Beyond the wage:
Changes in employment and compensation patterns in response to the national minimum wage

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Executive summary

This study examines whether the national minimum wage has changed aspects of individuals' work arrangements, other than just their hourly wage, drawing on data from the Annual Survey of Hours and Earnings and the Labour Force Survey for the period 1997-2011.

The study defines a 'wage gap' variable, equal to the amount the following year's minimum wage is above each worker's wage or zero if the new minimum wage is less than the worker's wage. The analysis then examines how this wage gap affects various outcome measures, controlling for all factors that vary across workers but do not vary over time. The analysis is restricted to those who are initially employed, meaning that it is unable to examine flows into employment.

The results indicate that the minimum wage has a significant negative effect on a person's likelihood of remaining in the same job or with the same employer a year later. However, the effect of the minimum wage on the probability of exiting employment altogether is modest, since many workers change firms within a year of a minimum wage rise.

The relationship between job exit and the minimum wage is found to strengthen after 2008, coinciding with the period of recession. However, young people are not found to be significantly more likely to leave employment because of the minimum wage than are adults.

Among those who remain with the same employer, the minimum wage reduces hours and weeks of work. This weakens the overall effect of the minimum wage on weekly income and means that there is no statistically significant effect of the minimum wage on annual income.

The minimum wage is found to have little effect on levels of non-basic pay, the use of temporary contracts or the provision of pensions by employers. It also has no significant effect on various types of flexible employment arrangements, such as zero hours contracts. However, measurement error and the shortness of the panel in the Labour Force Survey are found to present a significant obstacle to deriving accurate estimates using these data.

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1. Introduction

Previous studies have found that the U.K. minimum wage has had little effect on the employment levels of low-wage workers, but that it has raised their hourly earnings (Swaffield 2009, Dickens and Manning 2004, Stewart 2009). In contrast, relatively little attention has been paid to the possibility that employers might attempt to recoup the costs associated with the minimum wage by economising on aspects of the total employment package other than the basic hourly wage. Furthermore, this research has produced conflicting results, with some reporting that employers cut overtime and non-wage benefits in response to the minimum wage (White 1999, Brown and Crossman 2000) and others finding no significant relationship (Adam-Smith *et al*. 2003, Incomes Data Services 2005). These previous studies have all relied on relatively small surveys, however, and no large-scale longitudinal study has addressed the topic directly.

The aim of this paper is to examine how the national minimum wage affects the stability and composition of low-wage workers' total compensation, even when they remain employed. Specifically, it explores whether workers who are affected by a minimum wage increase are more likely to experience changes in job or employer, reductions in work hours, the rewards for overtime or shift work, or entitlements to pensions, and to change to more flexible forms of employment, such as temporary contracts, flexible hours or zero hours contracts.

Data from the Annual Survey of Hours and Earnings and the Labour Force Survey are used, for the period 1997-2011. Both datasets follow workers over time, meaning that it is possible to examine the effects of the minimum wage on those who are

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initially in low-paid employment. Previous studies (such as Card and Krueger 1995) have pointed out that low-paid workers are likely to have unstable employment histories, regardless of whether they are affected by changes in the minimum wage. In response, the study controls for workers' inherent propensities of changing outcomes over time by exploiting the longitudinal nature of data and including worker fixed effects in the regression analysis. Furthermore, by dividing the sample into pre- and post-2008 periods, evidence is presented on whether employers' behaviour has changed as a result of the recession. The effects of the minimum wage are also allowed to vary between adults and those on youth or youth development rates.

The next section briefly discusses previous work on the link between the minimum wage and work arrangements in the U.K. Section 3 describes the two datasets that are used and Section 4 outlines the empirical approach. The results from the analysis of the ASHE and LFS datasets are reported in Sections 5 and 6, respectively.

2. Literature review

Few previous studies have examined whether employers respond to the minimum wage by adjusting aspects of the employment relationship other than simply the hourly wage. These have all relied on data from small, specially-conducted surveys. Brown and Crossman (2000) surveyed 177 hotels in the lead-up to the introduction of the national minimum wage in 1998, in order to ascertain managers' strategies for dealing with the increase in labour costs. The majority of hotels reported that they planned to minimise costs elsewhere, by cutting paid breaks and holidays, charging for meals and accommodation, reducing overtime payments and employing more young and part-time workers. However, a sizeable fraction of respondents also planned to take a 'quality enhancement' approach, by employing better quality staff, using agency staff and increasing training provision.

Adam-Smith *et al*. (2003) conducted a follow-up study in 2000-01, after the introduction of the national minimum wage. In contrast to Brown and Crossman's findings, they reported that the minimum wage had had relatively little effect on the organisation of work within the hospitality industry. The informal nature of the industry means that managers have a high degree of flexibility regarding the 'wage-work bargain' and that businesses are able to absorb wage increases without making

major changes to operations, for example, by requiring employees to work harder to cover staffing shortages.

Incomes Data Services (2005) also reported little effect of the minimum wage on non-pay benefits, based on a postal survey of 341 organisations, with a follow-up telephone survey of a subset of these. 89% of employers reported that the national minimum wage had not led them to make any changes in the provision of the non-pay benefits, although the fraction was slightly lower among organisations with more than 500 employees.

3. Data

The analysis draws on individual-level longitudinal data from both the Annual Survey of Hours and Earnings (ASHE) and the Labour Force Survey (LFS). Each dataset has strengths and weaknesses, as outlined below.

Annual Survey of Hours and Earnings

The ASHE is an annual survey which collects data on the wages, work hours and pension arrangements of around 1% of the U.K. working population. Additional information, such as age, occupation and industrial classification, is also included. The ASHE was introduced in 2004 and replaced the New Earnings Survey (NES). However, by applying ASHE methodologies to NES data for the 1997-2003 period, the ONS has produced ASHE datasets for 1997 onwards. The analysis in this study uses data for 1997-2011.

The ASHE sample is drawn from HM Revenue and Customs' Pay As You Earn register, based on the last two digits of a worker's National Insurance Number. Survey forms are sent to all employers of the selected workers to complete. The analysis in this study includes all jobs a person had in each period. The questions in the ASHE refer to a reference week, which is in April each year. If a person does not work in a given year, they will not appear in the dataset. Therefore, the only way to determine whether someone has moved out of employment is by their absence from the data in a given year. Obviously, this will also include people who have moved abroad or died. However, as long as the fraction of people making these transitions is constant across the wage distribution, this will not bias the results from the empirical strategy outlined in the next section. Workers might also be absent from the ASHE if an employer fails to respond to the questionnaire or if they are not included in the

PAYE register because their earnings fall below the National Insurance Lower Earnings Limit.

Although it has a limited range of personal characteristics compared to the Labour Force Survey, the major benefits of the ASHE are its larger sample size and the fact that its wage and hours data are more accurate, since the responses are provided by employers rather than by employees. In addition, the ASHE tracks respondents year after year, which allows the analyst to separate the effects of the minimum wage from any inherent differences in labour market outcomes across workers.

Labour Force Survey

The LFS is a household survey, which collects information on a wide range of labour force measures and other topics. Since 1992 it has been conducted on a quarterly basis, with each sample household retained for five consecutive quarters and a fifth of the sample replaced each quarter. Although the survey was designed to produce cross-sectional data, by linking together data on individuals across quarters a short-term longitudinal dataset can be produced. The analysis in Section 6 will use pooled data for all cohorts who entered the LFS between the first quarter of 1997 and the final quarter of 2011.

The major benefit of the LFS for the purposes of this study is that it contains considerably more information than the ASHE on these aspects of respondents' jobs. A drawback of the LFS is that workers are only observed for five quarters, which means it is not possible to control for a person's inherent employment stability as accurately as in the ASHE data. In addition, the LFS wage data are known to be less accurate than those in the ASHE. The LFS contains two measures of hourly pay: usual hourly pay, calculated by dividing usual weekly earnings by usual weekly hours, and basic hourly pay rate for those workers who reported having a basic rate. Previous research (Dickens *et al*. 2012) has shown that the latter of these is more accurate. Although this measure is only available for a subset of respondents, this is not a major drawback as most minimum wage workers are paid by the hour.

Some variables are not available in all quarters. Pay information in only collected in the first and last waves a household is in the dataset. Shift work data is only collected in the third quarter of each year. Although information on the use of flexible employment arrangements is collected in each quarter, it is not available in the

longitudinal dataset after 2010.[1] The consequences of these complications will be discussed in Section 6.

Descriptive statistics

Table 1 presents means for the regression samples that will be used in the analysis in Sections 5 and 6. The level of job separations is much higher in the ASHE, partly because secondary jobs are included in this sample, but not the LFS sample. The wage gap is much lower in the ASHE sample because observations are included from years in which workers who previously had low wages but do not any longer.

A series of histograms of wages in each quarter using the ASHE data are presented in Figure 1. These show how the minimum wage has increasingly compressed the wage distribution of low-paid workers. A high degree of 'bunching' occurs around the prevailing minimum wage each period and this has become more pronounced over time as the minimum wage has been raised. Neoclassical economic theory predicts that in a competitive labour market firms should pay a given worker exactly his/her marginal revenue product. However, in contrast, it appears that many firms retain their low-paid workers after the minimum wage is raised, choosing instead to increase their wages to comply with the new level. This pattern has also been noted in other countries, including the U.S. (Card and Krueger, 1995).

Figures 2 and 3 plot the evolution of the wage distribution using the LFS data, with each histogram representing the period the minimum wage was held at a particular level. Figure 2 uses the usual hourly pay rate variable and shows a large fraction of people earning less than the minimum wage, most likely due to the measurement error in this variable. The distribution of the basic hourly rate variable (shown in Figure 3) resembles more closely the ASHE wage variable.

4. Methodology

The empirical analysis follows the approach used by Currie and Fallick (1996), Kramarz and Philippon (2001) and Papps (2012) and in the U.K. by Stewart (2004) and Dickens *et al*. (2012), which involves the construction of a 'wage gap' variable

[1] Although it is available for all years in the regular cross-sectional datasets, the necessary person and household identifiers are randomised after 2010, meaning it is not possible to merge it in to the longitudinal dataset.

measuring how much extra an employer must pay to retain a current employee after a minimum wage increase. When the minimum wage rises, workers who already earn more than the new minimum wage may be retained without any pay raise; however, workers who currently earn less than the new minimum wage cannot be (legally) retained by the employer without receiving a pay raise. The amount of the necessary pay raise will be equal to the difference between a worker's current wage and the new minimum wage. Hence, the treatment variable, $WAGEGAP_{it}$, is defined for each person *i* in each year *t* as follows, where w_{it} is the person's current hourly wage (in 2012 pounds, adjusted using the RPI) and $\overline{w}_{i(t+1)}$ is the relevant minimum wage in the following year:

$$WAGEGAP_{it} = \begin{cases} \overline{w}_{i(t+1)} - w_{it} & \text{if } w_{it} < \overline{w}_{i(t+1)} \\ 0 & \text{if } w_{it} \geq \overline{w}_{i(t+1)} \end{cases}. \quad (1)$$

The wage gap variable allows the analyst to distinguish between workers whose wage rates are affected by the minimum wage to differing degrees (unlike a standard difference-in-differences approach). This variation alone is sufficient to identify the effect of any increase in the minimum wage. However, following Currie and Fallick's approach, two control groups are included in the analysis, in order to control for omitted factors that might affect treated workers in any period.

Firstly, workers who initially earn slightly more than the following year's minimum wage (so that *WAGEGAP*=0) will be included in the sample in order to form a control group, as they will be unaffected by the minimum wage change. Hence, this group will provide an estimate of what *would* have happened in the absence of a change in the minimum wage between year *t* and year *t*+1 to the earnings of workers who are 'bound' by the minimum wage. Specifically, all workers who are ever observed to earn a real wage less than £7 (in 2012 pounds) between 1997 and 2011 are included in the sample. Workers whose hourly wage is always higher than this cut-off are excluded from the sample, as they are unlikely to provide a good comparison with minimum wage workers.

Secondly, in contrast to previous U.K. research, this analysis will exploit the longitudinal nature of the ASHE and LFS by comparing treated individuals' outcomes with their outcomes in periods when the minimum wage had little or no effect on their earnings. In effect, people can be used as counterfactuals for themselves by examining their labour market characteristics at different points in time. The major advantage of

this approach is that it is possible to control for each individual's long-run level of the dependent variable (for example, their likelihood of leaving employment in any period), regardless of whether the minimum wage has changed. Previous U.K. studies have in general only included a dummy for whether a person was 'bound' by the minimum wage, which allows for a general difference in outcomes between this group and those who are not bound by the minimum wage, but does not control for differences in outcomes *within* the bound group.

Although relatively few workers will be bound by the minimum wage between any two years, by pooling data over the full history of the national minimum wage, robust estimates may be obtained. Data from before the introduction of the national minimum wage (1997-1998) are used wherever possible, because they will contribute to the estimate of each person's long-run level of employment and earnings stability. For workers who turn 18 or 20 (or 21 prior to 2010) between periods t and t+1, *WAGEGAP* is positive because the person will become eligible for the youth development rate or adult rate in the following period. Similarly, apprentices who complete a year working at one firm qualify for the adult minimum wage and therefore will have a positive value of *WAGEGAP*.

The sample is restricted to people aged 16-64 who were employed in the initial quarter or year (t). Observations with wages less than 95% of the prevailing minimum wage are dropped from the sample. When analysing outcomes of job-specific outcomes, such as work hours, the sample will be further restricted to those who are still employed in the same job the following quarter or year (t+1).

The empirical analysis uses the following general specification:

$$\Delta Y_{i(t+1)} = \alpha WAGEGAP_{it} + \mathbf{X}_{it}\boldsymbol{\beta} + \mu_i + \lambda_t + \varepsilon_{it} . \quad (2)$$

The dependent variable here represents the change in some employment outcome from period t to period $t+1$. For example, when job separations are considered, $\Delta Y_{i(t+1)}$ is simply a dummy variable for whether person i is employed in period $t+1$, given that they were employed in period t, *i.e.* $\Delta Y_{i(t+1)} = (E_{i(t+1)} \mid E_{it} = 1)$. Person fixed effects, μ, are included to control for the effects of *all* time-invariant factors, whether observed, such as sex or education, or unobserved, such as a person's inherent level of $\Delta Y_{i(t+1)}$, irrespective of the minimum wage. Time dummies, λ, are included to control for any macroeconomic factors that affect all workers' outcomes from year to year. ε is a stochastic error term. $\mathbf{X}$ includes age and, in the LFS only, job tenure in months.

Although the inclusion of worker fixed effects in the regression equation controls for differences in individuals' inherent levels of employment instability, it is still possible that certain *jobs* may have higher turnover than others. To control for this possibility, controls for a worker's initial wage were also included in **X** in the ASHE sample only. These consisted of dummies for a worker's centile in the sample wage distribution, along with their interaction with the worker's real wage. These allow for a linear relationship between the dependent variable and the real wage that varies across each wage centile. Because the LFS sample is considerably smaller, the wage controls were omitted when analysing this sample; however, in unreported regressions, adding a worker's real wage as a regressor was not found to alter the results qualitatively.

Equation 2 is estimated by OLS in all cases, including when the dependent variable is a dummy variable, in which case it may be interpreted as a linear probability model. The estimates of α provide a measure of how much a particular worker's outcome variable changes when his/her employer is required to raise his/her hourly wage by £1 because of a minimum wage rise.

One additional complication in the analysis of the LFS is that this survey only asks respondents questions about their pay in the first and last quarters they are in the sample. Since this information is needed to construct the wage gap variable, there is no straightforward way to construct a panel dataset for the LFS. In response, two alternative solutions are tried. Firstly, each person's fixed effect is estimated by regressing the relevant dependent variable on a set of dummies for the number of quarters the household has spent in the sample, **Z**, (to control for possible systematic variation in sample attrition) and a set of person dummies, including observations from all quarters a household is interviewed:

$$\Delta Y_{i(t+1)} = \mathbf{Z}_{it}\boldsymbol{\beta} + \mu_i + \nu_{it} . \quad (3)$$

The estimated fixed effect from this regression, $\hat{\mu}$, is then added to a cross-sectional regression alongside all other independent variables and its coefficient constrained to be equal to one.

$$\Delta Y_{i(t+1)} = \alpha WAGEGAP_{it} + \mathbf{X}_{it}\boldsymbol{\beta} + \hat{\mu}_i + \lambda_t + \varepsilon_{it} . \quad (4)$$

The second approach that is taken is to restrict the analysis to those cohorts who enter the sample in the quarter prior to a minimum wage increase (the first quarter of 1999 and the third quarter of all subsequent years). Although we do not know a person's wage during the second, third and fourth quarters they are in the sample,

since the minimum wage does not change immediately after those periods, $WAGEGAP = 0$ by construction. Exceptions are people who turn 18 or 20 (or 21 prior to 2010) and apprentices who have completed a year at one firm. Since it is not possible to calculate *WAGEGAP* for these groups, the sample is restricted to those aged 22 and over for this specification and excludes apprentices with less than one year of tenure at their current employer.

5. ASHE analysis

The first section of the analysis uses the ASHE data for 1997-2012 to examine how changes in the national minimum wage have affected workers' likelihood of leaving their job or employment altogether; hourly, weekly and annual earnings; amount of overtime, shift or incentive pay received per week; and type of pension scheme or employee contract (*i.e*. permanent or temporary). Means of the key variables that are used are reported in Table 2, separately for those workers who are bound and not bound by changes in the minimum wage.

Job exit

Table 3 presents the results of estimating equation 2 when the dependent variable is a dummy variable for whether the person is still employed in the following year. Hence, they provide evidence of whether the minimum wage increases the rate of job separations. The first column of the table reports the results when the dependent variable is further restricted to whether the person is still employed in the same job in the following year, according to the PAYE reference number of the employer and reported information on whether a person has changed jobs in the previous year. These variables were not available in 1997, meaning that observations from that year are omitted from this regression.[2] As seen in the first column of the table, the wage gap is seen to have a significant negative coefficient, implying that an increase in the minimum wage will increase the likelihood of affected workers exiting their jobs one year later. The coefficient implies that a 10p increase in the minimum wage leads to a

[2] As a consequence, no observations from the before the introduction of the national minimum wage are included in the analysis. The identification of the coefficient on *WAGEGAP* comes from variation in the magnitude of *WAGEGAP* from year to year for each person, due to changes in the size of the minimum wage increase or changes in the person's gross wage.

0.7 percentage point fall in a 'bound' worker's likelihood of remaining in the same job a year later.[3] The elasticity of the minimum wage with respect to employment in the same job among bound workers is -0.05 at the mean, *i.e.* a 10% increase in the minimum wage yields a 0.5% reduction in job retention probability.

In the second column of Table 3, the dependent variable used is whether a person is still employed by the same firm in the following year (on any job). The results are very similar to those in the first column, since a relatively small number of workers change jobs within the same firm. The estimated elasticity remains -0.05.

The final column of Table 3 reports the results when the probability of being employed in *any* job in a year's time is considered. Compared to the previous columns, the coefficient on the wage gap variable falls sharply, although it remains significant. A 10p increase in the minimum wage is found to lead to a 0.18 percentage point fall in the probability of remaining employed a year later. At the mean, the elasticity is now -0.01. Taken together, the results in Table 3 suggest that the minimum wage leads to a significant rise in job separations among affected workers, but that much of this increase (about 70%) is mitigated by workers finding jobs at other firms within a year.

Overall, the effects of the minimum wage on exits from employment appear modest in magnitude and the elasticity estimated in the last column of Table 3 is only around a third as large as that obtained by Currie and Fallick (1996), who used the same approach with U.S. longitudinal data. However, a number of previous studies using ASHE data with similar methodological approaches have reported insignificant employment effects of the minimum wage (for example, Stewart 2004 and Dickens *et al*. 2012). Therefore, a number of robustness checks are performed to determine why the results might vary.

The regressions in Table 3 use a £7 wage cut-off to determine the control group. Previous studies have used a variety of control groups, sometimes defining them relative to the minimum wage (*e.g.* up to 10% above the minimum wage). In order to examine how sensitive the results in Table 3 are to the choice of sample, various alternative control groups were tested. Raising or lowering the cut-off slightly was not

[3] The results in Table 3 are very similar when person fixed effects are excluded, indicating that, contrary to Card and Krueger's argument, person-specific variation in job instability is relatively unimportant.

found to alter the results qualitatively. Table 4 reports the results of two extreme assumptions regarding the control group. In the first column, all observations with wages greater than the minimum wage are included in the control group. The coefficient on *WAGEGAP* is somewhat larger than in the second column of Table 3. In the second column of Table 4, wage observations greater than the minimum wage are excluded entirely, so that the coefficient on *WAGEGAP* is identified solely by variation in this variable among bound workers. In this case, the coefficient falls slightly compared to Table 3, but it remains highly significant. Finally, the cut-off was defined relative to the minimum wage and observations were included if the current wage was less than 110% of the prevailing minimum wage. Once again, this had little effect on the coefficient of interest, as seen in the final column of Table 4.

Another concern is that the use of wage centile controls may not adequately capture differences across jobs in terms of the level of employment instability. In this case, the wage gap variable might simply reflect the fact that jobs at the bottom of each centile are more likely to be unstable (even when person effects are included). In order to address this problem, the regression from the second column of Table 3 was repeated with fixed effects for each person/firm combination, rather than just each person. This specification controls for the inherent instability of each job and identifies the effect of the minimum wage by variation in the wage gap variable over time within each job. The results (reported in the first column of Table 5) indicate a considerably larger effect of the minimum wage on the probability of a worker exiting his/her current job.

A similar concern is that the sample in Table 3 includes workers' secondary jobs, which may be more unstable than the workers' main jobs. In the second column of Table 5 the sample is restricted to main jobs (defined as the jobs on which workers work most hours per week) only.[4] This has very little effect on the coefficient on *WAGEGAP* compared to the second column of Table 3.

In the final column of Table 5, the wage centile controls were replaced by a counterfactual wage gap variable. This allows for the possibility that a job at any given point in the wage distribution has an inherent level of instability that will prevail in every period – even prior to the introduction of the minimum wage. This

[4] Only main jobs are included in the LFS sample in Section 6.

resembles the approach taken by Dickens *et al*. (2012). To do this, the 1997 data were included and the dependent variable used was the dummy for remaining in *any* job after a year. The counterfactual wage gap variable was set equal to the true wage gap in the years in which the minimum wage existed. For 1997, it was constructed as though the minimum wage had been introduced in April 1998 at the 1999 rates, deflated by RPI. When the counterfactual wage gap is included as a regressor, the coefficient on the actual wage gap captures the *additional* effect of being at a particular position in the wage distribution after 1998. The coefficient on the wage gap falls only slightly from Table 3 (from -0.018 to -0.015) and, unlike in Dickens *et al*., it remains highly significant.[5]

Table 6 examines how the effects of the minimum wage vary over time and across groups. In the first column, *WAGEGAP* is interacted with a dummy for the post-2008 period, in order to examine whether the effects of the minimum wage have changed significantly since the onset of the current period of low economic growth. The interaction term is found to have a significant negative coefficient indicating that the relationship between job separations and the minimum wage has become stronger since 2008. In the second column of the table, the effect of the wage gap variable is allowed to vary by each year. Although the magnitudes of the job separation effect vary significantly from year to year, more recent years tend to have stronger job exit effects (especially 2008 and 2010).[6] This suggests that one explanation for why Stewart (2004) failed to find a significant effect of the minimum wage is that he only used data up to 1999 (the year the national minimum wage was introduced). Indeed, when the regression sample is restricted to 1998-1999, an insignificant coefficient on *WAGEGAP* is found.

In the final column of Table 6, *WAGEGAP* is interacted with dummies for whether a person was eligible for the youth minimum wage (for those aged 16-17) or the youth development minimum wage (for those aged 18-20, or 18-21 prior to 2010).

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[5] Dickens *et al*. (2012) break up their sample by sex and full-time/part-time status and find a significant coefficient on the wage gap for part-time women. Although unreported, this group was also found to have the largest coefficient on *WAGEGAP*.

[6] One explanation for the variability in coefficients over time is that firms tend to pay 'round' amounts, such as £5.50, as suggested by Lam *et al*. (2006). Under this scenario, the minimum wage rises in 2007 (to £5.52) and 2009 (to £5.80) had little effect on job separations, because firms were already paying close to (or exactly) these amounts.

Compared to adults, those on the two youth rates are not significantly more likely to exit their jobs because of the minimum wage.

Next, the sample is restricted to those who remain with their current employer in the following year and various job characteristics are used as the dependent variable in the regression equation, in order to examine whether the minimum wage has further effects on those who remain in employment.[7] In each case, the coefficient on *WAGEGAP* is allowed to vary before and after 2008 and for those on youth and youth development rates.

Earnings and hours

If employers are to be compliant with the minimum wage, they must raise a worker's gross wage by exactly the amount of *WAGEGAP* in order to retain them the following year. This means that if the year-to-year change in a worker's gross hourly wage is used as the dependent variable in equation 1, the coefficient on *WAGEGAP* (α) should be exactly 1 in the sample of workers who retain their jobs. If there is non-compliance, α will be less than one. However, in Table 7 the estimated coefficient is found to be equal to 1.123, meaning that a worker receives 11.2p extra per hour for every 10p the minimum wage 'pushes up' his/her wage. This coefficient is not significantly different from 1 and therefore the results are consistent with a situation in which employers respond to increases in the minimum wage by raising wages of affected workers to be compliant with the new minimum. The coefficient does not vary significantly before and after 2008 or between the three minimum wage rate age groups (as seen in the second and third columns of the table).

Even if the minimum wage raises hourly pay, workers' weekly earnings might fall if they work shorter hours as a result. If total work hours do not change at all, the estimate of α in the weekly earnings regression should simply be equal to average weekly hours times the estimate of α from the hourly earnings regression. Table 8 shows that a 10p increase in the wage gap increases weekly gross pay by £2.54, slightly less than the £2.91 one would expect, given the coefficient found in Table 7 (1.123) and the average weekly work hours among bound workers reported in Table 2

[7] Of course, the sample could alternatively include all workers who remained employed, with *any* firm. However, in that case, job attributes are likely to vary between years for job-movers because of firm-specific policies unrelated to the minimum wage.

(25.943). Table 9 confirms that this is because the minimum wage leads to a significant reduction in work hours among bound workers. A 10p increase in the minimum wage shortens the average working week by around 8 minutes.

Table 10 suggests that, as well as adjusting regular weekly hours, employers make sizeable adjustments to their total labour hours by reducing weeks worked over the year. In this table, the dependent variable is the annual pay reported for the previous tax year. Once again, the sample is restricted to those workers who remain with the same firm after a year. The estimated coefficient is 263.9; however, because the minimum wage is only adjusted midway through each tax year (in October), this should be doubled. Hence, a 10p increase in the minimum wage yields a £52.78 increase in annual pay among bound workers. This is considerably less than the £104.79 increase that would be expected if the weeks worked by these workers were unchanged.[8] Indeed, the results in Table 10 indicate that the effect of the minimum wage on annual pay is not significantly different from zero.

Components of pay

As well as raising a worker's weekly pay, the minimum wage may also change the composition of the pay package. Tables 11, 12 and 13 examine the effect of the wage gap variable on the amount of incentive pay, shift/premium pay and overtime pay received per week, respectively. Over the full sample period, the minimum wage is found to have no effect on the amount of incentive pay received, which is unsurprising, given that the average bound worker only received 33p of incentive pay per week. However, a significant negative effect of the wage gap on incentive pay is found for the post-2008 period only. There is some weak evidence that the minimum wage reduced the amount of shift pay received, but only among adults. Again, the average amount of shift pay received by bound workers the sample is very low (11p per week). The minimum wage is found to have no significant effects on overtime pay.

Temporary contract status

[8] Weeks worked is not reported directly in the ASHE, but can be recovered by dividing annual pay by weekly pay. The average weeks worked among bound workers in the sample estimated in this manner is 40.73.

Although both temporary and permanent staff are eligible for the minimum wage, it is possible that employers might prefer hiring the former when labour costs are high, as they afford more flexibility. To examine whether the minimum wage has an effect on the prevalence of temporary contracts, Table 14 reports the results of regressions using a dummy for temporary (or casual) contract as the dependent variable. In this specification, the sample is restricted to those who are initially employed on permanent contracts and remain with the same employer in the following year. Hence, it analyses flows *into* temporary employment within a job. The results indicate that there is no significant relationship between the level of the minimum wage and the likelihood of moving onto a temporary contract, either in the full sample or in different time periods or age groups.

Pension provision

A final outcome that is examined with the ASHE data is the provision of a pension by the employer. Reducing fringe benefits, such as pensions, may be one way that employers can economise when the minimum wage raises the cost of hiring low-wage workers. In Table 15, the sample is restricted to those who initially have a pension and remain with the same employer in the following year. Once again, no significant effects of the minimum wage are found.

Pseudo panel analysis

One weakness of the empirical approach used so far is that it only allows an analysis of how the minimum wage affects those workers who are initially employed. Specifically, the results in Tables 3-6 provide an indication of how big flows out of employment are when the minimum wage rises, but not of the total change in employment levels. It is possible that employers might respond to changes in the minimum wage by substituting between worker types or by increasing hiring standards and replacing existing low-wage workers with more productive workers. In that case, total employment might be unchanged even though job separations increase.

Table 16 examines this possibility by using a 'pseudo panel' approach (Blundell *et al*. 1990, Morrison *et al*. 2006, Papps 2012). This involves averaging all variables

within narrowly-defined demographic groups, or cells, in each year.[9] The employment variable is now the average employment level in each cell, while the wage gap variable represents the average effect of the minimum wage on the pay of those workers in each cell who were initially employed. The percentage change in employment from year *t* to year *t*+1 is regressed on the cell averages of the wage gap, real wage, age, with cell and year dummies also included. To reflect the fact that each cell is calculated over a different number of people, observations are weighted by the number of workers in each cell.

The results indicate that there is a weak disemployment effect of the minimum wage on the total size of the workforce. At the mean, the elasticity is -0.059. When the sample is split by gender in the second and third columns, the minimum wage is found to have a negative impact on the employment of women but no significant effect on men. The employment elasticity is -0.086 for women and -0.005 for men. This is consistent with previous research which has reported larger effects of the minimum wage on female employment (Dickens *et al*. 2012).

6. LFS analysis

In this section, the longitudinally-matched quarterly LFS data for 1997-2012 will be used to examine the effect of the minimum wage on different non-wage components of workers' total compensation and the use of flexible employment arrangements. Table 17 reports means for the main variables used in this section, for the bound and unbound groups of workers.

Job exit

To begin, employment regressions are estimated, as with the ASHE data, in order to see how closely the results coincide. As noted in Section 4, there are two LFS measures of hourly wages. Table 18 reports the results for employment regressions using usual hourly pay and Table 19 reports the results using basic hourly pay rate. Since it is not possible to construct an annual panel with the LFS data, four specifications are examined. In the first column of each table, an OLS regression is estimated using the change in employment and the wage gap from the first to the fifth

[9] Specifically, the categories are decade of birth, sex and level 2 NUTS region.

quarter a household is in the sample. This resembles most closely the ASHE regression in the first column of Table 3. Additional controls are added to the regression, including dummies for whether a person is male and is married and a set of 5 education dummies (the categories are: degree or higher; higher education, below degree; A level or equivalent; GCSE A-C or equivalent; CSE below grade 1 or equivalent; no/other qualification) and 19 region dummies. The second columns of Tables 18 and 19 report the results of an OLS regression using change from the first to the second quarter each household is in the sample. The third column adds the estimated fixed effects from a quarterly fixed effects regression excluding *WAGEGAP*, with the coefficient constrained to equal one. The final column uses the quarterly panel involving only those cohorts that entered the quarter before a minimum wage change.

In the year-to-year OLS regressions, there is a significant coefficient using both measures of pay. The coefficient is larger with the basic hourly pay rate variable, although it is still smaller than the corresponding coefficient in Table 3. The coefficients are slightly smaller under the quarter-to-quarter OLS specification, indicating that the adjustment takes place over more than one quarter. This is consistent with the findings of previous studies, such as Stewart (2004), which indicate that the employment response to a minimum wage change can take a number of months. When either of the approaches to controlling for person fixed effects is used, the coefficient on *WAGEGAP* becomes insignificant. This suggests that the four-quarter panel is not long enough to analyse employment responses to the minimum wage. If adjustment takes place over all four quarters, then fixed effects estimation will be unable to detect any employment change arising from a minimum wage change.

Flexible employment arrangements

The LFS includes a question on whether a person works from home on his/her main job (or works in different places, using home as a base). Table 20 reports the results of estimating equation 2 when the dependent variable is a dummy for working from home and the same is restricted to those who remain with the same employer in the following period. The year-to-year and quarter-to-quarter OLS regressions indicate that the minimum wage increases the likelihood of a person working at home. Once again, the result disappears in the panel dataset. However, there is some

evidence that the wage gap has had a significant effect on the likelihood of working at home since 2008, but not before.

Another variable in the LFS records which (if any) of a set of flexible employment arrangements (flexible hours, annualised hours contract, term time working, job sharing, nine-day fortnight, four-and-a-half day week, zero hours contract) is the main agreed work arrangement. As noted earlier, this variable is only available in the longitudinal LFS dataset for 1997-2009. Tables 21-27 report the OLS and fixed effects specifications using dummies for each of these work arrangements in turn. For every dependent variable and in every specification, the coefficient on *WAGEGAP* is insignificant.

Additional dependent variables

Some additional regressions use variables similar to those in the ASHE. In the year-to-year OLS results reported in Table 28, there is some evidence that the minimum wage increases the likelihood of a worker moving from a permanent to a temporary contract, as in the ASHE analysis. However, the result disappears in the quarter-to-quarter specifications. There is no strong evidence that the minimum wage affects the use of shift work or usual weekly hours, as seen in Tables 29 and 30, respectively.[10] These results are inconsistent with the findings from Section 5, although as noted above, the shortness of the LFS panel means it is impossible to adequately control for workers' inherent levels of volatility in work hours or type of work.

7. Conclusion

This study has examined whether the U.K. national minimum wage affects the nature of the employment relationship for those who remain employed after it is raised, drawing on data from the Annual Survey of Hours and Earnings and the Labour Force Survey and by estimating panel data models that control for individual fixed effects. Most previous research has focused on the possible disemployment effects associated with the minimum wage. This study has found that these effects are significant but small in magnitude. However, they conceal larger shifts in

[10] It is not possible to perform a quarter-to-quarter analysis with the shift work dummy as a dependent variable, because the relevant survey question was only asked in one quarter each year.

employment of low-wage workers between firms and jobs. In addition, the minimum wage is found to reduce work hours and weeks among those who remain with the same employer, reducing the overall effect of the minimum wage on their annual pay. However, there is no evidence that the minimum wage affects workers' levels of non-basic pay (incentive pay, shift/premium pay and overtime pay) or their likelihood of shifting from a permanent contract to a temporary contract or of losing eligibility for a pension. The minimum wage is also not found to have a significant effect on the use of various types of flexible work arrangements, such as zero hours contracts, although limitations in the availability of data in the Labour Force Survey and of its structure are a hindrance to obtaining accurate estimates of these relationships.

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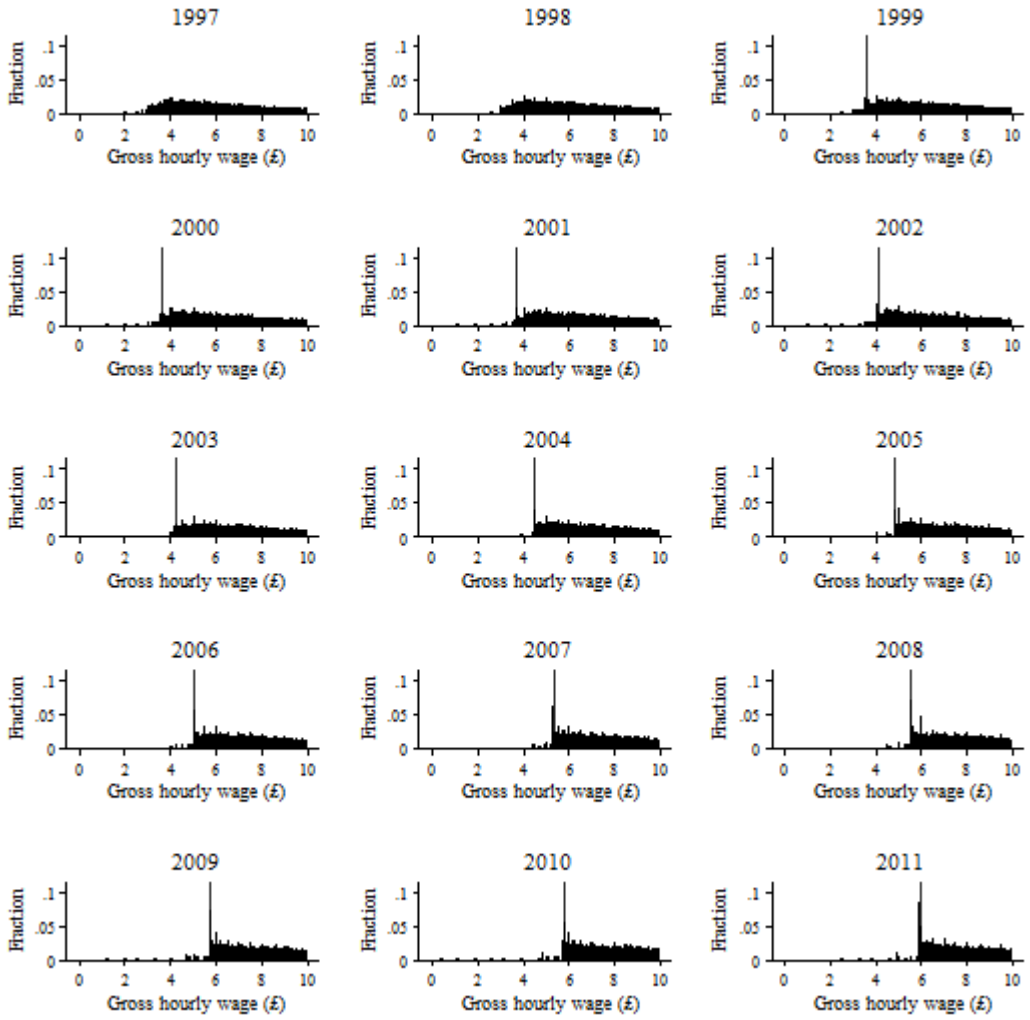
Figure 1

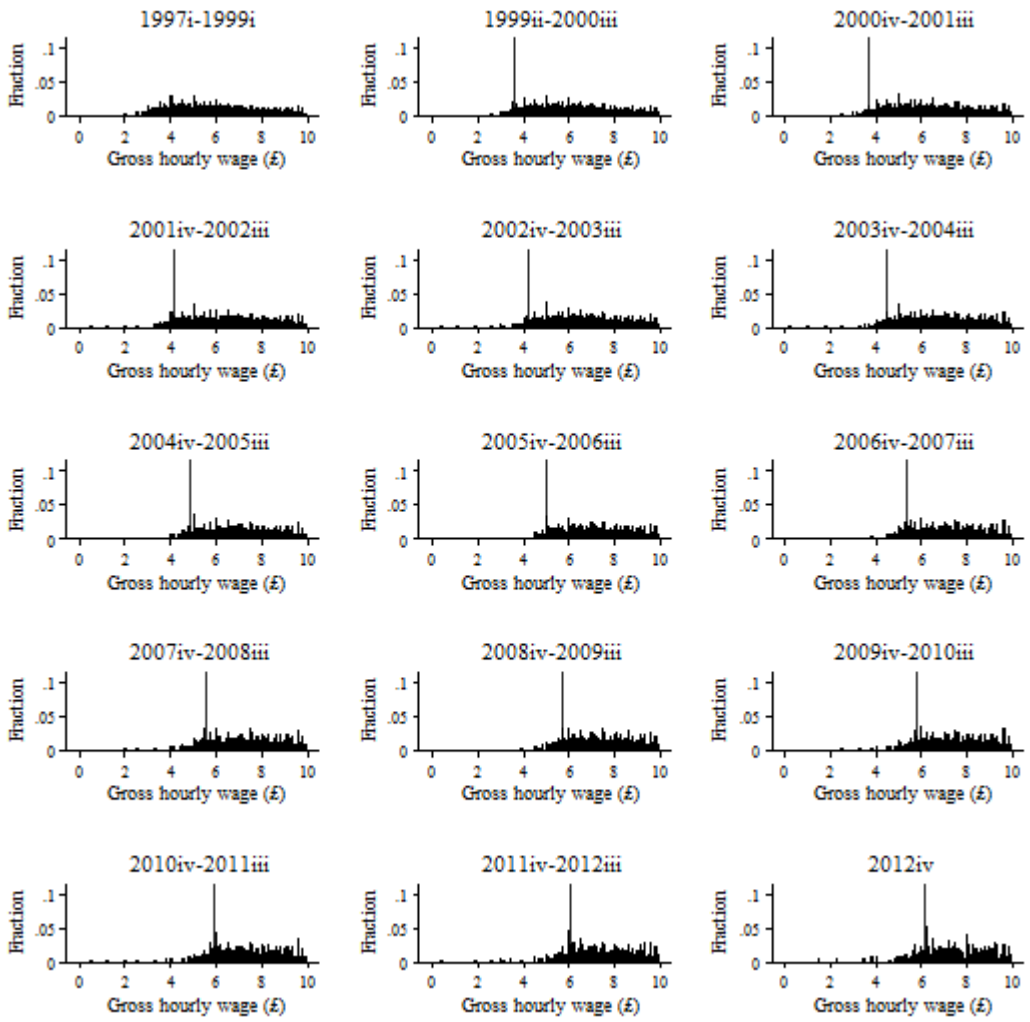
Distribution of gross hourly wage in the ASHE



Notes: The vertical spike denotes the prevailing minimum wage.
Only those with wages less than £10 are depicted and the sample is weighted by the ASHE low pay longitudinal survey weights.

Figure 2

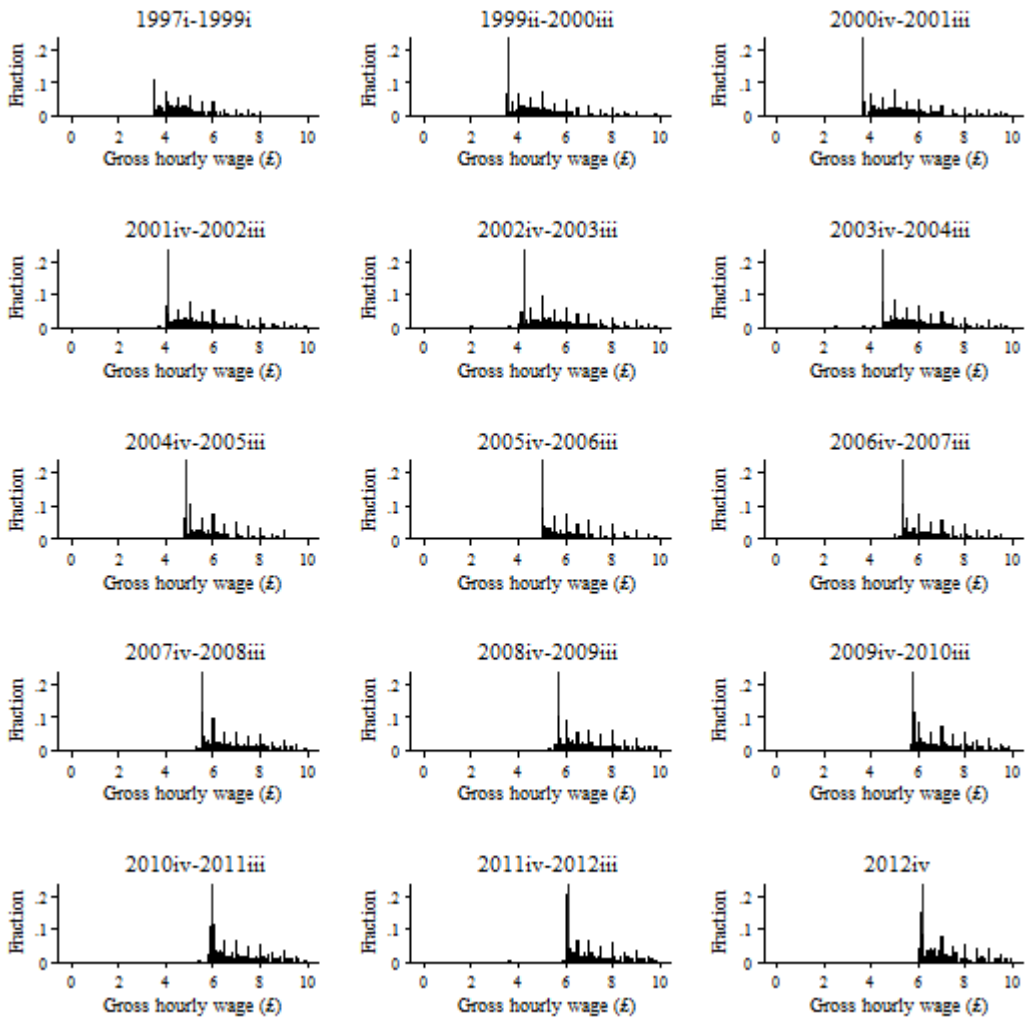
Distribution of gross hourly wage in the LFS



Notes: The vertical spike denotes the prevailing minimum wage.
Only those with wages less than £10 are depicted and the sample is weighted by the LFS longitudinal survey weights.

Figure 3

Distribution of gross basic hourly wage rate in the LFS



Notes: The vertical spike denotes the prevailing minimum wage.
Only those with wages less than £10 are depicted and the sample is weighted by the LFS longitudinal survey weights.

Table 1

Means for the ASHE and LFS estimation samples

Variable	ASHE	LFS
Same job in following year	0.605	0.690
Same job in following quarter	–	0.887
Wage gap	0.035	0.085
Age	36.993	35.524
Real wage	8.955	6.117
Weekly hours	31.062	24.389
Number of observations	776,177	18,620

Notes: The samples are those used for the basic employment regressions: column 2 of Table 3 for the ASHE and column 1 of Table 19 for the LFS.

Table 2

Means for the ASHE regression sample

Variable	All workers	Unbound workers	Bound workers
Same job in following year	0.605	0.618	0.495
Same firm in following year	0.761	0.773	0.657
Employed in following year	0.589	0.602	0.481
Wage gap	0.035	0.000	0.338
Age	36.993	37.025	36.723
Hourly pay (£)	8.955	9.354	5.530
Weekly pay (£)	285.884	302.349	144.709
Annual pay (£)	13,605.330	14,376.290	6,605.002
Incentive pay (£)	2.872	3.171	0.332
Shift pay (£)	3.759	4.188	0.116
Overtime pay (£)	15.581	16.544	7.325
Temporary	0.067	0.064	0.090
Pension provided	0.375	0.404	0.123
Weekly hours	31.062	31.659	25.943

Table 3

Basic employment regressions

Variable	Employed in same job	Employed in same firm	Employed in any firm
	(i)	(ii)	(iii)
Wage gap	-0.071***	-0.070***	-0.018***
	(0.007)	(0.007)	(0.004)
Age	-0.003***	-0.003***	-0.002***
	(0.001)	(0.001)	(0.001)
1998	–	–	-0.054***
			(0.003)
1999	-0.104***	-0.118***	-0.086***
	(0.003)	(0.003)	(0.003)
2000	0.336***	0.325***	-0.085***
	(0.004)	(0.004)	(0.004)
2001	0.067***	0.057***	-0.089***
	(0.004)	(0.004)	(0.004)
2002	0.073***	0.065***	-0.086***
	(0.005)	(0.005)	(0.005)
2003	0.102***	0.087***	-0.091***
	(0.006)	(0.006)	(0.006)
2004	0.103***	0.091***	-0.079***
	(0.007)	(0.007)	(0.006)
2005	0.176***	0.159***	-0.082***
	(0.008)	(0.008)	(0.007)
2006	0.064***	0.049***	-0.213***
	(0.009)	(0.008)	(0.008)
2007	0.169***	0.151***	-0.107***
	(0.009)	(0.009)	(0.009)
2008	0.195***	0.179***	-0.084***
	(0.010)	(0.010)	(0.009)
2009	0.244***	0.221***	-0.064***
	(0.011)	(0.011)	(0.010)
2010	0.230***	0.206***	-0.061***
	(0.012)	(0.012)	(0.011)
Constant	0.827***	0.860***	0.869***
	(0.051)	(0.051)	(0.034)
R-squared	0.309	0.309	0.314
Sample size	776,180	776,177	842,573

Notes: All regressions include person fixed effects and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 4

Employment regressions with different samples

Variable	All workers	Bound workers	Workers in 10% band
	(i)	(ii)	(iii)
Wage gap	-0.063***	-0.110***	-0.086***
	(0.007)	(0.008)	(0.007)
Age	-0.002***	-0.004**	-0.004***
	(0.001)	(0.001)	(0.001)
1999	-0.107***	-0.102***	-0.098***
	(0.002)	(0.006)	(0.004)
2000	0.282***	0.350***	0.337***
	(0.002)	(0.007)	(0.005)
2001	0.029***	0.080***	0.076***
	(0.003)	(0.007)	(0.005)
2002	0.058***	0.087***	0.086***
	(0.003)	(0.008)	(0.006)
2003	0.078***	0.105***	0.107***
	(0.004)	(0.009)	(0.007)
2004	0.066***	0.113***	0.114***
	(0.005)	(0.011)	(0.008)
2005	0.136***	0.186***	0.176***
	(0.005)	(0.012)	(0.009)
2006	0.013**	0.081***	0.069***
	(0.006)	(0.013)	(0.010)
2007	0.114***	0.171***	0.166***
	(0.007)	(0.015)	(0.011)
2008	0.146***	0.191***	0.190***
	(0.008)	(0.016)	(0.012)
2009	0.174***	0.247***	0.239***
	(0.008)	(0.017)	(0.013)
2010	0.155***	0.229***	0.224***
	(0.009)	(0.019)	(0.014)
Constant	0.816***	1.086***	0.961***
	(0.043)	(0.070)	(0.057)
R-squared	0.289	0.306	0.308
Sample size	1,936,903	280,240	504,547

Notes: All regressions include person fixed effects and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 5

Additional robustness checks

Variable	Only main job	Person/firm fixed effects	Adding counterfactual wage gap
	(i)	(ii)	(iii)
Wage gap	-0.066***	-0.222***	-0.015***
	(0.007)	(0.009)	(0.005)
Counterfactual wage gap	_	_	-0.023***
			(0.005)
Age	-0.004***	0.001	-0.002***
	(0.001)	(0.002)	(0.001)
1998	_	_	-0.054***
			(0.003)
1999	-0.118***	-0.323***	-0.087***
	(0.003)	(0.004)	(0.003)
2000	0.323***	-0.113***	-0.085***
	(0.004)	(0.005)	(0.004)
2001	0.057***	-0.370***	-0.085***
	(0.004)	(0.006)	(0.004)
2002	0.067***	-0.463***	-0.079***
	(0.005)	(0.007)	(0.005)
2003	0.089***	-0.541***	-0.081***
	(0.006)	(0.009)	(0.006)
2004	0.093***	-0.614***	-0.067***
	(0.007)	(0.010)	(0.006)
2005	0.162***	-0.611***	-0.068***
	(0.008)	(0.012)	(0.007)
2006	0.052***	-0.792***	-0.195***
	(0.009)	(0.013)	(0.008)
2007	0.155***	-0.735***	-0.090***
	(0.010)	(0.015)	(0.008)
2008	0.184***	-0.745***	-0.065***
	(0.010)	(0.016)	(0.009)
2009	0.228***	-0.737***	-0.039***
	(0.011)	(0.018)	(0.010)
2010	0.213***	-0.838***	-0.040***
	(0.012)	(0.019)	(0.011)
Constant	0.855***	2.141***	0.918***
	(0.051)	(0.078)	(0.024)
Wage centile controls	Yes	Yes	No
R-squared	0.315	0.581	0.312
Sample size	757,179	776,177	842,223

Notes: All regressions include person fixed effects.
The wage centile controls consist of a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 6

Employment regressions with interactions

Variable	(i)	(iii)	(ii)
Wage gap	-0.058***	–	-0.070***
	(0.007)		(0.007)
Wage gap × post-2008	-0.102***	–	–
	(0.018)		
Wage gap × 1998	–	-0.053***	–
		(0.009)	
Wage gap × 1999	–	-0.074***	–
		(0.026)	
Wage gap × 2000	–	0.054	–
		(0.036)	
Wage gap × 2001	–	-0.072***	–
		(0.016)	
Wage gap × 2002	–	-0.051**	–
		(0.024)	
Wage gap × 2003	–	-0.093***	–
		(0.016)	
Wage gap × 2004	–	-0.034*	–
		(0.018)	
Wage gap × 2005	–	-0.113***	–
		(0.025)	
Wage gap × 2006	–	-0.050**	–
		(0.020)	
Wage gap × 2007	–	-0.036	–
		(0.029)	
Wage gap × 2008	–	-0.175***	–
		(0.028)	
Wage gap × 2009	–	-0.015	–
		(0.032)	
Wage gap × 2010	–	-0.253***	–
		(0.028)	
Wage gap × youth rate	–	–	0.041
			(0.045)
Wage gap × development rate	–	–	0.005
			(0.009)
Age	-0.004***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.001)
Constant	0.800***	0.788***	0.792***
	(0.052)	(0.053)	(0.057)
R-squared	0.309	0.309	0.309
Sample size	776,177	776,177	776,177

Notes: All regressions include person fixed effects, year dummies and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 7

Results for change in hourly pay regressions

Variable	(i)	(ii)	(iii)
Wage gap	1.123***	1.172***	1.130***
	(0.114)	(0.120)	(0.115)
Age	-0.040**	-0.040**	-0.040**
	(0.017)	(0.017)	(0.017)
Wage gap × post-2008	–	-0.372	–
		(0.290)	
Wage gap × youth rate	–	–	-0.474
			(0.855)
Wage gap × development rate	–	–	-0.441***
			(0.168)
Constant	2.428***	2.187**	2.766***
	(0.893)	(0.913)	(0.906)
R-squared	0.378	0.378	0.378
Sample size	464,684	464,684	464,684

Notes: All regressions include person fixed effects, year dummies and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 8

Results for change in weekly pay regressions

Variable	(i)	(ii)	(iii)
Wage gap	25.411***	25.311***	25.413***
	(2.691)	(2.835)	(2.700)
Age	-0.659*	-0.659*	-0.655
	(0.400)	(0.400)	(0.400)
Wage gap × post-2008	–	0.768	–
		(6.849)	
Wage gap × youth rate	–	–	-24.371
			(19.625)
Wage gap × development rate	–	–	-12.658***
			(3.897)
Constant	78.009***	78.508***	89.466***
	(20.992)	(21.459)	(21.308)
R-squared	0.323	0.323	0.323
Sample size	468,639	468,639	468,639

Notes: All regressions include person fixed effects, year dummies and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 9

Results for change in weekly hours regressions

Variable	(i)	(ii)	(iii)
Wage gap	-1.247***	-1.503***	-1.276***
	(0.204)	(0.215)	(0.205)
Age	-0.006	-0.005	-0.006
	(0.030)	(0.030)	(0.030)
Wage gap × post-2008	–	1.962***	–
		(0.519)	
Wage gap × youth rate	–	–	1.148***
			(0.295)
Wage gap × development rate	–	–	-0.423
			(1.486)
Constant	0.783	2.059	0.059
	(1.590)	(1.625)	(1.614)
R-squared	0.232	0.232	0.232
Sample size	468,636	468,636	468,636

Notes: All regressions include person fixed effects, year dummies and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 10

Results for change in annual pay regressions

Variable	(i)	(ii)	(iii)
Wage gap	263.913	159.292	239.907
	(242.722)	(263.281)	(277.789)
Age	89.477***	89.575***	89.476***
	(30.737)	(30.737)	(30.737)
Wage gap × post-2008	–	547.411	–
		(533.668)	
Wage gap × youth rate	–	–	-1115.088
			(1622.157)
Wage gap × development rate	–	–	82.990
			(515.201)
Constant	-2958.213	-2579.401	-2715.083
	(2183.549)	(2214.559)	(2565.592)
R-squared	0.239	0.239	0.239
Sample size	441,540	441,540	441,540

Notes: All regressions include person fixed effects, year dummies and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 11

Results for change in incentive pay regressions

Variable	(i)	(ii)	(iii)
Wage gap	0.783	1.795	1.021
	(1.030)	(1.121)	(1.168)
Age	-0.014	-0.015	-0.014
	(0.127)	(0.127)	(0.127)
Wage gap × post-2008	–	-5.041**	–
		(2.202)	
Wage gap × youth rate	–	–	-0.994
			(6.783)
Wage gap × development rate	–	–	-0.954
			(2.211)
Constant	-0.413	-4.205	1.990
	(9.609)	(9.751)	(11.484)
R-squared	0.200	0.200	0.200
Sample size	423,046	423,046	423,046

Notes: All regressions include person fixed effects, year dummies and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 12

Results for change in shift/premium pay regressions

Variable	(i)	(ii)	(iii)
Wage gap	-0.760	-0.485	-1.131*
	(0.560)	(0.609)	(0.635)
Age	-0.045	-0.045	-0.045
	(0.069)	(0.069)	(0.069)
Wage gap × post-2008	–	-1.368	–
		(1.196)	
Wage gap × youth rate	–	–	2.578
			(3.684)
Wage gap × development rate	–	–	1.505
			(1.201)
Constant	3.369	2.340	-0.869
	(5.219)	(5.296)	(6.238)
R-squared	0.185	0.185	0.185
Sample size	423,046	423,046	423,046

Notes: All regressions include person fixed effects, year dummies and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 13

Results for change in overtime pay regressions

Variable	(i)	(ii)	(iii)
Wage gap	1.006	0.739	1.074
	(1.240)	(1.306)	(1.244)
Age	-0.215	-0.215	-0.215
	(0.184)	(0.184)	(0.184)
Wage gap × post-2008	–	2.053	–
		(3.155)	
Wage gap × youth rate	–	–	4.472
			(9.040)
Wage gap × development rate	–	–	-0.914
			(1.795)
Constant	12.454	13.790	12.535
	(9.669)	(9.884)	(9.815)
R-squared	0.414	0.414	0.414
Sample size	468,639	468,639	468,639

Notes: All regressions include person fixed effects, year dummies and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 14

Results for permanent to temporary contract regressions

Variable	(i)	(ii)	(iii)
Wage gap	0.004	0.003	0.005
	(0.003)	(0.004)	(0.004)
Age	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Wage gap × post-2008	–	0.005	–
		(0.007)	
Wage gap × youth rate	–	–	-0.024
			(0.024)
Wage gap × development rate	–	–	-0.003
			(0.007)
Constant	0.031	0.035	0.046
	(0.031)	(0.031)	(0.037)
R-squared	0.435	0.435	0.435
Sample size	402,156	402,156	402,156

Notes: All regressions include person fixed effects, year dummies and a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 15

Results for retention-of-pension regressions

Variable	(i)	(ii)	(iii)
Wage gap	0.007	0.011	0.008
	(0.013)	(0.014)	(0.014)
Age	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Wage gap × post-2008	–	-0.061	–
		(0.047)	
Wage gap × youth rate	–	–	0.874***
			(0.338)
Wage gap × development rate	–	–	-0.074***
			(0.027)
Constant	0.771***	0.753***	0.778***
	(0.093)	(0.094)	(0.094)
R-squared	0.615	0.616	0.616
Sample size	201,870	201,870	201,870

Notes: All regressions include person fixed effects, year dummies and a a set of real wage centile dummies and their interactions with the real wage.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 16

Results for employment regressions for pseudo panel

Variable	Total sample	Men only	Women only
	(i)	(ii)	(iii)
Wage gap	-0.228**	-0.022	-0.276*
	(0.097)	(0.162)	(0.148)
Real wage	-0.001	-0.000	-0.001
	(0.001)	(0.002)	(0.003)
Age	0.118***	0.112***	0.122***
	(0.004)	(0.005)	(0.005)
Constant	-3.963***	-3.778***	-4.068***
	(0.124)	(0.180)	(0.184)
R-squared	0.686	0.683	0.690
Sample size	5,375	2,688	2,687

Notes: All regressions include cell fixed effects and year dummies.
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 17

Means for the LFS regression sample

Variable	All workers	Unbound workers	Bound workers
Same job in following quarter	0.887	0.888	0.886
Same job in following year	0.690	0.694	0.688
Wage gap (using basic hourly pay rate)	0.085	0.238	0.000
Age	35.524	38.704	33.768
Male	0.291	0.256	0.311
Married	0.318	0.286	0.336
Months in job	24.108	25.833	23.156
Works at home	0.013	0.013	0.015
Flexible hours	0.031	0.030	0.032
Annualised hours contract	0.026	0.030	0.023
Term time working	0.040	0.028	0.046
Job sharing	0.005	0.003	0.006
None day fortnight	0.001	0.001	0.002
Four-and-a-half day week	0.007	0.004	0.008
Zero hours contract	0.010	0.007	0.012
Temporary	0.097	0.082	0.105
Usually works shift	0.178	0.167	0.185
Weekly hours	24.389	24.027	24.589
Number of observations	18,620	11,998	6,622

Table 18

Basic employment regressions using hourly pay variable

Variable	Annual (i)	Quarterly (ii)	Quarterly – estimated fixed effects (iii)	Quarterly – longitudinal sample (iv)
Wage gap	-0.016**	-0.009	0.003	0.010
	(0.006)	(0.010)	(0.007)	(0.011)
Age	0.004***	0.001***	-0.000**	0.004
	(0.000)	(0.000)	(0.000)	(0.006)
Male	-0.009*	-0.005	–	–
	(0.006)	(0.004)		
Married	0.030***	0.016***	–	–
	(0.007)	(0.005)		
Months in job	0.003***	0.002***	-0.000	-0.009***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.433***	0.714***	0.960***	1.070***
	(0.025)	(0.029)	(0.007)	(0.235)
R-squared	0.074	0.034	0.508	0.494
Sample size	30,567	30,567	30,655	19,477

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 19

Basic employment regressions using basic hourly pay rate variable

Variable	Annual (i)	Quarterly (ii)	Quarterly – estimated fixed effects (iii)	Quarterly – longitudinal sample (iv)
Wage gap	-0.076***	-0.072***	-0.016	0.012
	(0.017)	(0.025)	(0.018)	(0.032)
Age	0.004***	0.002***	-0.000**	-0.003
	(0.000)	(0.000)	(0.000)	(0.007)
Male	-0.009	-0.009*	–	–
	(0.007)	(0.005)		
Married	0.018**	0.001	–	–
	(0.009)	(0.006)		
Months in job	0.003***	0.001***	-0.000	-0.008***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.433***	0.778***	0.987***	1.327***
	(0.052)	(0.037)	(0.016)	(0.293)
R-squared	0.080	0.036	0.507	0.477
Sample size	18,620	18,620	18,738	13,546

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 20

Results for works-from-home regressions

Variable	Annual	Quarterly	Quarterly – longitudinal sample	
	(i)	(ii)	(iii)	(iv)
Wage gap	-0.001	-0.007	-0.005	-0.006
	(0.006)	(0.012)	(0.006)	(0.007)
Age	0.000***	0.000***	0.001	0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Male	0.003	0.002	–	–
	(0.002)	(0.002)		
Married	0.008**	0.004	–	–
	(0.003)	(0.003)		
Months in job	-0.000*	-0.000***	-0.000**	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Wage gap × post-2008	–	–	–	0.009
				(0.025)
Constant	-0.009	0.010	-0.005	-0.005
	(0.017)	(0.016)	(0.059)	(0.059)
R-squared	0.011	0.011	0.915	0.915
Sample size	12,823	12,754	12,552	12,552

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 21

Results for flexible hours regressions

Variable	Annual	Quarterly	Quarterly – longitudinal sample	
	(i)	(ii)	(iii)	(iv)
Wage gap	-0.007	0.048	0.032	0.013
	(0.017)	(0.046)	(0.081)	(0.097)
Age	0.000*	0.000	-0.002	-0.002
	(0.000)	(0.000)	(0.010)	(0.010)
Male	-0.003	-0.005	–	–
	(0.007)	(0.007)		
Married	-0.007	-0.003	–	–
	(0.008)	(0.008)		
Months in job	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.001)
Wage gap × post-2008	–	–	–	0.063
				(0.177)
Constant	0.080	0.027	0.125	0.121
	(0.037)	(0.031)	(0.446)	(0.446)
R-squared	0.011	0.011	0.760	0.760
Sample size	4,698	5,429	4,472	4,472

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 22

Results for annualised hours contracts regressions

Variable	Annual	Quarterly	Quarterly – longitudinal sample	
	(i)	(ii)	(iii)	(iv)
Wage gap	-0.018	0.006	-0.105	-0.172
	(0.016)	(0.040)	(0.093)	(0.111)
Age	0.000	0.000	0.001	0.001
	(0.000)	(0.000)	(0.012)	(0.012)
Male	0.000	0.005	–	–
	(0.006)	(0.006)		
Married	0.004	0.003	–	–
	(0.007)	(0.007)		
Months in job	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.001)
Wage gap × post-2008	–	–	–	0.223
				(0.203)
Constant	-0.003	0.066**	-0.015	-0.028
	(0.033)	(0.026)	(0.513)	(0.513)
R-squared	0.011	0.010	0.622	0.622
Sample size	4,698	5,429	4,472	4,472

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 23

Results for term time working regressions

Variable	Annual	Quarterly	Quarterly – longitudinal sample	
	(i)	(ii)	(iii)	(iv)
Wage gap	-0.025	-0.040	-0.013	-0.018
	(0.019)	(0.045)	(0.067)	(0.080)
Age	0.001*	0.000	0.006	-0.006
	(0.000)	(0.000)	(0.009)	(0.009)
Male	-0.066***	-0.050***	–	–
	(0.008)	(0.007)		
Married	0.033***	0.059***	–	–
	(0.009)	(0.008)		
Months in job	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.001)	(0.001)
Wage gap × post-2008	–	–	–	0.020
				(0.146)
Constant	0.007	0.034	-0.176	-0.177
	(0.041)	(0.030)	(0.369)	(0.369)
R-squared	0.046	0.037	0.887	0.887
Sample size	4,698	5,429	4,472	4,472

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 24

Results for job sharing regressions

Variable	Annual	Quarterly	Quarterly – longitudinal sample	
	(i)	(ii)	(iii)	(iv)
Wage gap	0.001	0.036**	0.002	-0.021
	(0.007)	(0.018)	(0.039)	(0.047)
Age	0.000	0.000*	-0.005	-0.005
	(0.000)	(0.000)	(0.005)	(0.005)
Male	-0.006**	-0.004*	–	–
	(0.003)	(0.003)		
Married	0.003	0.006*	–	–
	(0.003)	(0.003)		
Months in job	-0.000	-0.000**	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Wage gap × post-2008	–	–	–	0.078
				(0.085)
Constant	-0.014	0.001	0.233	0.228
	(0.014)	(0.012)	(0.216)	(0.216)
R-squared	0.011	0.011	0.698	0.698
Sample size	4,698	5,429	4,488	4,472

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 25

Results for nine-day fortnight regressions

Variable	Annual	Quarterly	Quarterly – longitudinal sample	
	(i)	(ii)	(iii)	(iv)
Wage gap	-0.001	-0.001	0.001	0.000
	(0.002)	(0.006)	(0.014)	(0.017)
Age	-0.000	0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.002)	(0.002)
Male	-0.001	0.003***	–	–
	(0.001)	(0.001)		
Married	0.001	0.002**	–	–
	(0.001)	(0.001)		
Months in job	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Wage gap × post-2008	–	–	–	0.004
				(0.031)
Constant	0.007	-0.004	0.048	0.047
	(0.004)	(0.004)	(0.078)	(0.078)
R-squared	0.010	0.011	0.627	0.627
Sample size	4,698	5,429	4,472	4,472

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 26

Results for four-and-a-half-day week regressions

Variable	Annual	Quarterly	Quarterly – longitudinal sample	
	(i)	(ii)	(iii)	(iv)
Wage gap	-0.007	-0.002	0.034	0.048
	(0.008)	(0.018)	(0.038)	(0.046)
Age	0.000*	0.000	0.000	0.000
	(0.000)	(0.000)	(0.005)	(0.005)
Male	0.004	0.006**	–	–
	(0.003)	(0.003)		
Married	-0.006	-0.001	–	–
	(0.004)	(0.003)		
Months in job	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Wage gap × post-2008	–	–	–	-0.047
				(0.083)
Constant	-0.016	-0.005	0.007	0.010
	(0.016)	(0.012)	(0.211)	(0.211)
R-squared	0.015	0.011	0.676	0.676
Sample size	4,698	5,429	4,472	4,472

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 27

Results for zero hours contract regressions

Variable	Annual	Quarterly	Quarterly – longitudinal sample	
	(i)	(ii)	(iii)	(iv)
Wage gap	0.016***	0.033	-0.020	-0.030
	(0.006)	(0.021)	(0.029)	(0.035)
Age	-0.000	-0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.004)	(0.004)
Male	0.002	-0.002	–	–
	(0.002)	(0.003)		
Married	-0.002	0.001	–	–
	(0.003)	(0.004)		
Months in job	-0.000	-0.000	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Wage gap × post-2008	–	–	–	0.030
				(0.064)
Constant	0.022*	0.046***	0.058	0.056
	(0.013)	(0.014)	(0.162)	(0.162)
R-squared	0.014	0.011	0.803	0.803
Sample size	4,698	5,429	4,472	4,472

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 28

Results for temporary regressions

Variable	Annual	Quarterly	Quarterly – longitudinal sample	
	(i)	(ii)	(iii)	(iv)
Wage gap	0.013*	-0.006	-0.014	-0.009
	(0.007)	(0.012)	(0.010)	(0.011)
Age	-0.000***	-0.000**	0.002	0.002
	(0.000)	(0.000)	(0.002)	(0.002)
Male	0.002	0.004	–	–
	(0.003)	(0.002)		
Married	-0.005*	-0.004	–	–
	(0.003)	(0.003)		
Months in job	-0.000***	-0.000***	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Wage gap × post-2008	–	–	–	-0.080*
				(0.042)
Constant	0.061***	0.029*	-0.087	-0.086
	(0.020)	(0.016)	(0.099)	(0.099)
R-squared	0.016	0.011	0.547	0.547
Sample size	11,987	15,175	11,884	11,884

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 29

Results for shift work regressions

Variable	Annual	
	(i)	(ii)
Wage gap	-0.010	-0.004
	(0.028)	(0.029)
Age	-0.003***	-0.003***
	(0.001)	(0.001)
Male	0.025*	0.025*
	(0.014)	(0.014)
Married	-0.005	-0.005
	(0.017)	(0.017)
Months in job	0.000	0.000
	(0.000)	(0.000)
Wage gap × post-2008	_	-0.199
		(0.184)
Constant	0.242***	0.244***
	(0.066)	(0.066)
R-squared	0.034	0.035
Sample size	2,265	2,265

Notes: All regressions include quarter dummies (60 variables), region dummies (20 categories) and highest qualification dummies (6 categories).
Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 30

Results for change in usual hours regressions

Variable	Annual	Quarterly	Quarterly – longitudinal sample	
	(i)	(ii)	(iii)	(iv)
Wage gap	-0.318	0.411	0.257	0.129
	(0.341)	(0.467)	(0.706)	(0.731)
Age	-0.039***	-0.007**	0.069	0.069
	(0.005)	(0.004)	(0.156)	(0.156)
Male	-0.090	-0.047	–	–
	(0.136)	(0.093)		
Married	-0.090	0.008	–	–
	(0.136)	(0.110)		
Months in job	-0.010***	-0.004**	0.009	0.009
	(0.002)	(0.002)	(0.009)	(0.009)
Wage gap × post-2008	–	–	–	1.892
				(2.809)
Constant	2.145**	-0.212	-3.245	-3.272
	(0.848)	(0.645)	(6.654)	(6.655)
R-squared	0.021	0.009	0.185	0.185
Sample size	12,660	16,259	12,404	12,404

Notes: All regressions include quarter dummies (60 variables); columns 1 and 2 also include region dummies (20 categories) and highest qualification dummies (6 categories); columns 3 and 4 also include person fixed effects.

Standard errors are presented in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.