0.007		0.172***	0.172***
		(0.025)	(0.025)		(0.019)	(0.018)
Migrant rate		0.086***	0.086***		-0.117***	-0.118***
		(0.028)	(0.028)		(0.013)	(0.013)
Change in migrant rate		-0.026	-0.033		0.058	0.053
		(0.045)	(0.044)		(0.040)	(0.039)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

Table 14 and Table 15 report results from the same regressions separately for men and women. The results are similar, suggesting no overall impact of the NMW on adult male and female employment.

Table 14 Employment Rate (proportion) 1998 to 2013, Adult Females

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	-0.023	-0.015		0.055	0.017	
	(0.047)	(0.038)		(0.047)	(0.020)	
2007			0.030			0.033
			(0.049)			(0.024)
2008			-0.000			0.013
			(0.049)			(0.026)
2009			-0.009			0.039
			(0.047)			(0.028)
2010			0.046			0.039
			(0.065)			(0.033)
2011			0.000			0.045
			(0.053)			(0.028)
2012			0.029			0.005
			(0.058)			(0.027)
2013			-0.033			-0.009
			(0.052)			(0.026)
Log of NMW toughness (t-1)	-0.048	0.010	0.010	-0.035	-0.047**	-0.048**
	(0.045)	(0.038)	(0.038)	(0.044)	(0.020)	(0.020)
Low Qual Share of Employment		-0.173***	-0.179***		-0.144***	-0.146***
		(0.032)	(0.032)		(0.021)	(0.021)
No Qual Share of Employment		-0.460***	-0.452***		-0.631***	-0.626***
		(0.051)	(0.050)		(0.031)	(0.031)
Youth Share of Employment		-0.253***	-0.259***		-0.197***	-0.208***
		(0.047)	(0.048)		(0.034)	(0.034)
Manufacturing share of Employment		-0.040	-0.041		0.097***	0.101***
		(0.030)	(0.030)		(0.020)	(0.020)
Migrant rate		-0.043	-0.041		-0.229***	-0.226***
		(0.033)	(0.033)		(0.014)	(0.014)
Change in migrant rate		0.027	0.019		0.117***	0.106**
		(0.058)	(0.058)		(0.044)	(0.044)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

Table 15 Employment Rate (proportion) 1998-2013, Adult Males

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	0.030	0.035		0.037	0.034	
	(0.047)	(0.039)		(0.057)	(0.031)	
2007			-0.016			0.032
			(0.056)			(0.034)
2008			0.038			0.008
			(0.060)			(0.035)
2009			-0.013			0.014
			(0.052)			(0.039)
2010			0.007			0.004
			(0.052)			(0.039)
2011			0.084			0.031
			(0.054)			(0.037)
2012			0.077			0.022
			(0.064)			(0.034)
2013			0.007			-0.029
			(0.057)			(0.035)
Log of NMW toughness (t-1)	-0.155***	-0.070*	-0.070*	-0.156***	-0.112***	-0.113***
	(0.046)	(0.039)	(0.039)	(0.055)	(0.031)	(0.030)
Low Qual Share of Employment		0.009	0.006		0.075***	0.095***
		(0.035)	(0.034)		(0.025)	(0.025)
No Qual Share of Employment		-0.668***	-0.665***		-0.850***	-0.872***
		(0.057)	(0.055)		(0.034)	(0.034)
Youth Share of Employment		-0.238***	-0.232***		-0.299***	-0.279***
		(0.055)	(0.055)		(0.034)	(0.034)
Manufacturing share of Employment		0.044	0.045		0.231***	0.228***
		(0.030)	(0.030)		(0.022)	(0.022)
Migrant rate		0.204***	0.202***		-0.016	-0.021
		(0.033)	(0.033)		(0.016)	(0.015)
Change in migrant rate		-0.069	-0.074		0.002	0.002
		(0.057)	(0.055)		(0.046)	(0.045)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

Table 16 and Table 17 report results for adult female full-time workers and adult female part-time workers. Here we find significant positive coefficients for full-time workers, but negative coefficients for female part-time employees. This suggests that female part-time minimum wage employees may have been replaced with female full-time employees.

Table 16 Employment Rate in Levels 1998 to 2013, Adult Full-time Females

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	0.063	0.071*		0.102***	0.103***	
	(0.045)	(0.040)		(0.026)	(0.024)	
2007			0.112**			0.122***
			(0.056)			(0.029)
2008			0.099			0.121***
			(0.063)			(0.032)
2009			0.128**			0.184***
			(0.058)			(0.029)
2010			0.178***			0.185***
			(0.064)			(0.033)
2011			0.082			0.184***
			(0.072)			(0.029)
2012			0.132***			0.156***
			(0.050)			(0.033)
2013			0.016			0.130***
			(0.054)			(0.031)
Log of NMW toughness (t-1)	-0.152***	-0.098**	-0.099**	-0.215***	-0.166***	-0.168***
	(0.043)	(0.039)	(0.039)	(0.026)	(0.024)	(0.024)
Low Qual Share of Employment		-0.223***	-0.226***		-0.216***	-0.261***
		(0.038)	(0.039)		(0.026)	(0.025)
No Qual Share of Employment		-0.017	-0.008		-0.015	0.042
		(0.055)	(0.054)		(0.039)	(0.037)
Youth Share of Employment		0.003	-0.002		0.079**	0.010
		(0.058)	(0.058)		(0.038)	(0.036)
Manufacturing share of Employment		0.029	0.026		0.043*	0.062***
		(0.033)	(0.033)		(0.023)	(0.022)
Migrant rate		0.191***	0.191***		0.067***	0.083***
		(0.032)	(0.031)		(0.017)	(0.014)
Change in migrant rate		-0.038	-0.055		0.038	0.011
		(0.067)	(0.067)		(0.046)	(0.044)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

Table 17 Employment Rate in Levels 1998-2013, Adult Part-time Females

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	-0.085**	-0.086**		-0.046	-0.085***	
	(0.037)	(0.033)		(0.059)	(0.022)	
2007			-0.083*			-0.089***
			(0.044)			(0.027)
2008			-0.098*			-0.106***
			(0.053)			(0.025)
2009			-0.138**			-0.144***
			(0.060)			(0.028)
2010			-0.132**			-0.147***
			(0.062)			(0.032)
2011			-0.082			-0.140***
			(0.070)			(0.027)
2012			-0.105**			-0.148***
			(0.047)			(0.027)
2013			-0.056			-0.140***
			(0.050)			(0.029)
Log of NMW toughness (t-1)	0.104***	0.110***	0.110***	0.180***	0.118***	0.119***
	(0.036)	(0.032)	(0.032)	(0.057)	(0.022)	(0.021)
Low Qual Share of Employment		0.050	0.047		0.072***	0.115***
		(0.032)	(0.033)		(0.025)	(0.025)
No Qual Share of Employment		-0.451***	-0.452***		-0.619***	-0.671***
		(0.048)	(0.049)		(0.037)	(0.038)
Youth Share of Employment		-0.252***	-0.252***		-0.275***	-0.217***
		(0.054)	(0.055)		(0.039)	(0.038)
Manufacturing share of Employment		-0.067**	-0.066**		0.057**	0.041*
		(0.028)	(0.028)		(0.024)	(0.023)
Migrant rate		-0.232***	-0.230***		-0.297***	-0.311***
		(0.030)	(0.030)		(0.016)	(0.015)
Change in migrant rate		0.066	0.074		0.080*	0.095**
		(0.056)	(0.057)		(0.046)	(0.045)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

Tables 18 to 20 show results for the log of total hours worked. Here the coefficients on the overall impact of the NMW are positive, but not statistically significant. However, in some of the unweighted models there are significant coefficients in 2010 and 2011, although these disappear when weighted by the size of each local area. Overall, there is no strong evidence that the NMW influenced total hours worked for men or women.

Table 18 Log total hours usually worked 1998 to 2013, All Adults

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	0.826	0.782		0.929	1.625	
	(0.686)	(0.555)		(1.328)	(1.817)	
2007			-0.059			1.587
			(0.805)			(1.873)
2008			1.030			1.875
			(0.701)			(1.853)
2009			1.123			2.154
			(0.777)			(1.875)
2010			1.962**			2.489
			(0.798)			(1.883)
2011			1.696**			2.648
			(0.794)			(1.893)
2012			1.817*			1.986
			(0.941)			(1.891)
2013			1.244			1.705
			(0.983)			(1.868)
Log of NMW toughness (t-1)	-3.673***	-2.257***	-2.272***	-5.528***	-3.244*	-3.274*
	(0.648)	(0.542)	(0.544)	(1.283)	(1.760)	(1.763)
Low Qual Share of Employment		-0.510	-0.622		-1.370***	-1.757***
		(0.476)	(0.465)		(0.512)	(0.523)
No Qual Share of Employment		1.007	1.242*		9.196***	9.753***
		(0.725)	(0.729)		(0.864)	(0.879)
Youth Share of Employment		6.324***	6.300***		10.960***	10.360***
		(0.726)	(0.729)		(0.804)	(0.799)
Manufacturing share of Employment		0.648	0.587		-1.770***	-1.602***
		(0.414)	(0.412)		(0.538)	(0.541)
Migrant rate		10.457***	10.432***		7.601***	7.745***
		(0.495)	(0.486)		(0.371)	(0.382)
Change in migrant rate		-4.561***	-4.600***		-9.080**	-9.360**
		(1.064)	(1.041)		(3.763)	(3.835)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

Table 19 Log total hours usually worked 1998-2013, Adult Females

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	0.874	0.834		1.006	1.696	
	(0.706)	(0.570)		(1.306)	(1.777)	
2007			0.038			1.662
			(0.805)			(1.832)
2008			1.166			1.917
			(0.711)			(1.816)
2009			1.196			2.312
			(0.776)			(1.835)
2010			2.145***			2.627
			(0.831)			(1.844)
2011			1.685**			2.795
			(0.831)			(1.854)
2012			1.898*			2.126
			(0.992)			(1.854)
2013			1.230			1.859
			(1.032)			(1.829)
Log of NMW toughness (t-1)	-3.736***	-2.295***	-2.310***	-5.652***	-3.314*	-3.345*
	(0.667)	(0.556)	(0.557)	(1.258)	(1.722)	(1.725)
Low Qual Share of Employment		-0.799	-0.909*		-1.770***	-2.211***
		(0.488)	(0.478)		(0.525)	(0.534)
No Qual Share of Employment		1.359*	1.597**		9.792***	10.409***
		(0.738)	(0.741)		(0.882)	(0.896)
Youth Share of Employment		6.508***	6.479***		11.345***	10.681***
		(0.737)	(0.739)		(0.818)	(0.811)
Manufacturing share of Employment		0.597	0.533		-1.982***	-1.797***
		(0.421)	(0.419)		(0.544)	(0.546)
Migrant rate		10.587***	10.563***		7.685***	7.844***
		(0.506)	(0.494)		(0.376)	(0.386)
Change in migrant rate		-4.465***	-4.516***		-9.066**	-9.377**
		(1.085)	(1.060)		(3.758)	(3.828)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

Table 20 Log total hours usually worked 1998-2013, Adult Males

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	0.796	0.748		0.881	1.581	
	(0.677)	(0.550)		(1.345)	(1.844)	
2007			-0.118			1.542
			(0.811)			(1.901)
2008			0.944			1.855
			(0.701)			(1.878)
2009			1.077			2.051
			(0.785)			(1.901)
2010			1.850**			2.402
			(0.786)			(1.909)
2011			1.691**			2.554
			(0.781)			(1.920)
2012			1.767*			1.897
			(0.918)			(1.916)
2013			1.240			1.603
			(0.960)			(1.894)
Log of NMW toughness (t-1)	-3.645***	-2.238***	-2.252***	-5.453***	-3.203*	-3.232*
	(0.639)	(0.537)	(0.539)	(1.302)	(1.786)	(1.789)
Low Qual Share of Employment		-0.337	-0.449		-1.115**	-1.467***
		(0.475)	(0.464)		(0.506)	(0.518)
No Qual Share of Employment		0.771	1.003		8.806***	9.324***
		(0.727)	(0.732)		(0.854)	(0.869)
Youth Share of Employment		6.234***	6.214***		10.728***	10.169***
		(0.727)	(0.731)		(0.797)	(0.793)
Manufacturing share of Employment		0.704*	0.646		-1.619***	-1.461***
		(0.414)	(0.413)		(0.536)	(0.539)
Migrant rate		10.405***	10.380***		7.555***	7.688***
		(0.491)	(0.484)		(0.369)	(0.380)
Change in migrant rate		-4.624***	-4.656***		-9.091**	-9.352**
		(1.058)	(1.037)		(3.769)	(3.842)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

Tables 21 to 23 consider the impact of the NMW on the unemployment rate for all adults, adult females and adult males. The results largely mirror those for employment in Tables 13 to 15, suggesting that overall the NMW had no impact on unemployment. Here, however, the weighted regressions do produce some coefficients that are statistically significant; positive for women in 2012 and negative for men in 2007.

Table 21 Unemployment Rate (proportion) 1998 to 2013, All Adults

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	-0.006	-0.009		-0.019	-0.012	
	(0.020)	(0.017)		(0.026)	(0.013)	
2007			-0.012			-0.019
			(0.021)			(0.014)
2008			-0.013			-0.002
			(0.022)			(0.014)
2009			0.003			0.006
			(0.023)			(0.015)
2010			-0.021			-0.005
			(0.021)			(0.018)
2011			-0.013			-0.001
			(0.027)			(0.016)
2012			-0.024			0.011
			(0.023)			(0.015)
2013			0.025			0.022
			(0.026)			(0.016)
Log of NMW toughness (t-1)	0.027	0.008	0.008	0.024	0.029**	0.029**
	(0.020)	(0.017)	(0.017)	(0.025)	(0.013)	(0.013)
Low Qual Share of Employment		0.030**	0.030**		0.021**	0.006
		(0.013)	(0.014)		(0.010)	(0.010)
No Qual Share of Employment		0.168***	0.169***		0.209***	0.223***
		(0.025)	(0.025)		(0.015)	(0.015)
Youth Share of Employment		0.095***	0.094***		0.119***	0.106***
		(0.023)	(0.024)		(0.014)	(0.014)
Manufacturing share of Employment		0.005	0.005		-0.037***	-0.036***
		(0.011)	(0.012)		(0.008)	(0.008)
Migrant rate		-0.006	-0.006		0.064***	0.067***
		(0.013)	(0.013)		(0.006)	(0.006)
Change in migrant rate		-0.003	0.001		-0.038**	-0.038**
		(0.023)	(0.023)		(0.017)	(0.017)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

Table 22 Unemployment Rate (proportion) 1998-2013, Adult Females

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	0.012	0.009		-0.007	0.004	
	(0.019)	(0.017)		(0.021)	(0.010)	
2007			-0.014			0.003
			(0.020)			(0.012)
2008			0.000			0.004
			(0.022)			(0.012)
2009			0.015			0.012
			(0.023)			(0.013)
2010			-0.034			-0.007
			(0.031)			(0.015)
2011			0.001			-0.001
			(0.029)			(0.013)
2012			0.002			0.031**
			(0.023)			(0.014)
2013			0.040			0.025
			(0.025)			(0.016)
Log of NMW toughness (t-1)	0.000	-0.007	-0.007	-0.007	0.009	0.010
	(0.018)	(0.017)	(0.017)	(0.020)	(0.010)	(0.010)
Low Qual Share of Employment		0.050***	0.050***		0.035***	0.028***
		(0.014)	(0.014)		(0.010)	(0.010)
No Qual Share of Employment		0.076***	0.076***		0.120***	0.126***
		(0.020)	(0.020)		(0.014)	(0.014)
Youth Share of Employment		0.086***	0.085***		0.067***	0.062***
		(0.019)	(0.019)		(0.015)	(0.015)
Manufacturing share of Employment		0.012	0.014		-0.020**	-0.019**
		(0.012)	(0.012)		(0.009)	(0.009)
Migrant rate		0.038***	0.038***		0.081***	0.082***
		(0.013)	(0.013)		(0.006)	(0.006)
Change in migrant rate		-0.026	-0.021		-0.062***	-0.062***
		(0.025)	(0.025)		(0.018)	(0.018)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

Table 23 Unemployment Rate (proportion) 1998-2013, Adult Males

	Unweighted			Weighted		
	1	**2**	**3**	**4**	**5**	**6**
Log of NMW toughness interacted with NMW year:						
1999-2013	-0.019	-0.022		-0.028	-0.024	
	(0.027)	(0.022)		(0.030)	(0.017)	
2007			-0.008			-0.035**
			(0.028)			(0.017)
2008			-0.021			-0.005
			(0.030)			(0.019)
2009			-0.003			0.003
			(0.030)			(0.019)
2010			-0.011			-0.002
			(0.027)			(0.022)
2011			-0.016			0.001
			(0.034)			(0.024)
2012			-0.040			-0.005
			(0.031)			(0.019)
2013			0.015			0.019
			(0.033)			(0.019)
Log of NMW toughness (t-1)	0.047*	0.018	0.018	0.048	0.044***	0.044***
	(0.026)	(0.023)	(0.023)	(0.030)	(0.016)	(0.016)
Low Qual Share of Employment		0.013	0.013		0.008	-0.014
		(0.018)	(0.018)		(0.013)	(0.013)
No Qual Share of Employment		0.241***	0.243***		0.285***	0.305***
		(0.045)	(0.044)		(0.020)	(0.020)
Youth Share of Employment		0.102**	0.099**		0.161***	0.142***
		(0.041)	(0.042)		(0.019)	(0.019)
Manufacturing share of Employment		-0.003	-0.004		-0.054***	-0.051***
		(0.016)	(0.016)		(0.011)	(0.011)
Migrant rate		-0.044**	-0.044**		0.050***	0.054***
		(0.018)	(0.019)		(0.008)	(0.007)
Change in migrant rate		0.022	0.025		-0.017	-0.018
		(0.030)	(0.030)		(0.022)	(0.022)
Observations	2078	2078	2078	2078	2078	2078
Number of Areas	130	130	130	130	130	130
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Interaction terms between the log of NMW toughness and years 1999 to 2006 were estimated in models 3 and 6, but are not reported here. In all cases the estimated coefficients are not statistically significant at the 5% level.

5. SUBGROUP ANALYSIS

This chapter considers the impact of the NMW on particular subgroups of employees, considering those working in the public and private sectors, those working for firms of different sizes and those aged 50 or more, or under the age of 50. It then moves on to present results for those eligible for the youth development rate and the rate for those aged 16-17. The ASHE data is used exclusively for this analysis, as it gives larger sample sizes which are more likely to provide conclusive results than the LFS data.

5.1. Sector

As mentioned in section 2.7, it has been suggested that the recession may have affected the public and private sectors at different times. Therefore, this section considers the impact of the uprating of the NMW on employment retention and hours on employees working in either the public or private sectors separately. Whilst Table 24 and Table 26 show that findings for the private sector were very similar to the aggregate results presented in the previous chapter, the picture was quite different in the public sector (Table 25 and Table 27). However, as low-paid employees tend to be more heavily concentrated in the private sector than the public sector, small sample sizes are likely to partly explain why the general patterns observed in earlier tables are not apparent in the public sector. In particular, small sample sizes for low-paid male full-time employees in the public sector mean that the model fit was poor and so results are suppressed for this group.

Table 24 Impact of the adult NMW on employment retention, private sector only

	Female full-time	Female part-time	Male full-time
Pooled – all years	-0.039	-0.071***	-0.044
	(0.024)	(0.017)	(0.028)
Base	30,126	60,235	31,583
Pooled – base	-0.039	-0.067***	-0.030
	(0.025)	(0.018)	(0.029)
Recession (2008-2009)	-0.010	-0.023**	-0.011
	(0.017)	(0.011)	(0.017)
Recovery (2010-2012)	0.007	-0.005	-0.045***
	(0.013)	(0.009)	(0.013)
Base	30,126	60,235	31,583
Impact of upratings only:			
Pooled – all years	-0.042*	-0.073***	-0.045
	(0.024)	(0.017)	(0.028)
Base	28,590	57,257	30,128
Pooled – base	-0.042*	-0.069***	-0.029
	(0.025)	(0.018)	(0.029)
Recession (2008-2009)	-0.009	-0.020*	-0.013
	(0.017)	(0.011)	(0.017)
Recovery (2010-2012)	0.008	-0.002	-0.047***
	(0.013)	(0.009)	(0.014)
Base	28,590	57,257	30,128

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

Table 25 Impact of the adult NMW on employment retention, public sector only

	Female full-time	Female part-time	Male full-time
Pooled – all years	0.063	-0.013	-0.062
	(0.087)	(0.032)	(0.148)
Base	1,848	13,791	977
Pooled – base	0.048	-0.013	-0.084
	(0.087)	(0.033)	(0.149)
Recession (2008-2009)	0.114	0.017	0.111
	(0.095)	(0.027)	(0.145)
Recovery (2010-2012)	0.027	-0.011	0.075
	(0.063)	(0.021)	(0.101)
Base	1,848	13,791	977
Impact of upratings only:			
Pooled – all years	0.044	-0.008	-0.080
	(0.090)	(0.033)	(0.149)
Base	1,734	13,049	917
Pooled – base	0.022	-0.007	-0.113
	(0.091)	(0.033)	(0.150)
Recession (2008-2009)	0.135	0.012	0.138
	(0.096)	(0.027)	(0.145)
Recovery (2010-2012)	0.045	-0.016	0.101
	(0.064)	(0.021)	(0.102)
Base	1,734	13,049	917

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

Table 26 Impact of the adult NMW on hours, private sector only

	Female full-time	Female part-time	Male full-time
Pooled – all years	-0.357	-0.417	-1.216*
	(0.584)	(0.467)	(0.703)
Base	21,706	39,880	20,888
Pooled – base	0.203	-0.378	-0.916
	(0.591)	(0.472)	(0.713)
Recession (2008-2009)	-0.736*	0.137	-0.633
	(0.428)	(0.290)	(0.411)
Recovery (2010-2012)	-1.843***	-0.260	-0.741**
	(0.344)	(0.235)	(0.363)
Base	21,706	39,880	20,888
Impact of upratings only:			
Pooled – all years	-0.192	-0.425	-1.249*
	(0.589)	(0.471)	(0.713)
Base	20,630	38,038	19,959
Pooled – base	0.455	-0.421	-0.922
	(0.598)	(0.478)	(0.727)
Recession (2008-2009)	-0.839*	0.237	-0.640
	(0.432)	(0.291)	(0.416)
Recovery (2010-2012)	-1.937***	-0.159	-0.745**
	(0.349)	(0.238)	(0.369)
Base	20,630	38,038	19,959

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

Table 27 Impact of the adult NMW on hours, public sector only

	Female full-time	Female part-time	Male full-time
Pooled – all years	-0.918	-1.050	-
	(2.441)	(0.897)	-
Base	1,482	9,907	-
Pooled – base	-0.780	-0.733	-
	(2.464)	(0.906)	-
Recession (2008-2009)	-0.524	-1.352*	-
	(2.146)	(0.721)	-
Recovery (2010-2012)	-0.590	-1.061*	-
	(2.057)	(0.644)	-
Base	1,482	9,907	-
Impact of upratings only:			
Pooled – all years	-0.844	-1.372	-
	(2.546)	(0.924)	-
Base	1,385	9,359	-
Pooled – base	-0.634	-1.035	-
	(2.585)	(0.938)	-
Recession (2008-2009)	-0.642	-1.253*	-
	(2.182)	(0.727)	-
Recovery (2010-2012)	-0.722	-0.965	-
	(2.094)	(0.652)	-
Base	1,385	9,359	-

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

5.2. Firm Size

This section considers the ability of firms of different sizes to respond to the uprating of the NMW in the context of an economic downturn. Tables 28 to 30 show that whilst there was little evidence that employment retention varied by female full-time employees depending on whether they worked for a smaller or larger enterprise, negative employment effects for male full-time employees (both in recession and recovery) were more apparent in larger organisations. For female part-time employees, negative employment effects were seen in both the smallest and largest firms, but the timing was different, with those working for firms with fewer than 50 employees experiencing lower employment retention during the recession and recovery and those in firms with 250 or more employees experiencing lower employment retention before the recession.

Table 28 Impact of the adult NMW on employment retention, those working for enterprise with fewer than 50 employees

	Female full-time	Female part-time	Male full-time
Pooled – all years	-0.005	-0.051*	-0.052
	(0.038)	(0.029)	(0.040)
Base	9,992	20,395	11,165
Pooled – base	-0.002	-0.037	-0.055
	(0.039)	(0.029)	(0.041)
Recession (2008-2009)	-0.014	-0.043**	0.038
	(0.032)	(0.021)	(0.031)
Recovery (2010-2012)	-0.008	-0.037**	-0.009
	(0.024)	(0.016)	(0.024)
Base	9,992	20,395	11,165
Impact of upratings only:			
Pooled – all years	-0.001	-0.043	-0.052
	(0.039)	(0.029)	(0.041)
Base	9,249	19,159	10,318
Pooled – base	0.004	-0.027	-0.055
	(0.039)	(0.030)	(0.042)
Recession (2008-2009)	-0.019	-0.045**	0.037
	(0.032)	(0.022)	(0.031)
Recovery (2010-2012)	-0.012	-0.038**	-0.010
	(0.025)	(0.016)	(0.025)
Base	9,249	19,159	10,318

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

Table 29 Impact of the adult NMW on employment retention, those working for enterprise with 50-249 employees

	Female full-time	Female part-time	Male full-time
Pooled – all years	-0.035	0.007	0.013
	(0.052)	(0.044)	(0.067)
Base	5,652	7,284	5,616
Pooled – base	-0.039	0.006	0.031
	(0.053)	(0.045)	(0.068)
Recession (2008-2009)	0.012	0.018	0.020
	(0.039)	(0.033)	(0.041)
Recovery (2010-2012)	0.009	-0.007	-0.067**
	(0.029)	(0.025)	(0.030)
Base	5,652	7,284	5,616
Impact of upratings only:			
Pooled – all years	-0.046	0.006	0.016
	(0.053)	(0.045)	(0.067)
Base	5,334	6,787	5,408
Pooled – base	-0.053	0.005	0.038
	(0.054)	(0.046)	(0.068)
Recession (2008-2009)	0.020	0.018	0.014
	(0.039)	(0.034)	(0.042)
Recovery (2010-2012)	0.016	-0.007	-0.072**
	(0.030)	(0.026)	(0.031)
Base	5,334	6,787	5,408

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

Table 30 Impact of the adult NMW on employment retention, those working for enterprise with 250 or more employees

	Female full-time	Female part-time	Male full-time
Pooled – all years	-0.053	-0.066***	-0.029
	(0.033)	(0.018)	(0.046)
Base	17,686	51,088	16,489
Pooled – base	-0.052	-0.064***	-0.002
	(0.034)	(0.019)	(0.047)
Recession (2008-2009)	-0.021	-0.017	-0.054**
	(0.021)	(0.011)	(0.023)
Recovery (2010-2012)	0.005	0.002	-0.056***
	(0.016)	(0.009)	(0.018)
Base	17,686	51,088	16,489
Impact of upratings only:			
Pooled – all years	-0.062*	-0.072***	-0.030
	(0.034)	(0.018)	(0.046)
Base	17,006	48,860	15,984
Pooled – base	-0.062*	-0.071***	-0.002
	(0.034)	(0.019)	(0.047)
Recession (2008-2009)	-0.016	-0.014	-0.054**
	(0.021)	(0.012)	(0.023)
Recovery (2010-2012)	0.010	0.004	-0.057***
	(0.017)	(0.009)	(0.018)
Base	17,006	48,860	15,984

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

Hours effects were concentrated in enterprises with 250 or more employees for female full-time employees, with the uprating of the NMW resulting in increased hours prior to the recession and a reduction in hours in the recovery (Table 31). For female part-time employees, those in small firms tended to experience a negative impact on hours from the uprating of the NMW, whereas this was not apparent for those in larger firms (Table 32). There was little to suggest that hours effects from the uprating of the NMW varied for male full-time employees depending on the size of firm for which they worked (Table 33).

Table 31 Impact of the adult NMW on hours, those working for enterprise with fewer than 50 employees

	Female full-time	**Female part-time**	**Male full-time**
Pooled – all years	-0.829	-1.637**	-1.608*
	(0.803)	(0.747)	(0.853)
Base	6,869	12,393	7,109
Pooled – base	-0.665	-1.634**	-1.619*
	(0.812)	(0.756)	(0.861)
Recession (2008-2009)	0.004	0.253	0.187
	(0.774)	(0.579)	(0.653)
Recovery (2010-2012)	-0.825	-0.152	-0.057
	(0.593)	(0.413)	(0.631)
Base	6,869	12,393	7,109
Impact of upratings only:			
Pooled – all years	-0.796	-1.527**	-1.512*
	(0.820)	(0.758)	(0.882)
Base	6,354	11,610	6,558
Pooled – base	-0.640	-1.562**	-1.474
	(0.834)	(0.770)	(0.897)
Recession (2008-2009)	0.075	0.350	0.059
	(0.780)	(0.583)	(0.661)
Recovery (2010-2012)	-0.742	-0.044	-0.186
	(0.602)	(0.421)	(0.643)
Base	6,354	11,610	6,558

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

Table 32 Impact of the adult NMW on hours, those working for enterprise with 50-249 employees

	Female full-time	Female part-time	Male full-time
Pooled – all years	-0.734	-0.017	0.920
	(1.309)	(1.070)	(2.220)
Base	4,062	4,731	3,689
Pooled – base	-0.489	-0.144	1.609
	(1.325)	(1.086)	(2.255)
Recession (2008-2009)	-0.093	0.592	-1.025
	(0.985)	(0.918)	(1.070)
Recovery (2010-2012)	-0.920	0.209	-1.714*
	(0.776)	(0.726)	(0.889)
Base	4,062	4,731	3,689
Impact of upratings only:			
Pooled – all years	-0.430	0.085	0.900
	(1.300)	(1.095)	(2.232)
Base	3,825	4,385	3,553
Pooled – base	-0.050	-0.067	1.570
	(1.317)	(1.120)	(2.283)
Recession (2008-2009)	-0.360	0.613	-0.931
	(0.991)	(0.928)	(1.085)
Recovery (2010-2012)	-1.180	0.237	-1.594*
	(0.789)	(0.741)	(0.910)
Base	3,825	4,385	3,553

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

Table 33 Impact of the adult NMW on hours, those working for enterprise with 250 or more employees

	Female full-time	Female part-time	Male full-time
Pooled – all years	1.819*	-0.017	0.920
	(0.981)	(1.070)	(2.220)
Base	13,329	4,731	3,689
Pooled – base	2.397**	-0.144	1.609
	(0.992)	(1.086)	(2.255)
Recession (2008-2009)	-0.725	0.592	-1.025
	(0.570)	(0.918)	(1.070)
Recovery (2010-2012)	-1.842***	0.209	-1.714*
	(0.481)	(0.726)	(0.889)
Base	13,329	4,731	3,689
Impact of upratings only:			
Pooled – all years	2.214**	0.085	0.900
	(0.989)	(1.095)	(2.232)
Base	12,839	4,385	3,553
Pooled – base	2.935***	-0.067	1.570
	(1.004)	(1.120)	(2.283)
Recession (2008-2009)	-0.952*	0.613	-0.931
	(0.577)	(0.928)	(1.085)
Recovery (2010-2012)	-2.058***	0.237	-1.594*
	(0.490)	(0.741)	(0.910)
Base	12,839	4,385	3,553

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

5.3. Employee age

This section considers the impact of the recession on older and younger employees to see whether either group were disproportionately affected by the uprating of the NMW during the recession and recovery. Table 34 and Table 35 suggest that older female part-time employees may have experienced a stronger negative impact from the recession on their likelihood of being in work one year later than employees under the age of 50, although generally over time it was younger female part-time employees who were more likely to be negatively affected by the introduction and uprating of the adult NMW. There was also some evidence that men under the age of 50 were more likely to be negatively affected by upratings after 2009 than those aged 50 or more, although this may have been partly due to the smaller sample sizes for older employees. There was no evidence that the employment retention of female full-time employees in response to the uprating of the NMW was affected by their age.

Table 34 Impact of the adult NMW on employment retention, those aged 50 or more only

	Female full-time	Female part-time	Male full-time
Pooled – all years	-0.054	-0.031	-0.037
	(0.047)	(0.028)	(0.052)
Base	7,564	20,131	8,280
Pooled – base	-0.065	-0.023	-0.037
	(0.047)	(0.029)	(0.053)
Recession (2008-2009)	0.049	-0.040**	0.011
	(0.033)	(0.019)	(0.033)
Recovery (2010-2012)	0.029	-0.019	-0.005
	(0.025)	(0.015)	(0.026)
Base	7,564	20,131	8,280
Impact of upratings only:			
Pooled – all years	-0.070	-0.037	-0.033
	(0.047)	(0.029)	(0.053)
Base	7,192	19,155	7,877
Pooled – base	-0.084*	-0.029	-0.032
	(0.048)	(0.029)	(0.053)
Recession (2008-2009)	0.054*	-0.034*	0.008
	(0.033)	(0.019)	(0.034)
Recovery (2010-2012)	0.035	-0.013	-0.008
	(0.025)	(0.015)	(0.027)
Base	7,192	19,155	7,877

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

Table 35 Impact of the adult NMW on employment retention, those under the age of 50 only, ASHE

	Female full-time	Female part-time	Male full-time
Pooled – all years	-0.036	-0.074***	-0.048
	(0.026)	(0.017)	(0.032)
Base	25,894	59,155	25,135
Pooled – base	-0.031	-0.071***	-0.030
	(0.026)	(0.017)	(0.032)
Recession (2008-2009)	-0.030*	-0.012	-0.015
	(0.018)	(0.011)	(0.019)
Recovery (2010-2012)	-0.005	-0.006	-0.053***
	(0.014)	(0.009)	(0.015)
Base	25,894	59,155	25,135
Impact of upratings only:			
Pooled – all years	-0.039	-0.076***	-0.051
	(0.026)	(0.017)	(0.032)
Base	24,518	56,127	23,970
Pooled – base	-0.033	-0.073***	-0.032
	(0.027)	(0.018)	(0.033)
Recession (2008-2009)	-0.029	-0.012	-0.014
	(0.019)	(0.012)	(0.020)
Recovery (2010-2012)	-0.004	-0.006	-0.053***
	(0.015)	(0.009)	(0.015)
Base	24,518	56,127	23,970

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data

Table 36 and Table 37 show that the effect on hours worked of the introduction and uprating of the adult NMW was fairly similar for both older and younger employees. Hours effects were not apparent for male full-time employees in either age group. However, whilst female full-time employees, regardless of age, tended to reduce their hours during the recovery, before the recession those aged 50 or more were more likely to increase their hours in response to upratings. This was not apparent for the younger age group.

Table 36 Impact of the adult NMW on hours, those aged 50 or more only

	Female full-time	**Female part-time**	**Male full-time**
Pooled – all years	1.434	-1.464**	-2.255
	(0.908)	(0.731)	(1.485)
Base	5,902	14,455	5,955
Pooled – base	1.820**	-1.337*	-1.806
	(0.917)	(0.736)	(1.505)
Recession (2008-2009)	-0.496	-0.424	-0.922
	(0.703)	(0.465)	(0.854)
Recovery (2010-2012)	-1.508**	-0.377	-1.531*
	(0.608)	(0.394)	(0.886)
Base	5,902	14,455	5,955
Impact of upratings only:			
Pooled – all years	1.770*	-1.441*	-2.209
	(0.919)	(0.742)	(1.510)
Base	5,617	13,769	5,672
Pooled – base	2.258**	-1.318*	-1.715
	(0.931)	(0.751)	(1.538)
Recession (2008-2009)	-0.690	-0.386	-0.944
	(0.708)	(0.468)	(0.866)
Recovery (2010-2012)	-1.697***	-0.338	-1.551*
	(0.615)	(0.399)	(0.902)
Base	5,617	13,769	5,672

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

Table 37 Impact of the adult NMW on hours, those under the age of 50 only

	Female full-time	Female part-time	Male full-time
Pooled – all years	-0.098	0.446	-0.291
	(0.671)	(0.476)	(0.814)
Base	18,411	38,883	16,259
Pooled – base	0.366	0.510	-0.107
	(0.681)	(0.481)	(0.819)
Recession (2008-2009)	-0.572	-0.015	-0.416
	(0.497)	(0.312)	(0.453)
Recovery (2010-2012)	-1.576***	-0.285	-0.404
	(0.395)	(0.252)	(0.378)
Base	18,411	38,883	16,259
Impact of upratings only:			
Pooled – all years	0.112	0.495	-0.317
	(0.677)	(0.481)	(0.822)
Base	17,448	36,975	15,532
Pooled – base	0.659	0.546	-0.115
	(0.691)	(0.488)	(0.830)
Recession (2008-2009)	-0.670	0.031	-0.424
	(0.502)	(0.315)	(0.459)
Recovery (2010-2012)	-1.663***	-0.240	-0.409
	(0.403)	(0.255)	(0.386)
Base	17,448	36,975	15,532

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

5.4. Youth development rate

Table 38 shows that there was little evidence that the introduction and uprating of the youth development rate had any impact on the likelihood that those eligible for the youth development rate were retained in employment from one year to the next. However, there were some signs that this group were more likely to work fewer hours in the period after 2009 than those of a similar age who were slightly better paid.

Table 38 Impact of the youth development rate of the NMW on employment retention and hours

	Employment retention	**Hours**
Pooled – all years	-0.044	-0.339
	(0.051)	(1.642)
Base	7,287	4,270
Pooled – base	-0.033	0.001
	(0.051)	(1.663)
Recession (2008-2009)	-0.048	-0.303
	(0.038)	(1.229)
Recovery (2010-2012)	-0.042	-2.763**
	(0.035)	(1.259)
Base	7,287	4,270
Impact of upratings only:		
Pooled – all years	-0.036	-0.084
	(0.051)	(1.668)
Base	6,806	3,981
Pooled – base	-0.021	0.244
	(0.052)	(1.698)
Recession (2008-2009)	-0.058	-0.202
	(0.038)	(1.249)
Recovery (2010-2012)	-0.053	-2.568**
	(0.036)	(1.279)
Base	6,806	3,981

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

5.5. 16-17 year old rate

It was not possible to include control variables when seeking to estimate the impact of the introduction and uprating of the NMW on those eligible for the 16-17 year old rate, due to the small sample size.

Table 39 shows that the 16-17 year old rate did not affect the likelihood that eligible employees were retained in employment. However, the small numbers of employees in this age range affects confidence in this finding. Results showing the impact of the NMW on the number of hours worked by 16-17 year olds are suppressed, as the small sample sizes meant that the model was a poor fit.

Table 39 Impact of the 16-17 year old rate of the NMW on employment retention and hours

	Employment retention
Pooled – all years	0.004
	(0.086)
Base	685
Pooled – base	-0.139
	(0.136)
Recession (2008-2009)	0.199
	(0.171)
Recovery (2010-2012)	0.193
	(0.157)
Base	685
Impact of upratings only:	
Pooled – all years	0.004
	(0.086)
Base	669
Pooled – base	-0.139
	(0.136)
Recession (2008-2009)	0.199
	(0.171)
Recovery (2010-2012)	0.193
	(0.157)
Base	669

Notes: Weighted estimates without control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses. Based on analysis of ASHE data.

6. SUMMARY AND CONCLUSIONS

6.1. Introduction

This chapter begins by summarising the main findings presented in this report and discussing the robustness of the results to changes of specification. It makes comparisons with the findings of other similar studies and concludes by considering the likely policy implications of the study.

6.2. Summary

6.2.1. Employment retention

The individual level analysis of ASHE data found that the introduction and uprating of the adult NMW had little impact on the employment retention of female full-time employees over the period up to the October 2013 uprating. However, it did have a negative impact on employment retention for female part-time employees for much of the period considered. It also appeared to have a negative impact on employment retention for male full-time employees in the period after the end of the recession (from 2010 onwards). These findings were evident in weighted and unweighted results and were not sensitive to the inclusion of controls. When the focus switched from the period of economic contraction (2008 to 2009) to the period of employment contraction (2008 to 2011), the negative employment effects from the uprating of the NMW in the recovery period shifted back into the recession, but for women the results were unchanged.

The analysis also considered the impact of the NMW on particular subgroups of employees. As low-paid employees tended to be more heavily concentrated in the private, rather than the public sector, it was unsurprising to find that the impact estimates for the private sector were more typical of the aggregate results than those for the public sector. Negative employment effects for male full-time employees were more apparent in larger firms than smaller ones and female part-time employees working for firms with fewer than 50 employees were more likely to experience lower employment retention in the recession and recovery than those working for larger firms. Older female part-time employees appeared to experience a stronger negative impact on employment retention from the recession than employees under the age of 50, although generally over time it was younger female part-time employees who were more likely to be negatively affected by the introduction and uprating of the adult NMW. There was also some evidence that men under the age of 50 were more likely to be negatively affected by upratings after 2009 than those aged 50 or more. Analysis of the impact of the uprating of the youth development and 16-17 rate of the NMW was inconclusive due to small sample sizes.

A series of sensitivity checks cast some doubt over the robustness of the main findings. Firstly, when the impact of the upratings since 2009 were considered, using 2009 (a year which saw a relatively small increase in the NMW) as the base year, the negative employment impacts for female part-time employees disappeared and instead become positive. Also, the size of the negative coefficients for female full-time and male full-time employees were reduced (although they remained largely statistically insignificant). This suggests that generally any negative employment impacts that emerge over time should be regarded with caution.

Secondly, when comparison groups were chosen from those higher up the wage distribution, rather than those earning up to 10 per cent more than the NMW prior to each uprating, there were some notable differences in the findings. This was particularly apparent for female part-time, and male full-time, employees, but even results for female full-time employees were affected.

Finally, a similar analysis of the LFS found that the uprating of the NMW had very little impact on the likelihood that low-paid employees were retained in employment from one year to the next. Similar findings were apparent when the analysis was run without control variables and without weighting.

6.2.2. Hours

There were some signs that the uprating of the NMW during the recovery period has reduced the hours worked by female full-time employees, but the hours of female part-time employees and male full-time employees have not generally been affected by the introduction and uprating of the adult NMW. When the analysis was repeated without weights and control variables, there was stronger evidence of a positive impact from the NMW on the hours worked by female full-time employees before 2008. There was also some evidence that male full-time employees worked fewer hours from 2010 onwards.

Adjusting the definition of the recession, from one focused on the drop in GDP to one focused on the period of employment contraction, changed the observed impact of the recession on the hours worked by those affected by the uprating of the NMW. For full-time employees of either gender a negative effect from the uprating of the NMW on hours during the recession became apparent when the recession was considered to last from 2008 to 2011 rather than from 2008 to 2009. There were also signs that the uprating of the NMW during the recovery had a negative impact on hours for female part-time employees when the recovery was only treated as having started in 2012.

As with the findings for employment retention, the impact of the NMW on hours worked in the private sector was similar to the results for the economy as a whole, whereas this was less apparent in the public sector, partly due to the smaller sample sizes. There were some notable differences between firms of different sizes in the hours effects of the uprating of the NMW. For female full-time employees working in firms with 250 or more employees, increases in the NMW prior to the recession resulted in increased hours, whereas hours fell for this group in the recovery. This was not the case in smaller firms. Female part-time employees in small firms tended to experience a negative impact on hours from the uprating of the NMW, whereas this was not apparent for those in larger firms. The effect of the uprating of the adult NMW on hours was fairly similar for both older and younger employees. However, before the recession female full-time employees aged 50 or more tended to increase their hours in response to its uprating, whereas this was not apparent for the younger age group.

There were some signs that those eligible for the youth development rate who were affected by the uprating of the NMW were more likely to work fewer hours in the period after 2009 than those of a similar age who were slightly better paid, but otherwise the uprating of the youth development rate appeared to have little impact on the hours worked by young people. It was not possible to explore the impact of the uprating of the 16-17 year old rate of the NMW on hours worked due to small sample sizes.

Switching to using 2009 as the base year when seeking to estimate the impact of the NMW on hours suggested that the uprating of the NMW in the period from 2010 onwards had no impact on hours worked. Reductions in hours in response to upratings of the NMW became more apparent when the comparison group was chosen from those higher up the wage distribution, although the hours of female full-time employees were more likely to increase on average in response to the uprating of the NMW in the years prior to the recession when those earning 20 to 30 per cent more than the NMW rate were chosen as the comparison group.

Similarly to the main ASHE analysis, the individual-level analysis of the LFS found few signs that the uprating of the NMW affected the hours worked by women or men, although when years

were pooled, there was some evidence that the hours of female part-time employees fell after 2009.

6.2.3. Job entry

The probability of unemployed women with a high probability of being paid the NMW entering employment was not affected by the uprating of the NMW. However, when control variables were excluded from the model, the NMW appeared to have a negative impact on the probability of job entry for this group prior to the recession. For men most likely to be affected by the uprating of the NMW, the probability of entering employment from unemployment appeared higher in response to the uprating of the NMW during the recovery period. This finding remained when control variables were excluded, but the likelihood of job entry was lower in the recessionary period when the controls were left out of the model. Defining the recession as the period from 2008 to 2011, rather than 2008 to 2009, did not affect the findings for men or women.

6.2.4. Local area analysis

The analysis of the impact of the introduction and uprating of the NMW which exploited variation in the proportion of the workforce likely to be affected by it in different areas suggested that the NMW did not have an impact on the employment rate of adult workers. This was evident through the recent recession and recovery and for men and women and the results were consistent with the findings when the unemployment rate was considered. However, the employment rate of female full-time employees did appear to increase in response to the uprating of the NMW, whereas the opposite was the case for female part-time employees, suggesting that female part-time minimum wage employees may have been replaced with female full-time employees. There was no strong evidence from the local area analysis that the NMW influenced the total number of hours worked by men or women.

6.3. Conclusions

In common with Dickens et al. (2014), this report suggests that the uprating of the NMW has resulted in a reduced likelihood of female part-time employees remaining in employment. Papps and Gregg (2014) also found negative employment effects from the NMW across all employees when considering the period to 2010. However, the sensitivity testing carried out in the current study brought the finding of negative effects for female part-time employees into doubt, at least in the years since 2009.

Male full-time employees appeared to have a lower rate of employment retention during the years from 2010 onwards. Dickens et al. (2014) also found some negative employment effects for this group in the shorter run of data that they were able to use (to 2009), but this was not evident in the LFS analysis presented in the current study and it is uncertain whether this finding is robust.

Past research has found only limited evidence of the NMW having any impact on hours or employment and unemployment rates. This was generally true in the current study, once the differences in the results for the impact of the NMW on hours when trying alternative specifications are taken into account. The probability of job entry for low-wage men appeared to be greater in the recovery period, which is perhaps consistent with lower retention rates for men, if they leave a minimum wage job, are unemployed for a spell and then re-enter a minimum wage job.

It is possible that the general lack of wage growth during the recession and recovery explains the negative employment effects for some minimum wage employees, as for much of this period,

only those on the NMW would have experienced pay increases, potentially making these employees relatively less attractive to employers than those earning slightly more. Certainly the findings suggest that any impact from the uprating of the NMW is unevenly distributed between different groups of employees, when taking into account their gender, the number of hours worked, their age and the size of their employer. It therefore seems reasonable to conclude that it will be necessary to give careful consideration to these variations in future rate-setting.

7. ANNEX

This annex provides details of the sensitivity testing of the results from the individual-level analysis presented in the main body of the report. The reported analysis is based on the ASHE data, as whilst similar tests were carried out using the LFS, small sample sizes and poor model fit meant that much of the LFS analysis was not informative. The first section shows how the results are affected when the data are not weighted and when control variables are excluded, whilst the second shows the sensitivity of the findings to using comparison groups drawn from higher up the wage distribution.

7.1. Unweighted estimates without control variables

Excluding controls and weights appears to have a greater effect on the observed impact of the uprating of the NMW on hours than it does on employment retention, but that is possibly also due to the smaller sample sizes available for the hours variables (see Table 40 and Table 41). The main differences are that unweighted results suggest a positive impact on hours for full-time female employees in the period before 2008, and there is some evidence of a negative impact on hours for male full-time employees from 2010 onwards. A similar analysis showed that the LFS results were not sensitive to the inclusion of controls and the use of weights.

Table 40 Impact of the adult NMW on employment retention, unweighted and without controls, ASHE

	Female full-time	Female part-time	Male full-time
1998	-0.012	-0.040**	-0.037
	(0.030)	(0.020)	(0.035)
Base	3,520	7,932	2,909
2000	-0.004	-0.068***	0.025
	(0.037)	(0.022)	(0.043)
Base	2,852	6,899	2,293
2001	0.005	-0.032*	0.001
	(0.030)	(0.019)	(0.035)
Base	3,577	8,600	3,011
2002	-0.022	-0.038*	-0.075*
	(0.034)	(0.020)	(0.039)
Base	3,197	7,911	2,623
2003	-0.005	-0.045**	0.022
	(0.030)	(0.019)	(0.035)
Base	3,564	8,322	2,922
2004	-0.011	-0.025	0.017
	(0.028)	(0.017)	(0.032)
Base	4,100	9,916	3,652
2005	-0.042	-0.076***	-0.019
	(0.029)	(0.018)	(0.033)
Base	4,124	9,729	3,703
2006	-0.041	-0.068***	0.001
	(0.030)	(0.019)	(0.033)
Base	4,407	10,057	4,121
2007	-0.044	-0.071***	-0.067**
	(0.029)	(0.018)	(0.033)
Base	4,037	9,257	3,707
2008	-0.056**	-0.060***	-0.025
	(0.028)	(0.018)	(0.033)
Base	4,199	9,246	3,805
2009	-0.026	-0.095***	-0.026
	(0.029)	(0.018)	(0.033)
Base	4,263	9,688	3,849
2010	-0.014	-0.057***	-0.059*
	(0.027)	(0.018)	(0.031)
Base	4,642	10,469	4,432
2011	-0.028	-0.077***	-0.061**
	(0.027)	(0.017)	(0.030)

	Female full-time	Female part-time	Male full-time
Base	5,017	11,245	4,984
2012	-0.008	-0.060***	-0.046
	(0.027)	(0.018)	(0.031)
Base	4,879	11,065	4,818
Pooled – all years	-0.023	-0.059***	-0.029
	(0.022)	(0.014)	(0.026)
Base	33,602	79,480	33,461
Pooled – base	-0.022	-0.052***	-0.015
	(0.022)	(0.015)	(0.027)
Recession (2008-2009)	-0.021	-0.026***	-0.011
	(0.016)	(0.010)	(0.016)
Recovery (2010-2012)	0.004	-0.012	-0.042***
	(0.012)	(0.008)	(0.013)
Base	33,602	79,480	33,461
Impact of upratings only:			
Pooled – all years	-0.024	-0.060***	-0.029
	(0.022)	(0.014)	(0.027)
Base	31,834	75,460	31,888
Pooled – base	-0.023	-0.053***	-0.012
	(0.022)	(0.015)	(0.027)
Recession (2008-2009)	-0.019	-0.024**	-0.013
	(0.016)	(0.010)	(0.016)
Recovery (2010-2012)	0.006	-0.011	-0.044***
	(0.012)	(0.008)	(0.013)
Base	31,834	75,460	31,888

Notes: Unweighted estimates without control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

Table 41 Impact of the adult NMW on hours, unweighted without controls, ASHE

	Female full-time	Female part-time	Male full-time
1998	-0.374	0.399	-0.749
	(0.692)	(0.497)	(0.875)
Base	2,521	5,282	1,917
2000	2.199***	0.781	-0.928
	(0.778)	(0.594)	(1.055)
Base	2,067	4,636	1,525
2001	2.233***	0.240	0.026
	(0.647)	(0.472)	(0.833)
Base	2,586	5,877	2,028
2002	0.983	-0.017	-0.176
	(0.810)	(0.545)	(1.146)
Base	2,318	5,459	1,762
2003	1.662**	0.313	-0.350
	(0.740)	(0.495)	(0.951)
Base	2,620	5,753	2,032
2004	1.695**	0.343	-0.845
	(0.708)	(0.456)	(0.842)
Base	3,035	7,057	2,518
2005	0.938	0.135	-0.935
	(0.676)	(0.466)	(0.856)
Base	3,000	6,802	2,487
2006	0.986	-0.104	-0.796
	(0.702)	(0.470)	(0.865)
Base	2,835	6,236	2,435
2007	1.470**	0.587	-1.621*
	(0.712)	(0.477)	(0.886)
Base	2,908	6,363	2,440
2008	1.013	0.107	-1.122
	(0.697)	(0.476)	(0.860)
Base	3,095	6,368	2,562
2009	0.731	0.276	-1.692*
	(0.787)	(0.496)	(0.865)
Base	3,136	6,604	2,605
2010	-0.319	0.259	-1.966**
	(0.718)	(0.476)	(0.889)
Base	3,490	7,114	3,064
2011	-0.078	0.162	-1.388*
	(0.692)	(0.459)	(0.819)
Base	3,621	7,435	3,348

	Female full-time	Female part-time	Male full-time
2012	0.293	-0.251	-1.453*
	(0.705)	(0.461)	(0.846)
Base	3,546	7,261	3,268
Pooled – all years	0.842	0.201	-1.116
	(0.538)	(0.378)	(0.716)
Base	24,398	53,446	22,239
Pooled – base	1.278**	0.273	-0.762
	(0.545)	(0.383)	(0.723)
Recession (2008-2009)	-0.393	-0.088	-0.642
	(0.406)	(0.251)	(0.406)
Recovery (2010-2012)	-1.302***	-0.222	-0.815**
	(0.332)	(0.210)	(0.354)
Base	24,398	53,446	22,239
Impact of upratings only:			
Pooled – all years	0.925*	0.190	-1.138
	(0.541)	(0.381)	(0.720)
Base	23,137	50,841	21,226
Pooled – base	1.488***	0.260	-0.763
	(0.552)	(0.388)	(0.731)
Recession (2008-2009)	-0.603	-0.075	-0.640
	(0.410)	(0.252)	(0.412)
Recovery (2010-2012)	-1.512***	-0.209	-0.814**
	(0.337)	(0.213)	(0.362)
Base	23,137	50,841	21,226

Notes: Unweighted estimates without control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

7.2. Alternative comparison groups

Using a comparison group drawn from higher up the wage distribution (Tables 42 to 45) does have some impact on whether employment and hours effects from the NMW are statistically significant for individual years and in the pooled results. This is unsurprising, as those higher up the wage distribution might be expected to be affected differently by changes in the economy, aside from the uprating of the NMW. This would mean that these alternative comparison groups may provide a less robust estimate of what would have happened to employees affected by the uprating of the NMW, had the uprating not taken place, than if the comparison group were more similar to minimum-wage employees. The sensitivity of the results to the choice of comparison group is most evident for female part-time and male full-time employees, suggesting that those higher up the wage distribution may be poor proxies for them in particular.

Table 42 reports the impact of the uprating of the NMW on employment retention when using a comparison group composed of those earning between 10 and 20 per cent more than the NMW. Aside from differences in the statistical significance of results for individual years, a positive impact of the NMW on employment retention by female full-time employees in the recovery period is evident in this model, when this was not the case when the comparison group was drawn from lower down the wage distribution.

Table 42 Impact of the adult NMW on employment retention, 10 to 20 per cent comparison group, ASHE

	Female full-time	Female part-time	Male full-time
1998	-0.021	-0.057***	-0.011
	(0.028)	(0.018)	(0.030)
Base	3,989	9,065	3,693
2000	-0.054	-0.106***	-0.012
	(0.037)	(0.022)	(0.042)
Base	3,352	7,762	2,913
2001	-0.030	-0.046**	-0.017
	(0.029)	(0.018)	(0.031)
Base	3,971	9,060	3,674
2002	-0.046	-0.008	-0.048
	(0.033)	(0.020)	(0.037)
Base	3,622	8,649	3,371
2003	-0.009	-0.030	0.048
	(0.029)	(0.019)	(0.031)
Base	4,029	8,905	3,852
2004	-0.050*	0.002	0.013
	(0.026)	(0.017)	(0.029)
Base	4,472	9,620	4,428
2005	-0.081***	-0.040**	-0.020
	(0.027)	(0.018)	(0.029)
Base	4,547	9,996	4,555
2006	-0.047*	-0.019	0.026
	(0.029)	(0.019)	(0.030)
Base	4,918	10,103	4,952
2007	-0.086***	-0.050***	-0.040
	(0.027)	(0.019)	(0.030)
Base	4,333	9,005	4,265
2008	-0.054**	-0.060***	0.006
	(0.027)	(0.018)	(0.030)
Base	4,348	8,940	4,218
2009	-0.033	-0.085***	-0.025
	(0.028)	(0.018)	(0.030)
Base	4,477	9,208	4,493

	Female full-time	Female part-time	Male full-time
2010	-0.012	-0.051***	-0.035
	(0.027)	(0.018)	(0.028)
Base	4,670	9,512	4,776
2011	-0.027	-0.054***	-0.050*
	(0.026)	(0.017)	(0.027)
Base	5,248	10,755	5,720
2012	-0.018	-0.045***	-0.023
	(0.026)	(0.018)	(0.028)
Base	5,016	10,549	5,289
Pooled – all years	-0.040*	-0.047***	-0.018
	(0.021)	(0.013)	(0.023)
Base	36,188	74,033	38,658
Pooled – base	-0.047**	-0.040***	-0.010
	(0.021)	(0.014)	(0.024)
Recession (2008-2009)	0.002	-0.035***	-0.000
	(0.015)	(0.010)	(0.016)
Recovery (2010-2012)	0.026**	-0.013	-0.028**
	(0.012)	(0.008)	(0.012)
Base	36,188	74,033	38,658
Impact of upratings only:			
Pooled – all years	-0.042**	-0.046***	-0.019
	(0.021)	(0.014)	(0.023)
Base	34,107	69,360	36,622
Pooled – base	-0.051**	-0.037***	-0.010
	(0.021)	(0.014)	(0.024)
Recession (2008-2009)	0.006	-0.038***	-0.000
	(0.015)	(0.010)	(0.016)
Recovery (2010-2012)	0.030**	-0.015*	-0.029**
	(0.012)	(0.008)	(0.012)
Base	34,107	69,360	36,622

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

When the comparison group is composed of those earning 20 to 30 per cent more than the NMW before each uprating, the negative employment effects for female part-time employees prior to the recession, and when all years are pooled, lose statistical significance (Table 43). The negative employment effect for male full-time employees in the recovery also becomes statistically insignificant. Therefore, the impact of the NMW on employment retention becomes less apparent when the comparison group is drawn from those higher up the wage distribution.

Table 43 Impact of the adult NMW on employment retention, 20 to 30 per cent comparison group, ASHE

	Female full-time	Female part-time	Male full-time
1998	-0.033	-0.080***	-0.017
	(0.026)	(0.018)	(0.026)
Base	4,528	8,482	4,750
2000	-0.054	-0.069***	0.013
	(0.034)	(0.022)	(0.038)
Base	3,955	7,740	4,160
2001	-0.035	-0.003	-0.004
	(0.025)	(0.018)	(0.027)
Base	4,686	8,661	5,036
2002	-0.045	-0.015	-0.071**
	(0.031)	(0.020)	(0.033)
Base	4,140	7,561	4,357
2003	-0.010	-0.016	0.049*
	(0.026)	(0.018)	(0.028)
Base	4,658	8,355	5,020
2004	0.016	0.056***	0.026
	(0.026)	(0.018)	(0.026)
Base	5,001	9,067	5,689
2005	-0.043*	-0.021	0.008
	(0.026)	(0.018)	(0.027)
Base	4,937	9,025	5,480
2006	0.013	0.021	0.053*
	(0.028)	(0.020)	(0.028)
Base	5,324	9,198	5,887
2007	-0.023	0.003	-0.022
	(0.027)	(0.019)	(0.027)
Base	4,538	8,157	5,157
2008	-0.008	-0.018	0.030
	(0.026)	(0.019)	(0.028)
Base	4,714	8,225	5,211
2009	0.014	-0.059***	0.002
	(0.027)	(0.018)	(0.027)
Base	4,878	8,440	5,657

	Female full-time	Female part-time	Male full-time
2010	0.001	-0.037**	-0.023
	(0.025)	(0.018)	(0.025)
Base	5,150	8,818	5,885
2011	-0.023	-0.009	-0.015
	(0.024)	(0.018)	(0.025)
Base	5,716	9,803	6,466
2012	0.018	-0.024	0.016
	(0.025)	(0.018)	(0.025)
Base	5,618	9,777	6,663
Pooled – all years	-0.017	-0.018	0.003
	(0.019)	(0.014)	(0.020)
Base	38,450	66,618	45,284
Pooled – base	-0.022	-0.012	0.005
	(0.019)	(0.014)	(0.021)
Recession (2008-2009)	0.015	-0.029***	0.010
	(0.015)	(0.011)	(0.015)
Recovery (2010-2012)	0.013	-0.010	-0.014
	(0.012)	(0.008)	(0.012)
Base	38,450	66,618	45,284
Impact of upratings only:			
Pooled – all years	-0.016	-0.013	0.004
	(0.019)	(0.014)	(0.021)
Base	36,183	62,343	42,852
Pooled – base	-0.021	-0.003	0.008
	(0.019)	(0.014)	(0.021)
Recession (2008-2009)	0.014	-0.038***	0.006
	(0.015)	(0.011)	(0.015)
Recovery (2010-2012)	0.011	-0.019**	-0.017
	(0.012)	(0.009)	(0.012)
Base	36,183	62,343	42,852

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

The hours worked by female part-time employees appeared to be negatively affected by the uprating of the NMW during the recession and recovery period when a comparison group earning 10 to 20 per cent more than the NMW prior to each uprating was used (Table 44). Negative hours effects also emerged for male full-time employees during the recessionary period (and more strongly in the recovery). Also, for male full-time employees directly affected by the uprating of the NMW, the NMW had a negative impact on hours worked when averaged across all years since its introduction.

Table 44 Impact of the adult NMW on hours, 10 to 20 per cent comparison group, ASHE

	Female full-time	Female part-time	Male full-time
1998	-0.592	0.352	-1.046
	(0.697)	(0.471)	(0.728)
Base	2,900	6,255	2,529
2000	0.244	0.306	1.044
	(0.829)	(0.632)	(1.019)
Base	2,483	5,486	2,066
2001	1.327**	0.194	0.512
	(0.642)	(0.476)	(0.719)
Base	2,926	6,381	2,613
2002	-0.515	-0.081	0.065
	(0.804)	(0.570)	(1.098)
Base	2,671	6,072	2,358
2003	0.235	0.584	0.042
	(0.722)	(0.497)	(0.864)
Base	2,982	6,249	2,771
2004	0.692	-0.585	-1.066
	(0.708)	(0.456)	(0.749)
Base	3,396	6,906	3,202
2005	-0.384	-0.208	-1.221
	(0.698)	(0.470)	(0.775)
Base	3,406	7,035	3,239
2006	0.655	-1.147**	-0.908
	(0.729)	(0.469)	(0.778)
Base	3,237	6,351	3,050
2007	0.735	-0.812	-1.429*
	(0.735)	(0.494)	(0.791)
Base	3,236	6,281	2,930
2008	0.111	-1.018**	-1.847**
	(0.723)	(0.488)	(0.757)
Base	3,233	6,311	2,938
2009	-0.177	-0.840*	-1.915**
	(0.796)	(0.506)	(0.765)
Base	3,355	6,405	3,193

	Female full-time	Female part-time	Male full-time
2010	-0.835	-0.826*	-2.275***
	(0.736)	(0.481)	(0.798)
Base	3,527	6,648	3,411
2011	-0.257	-0.977**	-1.958***
	(0.707)	(0.461)	(0.716)
Base	3,838	7,267	4,027
2012	-0.176	-1.084**	-1.644**
	(0.719)	(0.467)	(0.745)
Base	3,720	7,113	3,726
Pooled – all years	0.211	-0.444	-1.452**
	(0.565)	(0.367)	(0.624)
Base	26,814	50,616	26,869
Pooled – base	0.455	-0.149	-0.944
	(0.570)	(0.373)	(0.631)
Recession (2008-2009)	-0.294	-0.806***	-1.165***
	(0.402)	(0.269)	(0.380)
Recovery (2010-2012)	-0.821**	-0.803***	-1.141***
	(0.331)	(0.224)	(0.337)
Base	26,814	50,616	26,869
Impact of upratings only:			
Pooled – all years	0.313	-0.487	-1.481**
	(0.569)	(0.371)	(0.630)
Base	25,306	47,449	25,508
Pooled – base	0.644	-0.192	-0.928
	(0.577)	(0.380)	(0.644)
Recession (2008-2009)	-0.450	-0.740***	-1.179***
	(0.405)	(0.271)	(0.386)
Recovery (2010-2012)	-0.979***	-0.739***	-1.155***
	(0.335)	(0.228)	(0.346)
Base	25,306	47,449	25,508

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

Reductions in hours worked in response to the uprating of the NMW were also evident for male full-time employees when those earning 20 to 30 per cent more than the NMW were used as the comparison group, both in the recession and recovery periods and when averaged across all years (Table 45). By contrast, the hours of female full-time employees were more likely to increase on average in response to the uprating of the NMW in the years prior to the recession. These findings (for both male and female full-time employees) were not statistically significant in the analysis which used those earning up to 10 per cent more than the NMW as the comparison group.

Table 45 Impact of the adult NMW on hours, 20 to 30 per cent comparison group, ASHE

	Female full-time	Female part-time	Male full-time
1998	-0.220	0.026	-1.169*
	(0.644)	(0.479)	(0.653)
Base	3,394	6,025	3,397
2000	0.857	0.064	0.462
	(0.776)	(0.624)	(0.927)
Base	3,014	5,550	3,011
2001	1.989***	-0.673	-0.197
	(0.595)	(0.466)	(0.679)
Base	3,574	6,146	3,698
2002	0.504	-1.050*	-0.548
	(0.761)	(0.559)	(1.071)
Base	3,140	5,450	3,189
2003	1.135*	0.464	-1.024
	(0.683)	(0.491)	(0.826)
Base	3,565	5,982	3,732
2004	1.479**	-0.281	-1.522**
	(0.703)	(0.468)	(0.736)
Base	3,818	6,552	4,232
2005	0.980	-1.559	-1.454*
	(0.668)	(1.013)	(0.760)
Base	3,734	6,418	3,988
2006	2.078***	-0.415	-1.325*
	(0.742)	(0.496)	(0.768)
Base	3,546	5,858	3,790
2007	1.793**	-0.168	-2.157***
	(0.704)	(0.506)	(0.765)
Base	3,394	5,688	3,641
2008	0.577	-0.448	-1.801**
	(0.711)	(0.497)	(0.738)
Base	3,555	5,812	3,733
2009	0.719	-0.047	-2.269***
	(0.781)	(0.509)	(0.746)

	Female full-time	Female part-time	Male full-time
Base	3,678	5,951	4,117
2010	0.151	0.062	-2.750***
	(0.714)	(0.485)	(0.774)
Base	3,976	6,231	4,344
2011	0.957	-0.207	-2.072***
	(0.693)	(0.469)	(0.702)
Base	4,311	6,646	4,632
2012	1.042	-0.247	-2.100***
	(0.699)	(0.472)	(0.728)
Base	4,233	6,677	4,771
Pooled – all years	0.943*	-0.356	-1.599***
	(0.519)	(0.379)	(0.585)
Base	28,962	45,947	32,188
Pooled – base	1.204**	-0.371	-1.212**
	(0.524)	(0.390)	(0.591)
Recession (2008-2009)	-0.715*	-0.027	-0.754**
	(0.397)	(0.285)	(0.370)
Recovery (2010-2012)	-0.676**	0.087	-0.972***
	(0.320)	(0.241)	(0.327)
Base	28,962	45,947	32,188
Impact of upratings only:			
Pooled – all years	1.007*	-0.407	-1.634***
	(0.524)	(0.384)	(0.592)
Base	27,258	42,925	30,490
Pooled – base	1.384***	-0.439	-1.219**
	(0.531)	(0.399)	(0.605)
Recession (2008-2009)	-0.940**	0.017	-0.752**
	(0.400)	(0.289)	(0.377)
Recovery (2010-2012)	-0.907***	0.128	-0.969***
	(0.325)	(0.247)	(0.337)
Base	27,258	42,925	30,490

Notes: Weighted estimates with control variables. ***=statistically significant at the 1 per cent level; **=statistically significant at the 5 per cent level; *=statistically significant at the 10 per cent level. Standard errors shown in parentheses.

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