

Does Raising the Pay of Low-Wage Employees Reduce their Rate of Sickness Absence? Evidence from the Impact of Minimum Wage Legislation.[†]

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Abstract

Employee absenteeism is widely recognised as a major problem for the United Kingdom economy, resulting in billions of pounds of lost output and reductions in the productivity of employees and organisations affected. Economic theory suggests that the real wage rate will be a key influence on employee absence behaviour, while empirical research based on cross-section data typically finds evidence of a negative relationship between real wages and the rate of sickness absence. Such evidence, however, is relatively uninformative on the direction of the causal relationship between the two variables. In contrast, using panel information from respondents to the quarterly national Labour Force Survey, the current study uses the introduction of the National Minimum Wage in the UK as a natural experiment to evaluate the effects of an exogenously determined increase in real wages on the rate of sickness absence among low wage employees. The findings suggest that raising the real wage may be an effective instrument for reducing rates of sickness absence among the low paid.

Keywords: sickness absence; minimum wages

JEL codes: J22, M52

1. Introduction.

Employee absenteeism is widely recognised as a major problem for the United Kingdom economy. It has been estimated that in 2003, for example, the direct costs of sickness absence in terms of the value of lost output amounted to £11.6 billion (Barham and Begum, 2005), about 1 percent of the value of annual UK GDP. In addition to these direct costs, there are various indirect costs, such as the reduction in the morale of employees who are required to cover for absent colleagues and the impact on workers' training and development, which are harder to quantify but which almost certainly have detrimental effects on the productivity of employees and organisations affected. Understanding the causes of sickness absence and developing policies to try to tackle the problem are therefore major priorities for employers and government.

While a significant component of measured sickness absence undoubtedly reflects instances of genuine ill-health there is a general view that many recorded instances of sickness absence represent the effect of shirking behaviour by employees. Such shirking behaviour may occur when, at a given wage rate, an individual's contracted working hours exceed the number of hours that the employee wishes to work. In these circumstances, if the probability of detection and the penalties for shirking are sufficiently low an individual may choose to accept a job with a level of contractual hours that exceeds his or her preferred number of hours and make up the difference by engaging in periods of absenteeism. Such a strategy may yield a higher expected utility than the alternative of not working at all.

Within this framework, a key influence on the employee's absence behaviour will be the wage rate associated with the job. An increase in the wage rate will generate both an income effect and a substitution effect on the individual's desired hours of work. If the substitution effect is dominant an increase in the wage will raise the employee's desired hours of work and reduce their rate of sickness absence. In these circumstances, paying higher

wages is potentially an effective means through which employers may be able to tackle problems of sickness absence in the workplace. However, in the converse case in which the income effect is dominant raising the pay of employees will tend to result in a higher rate of sickness absence. These results were first derived by Allen (1981).

Empirical studies typically find evidence of a negative cross-section correlation between the wage rate of individuals and their rate of sickness absence (e.g. Chaudhury and Ng, 1992; Drago and Wooden, 1992; Barmby et al., 2004). However, such evidence is relatively uninformative on the key issue of whether increasing the wage rate offered to individual employees is likely to be an effective means of reducing their rate of sickness absence. The reason for this is that there is likely to be simultaneity in the causal relationship between employee wages and their absence behaviour. Employees who exhibit relatively low rates of absenteeism are likely to be rewarded in the form of higher wages, for example because they accumulate higher levels of human capital through on-the-job learning or because they are more likely to be promoted.¹

To examine more effectively the question of whether raising employees' pay can lead to a reduction in the rate of sickness absence we need to study the effects of an exogenous intervention that results in an increase in the real wage rate offered to employees. Such a 'natural experiment' is provided by the introduction of the UK National Minimum Wage in April 1999. The National Minimum Wage (NMW) was introduced at a rate of £3.60 per hour for adults with a lower youth rate of £3.00 per hour for employees aged 18-21. Around 1.2 million individuals – about 6% of employees – were estimated to have had their pay directly affected by the introduction of the NMW (Metcalf, 2004). The NMW has subsequently been

¹ Alternatively, Coles et al. (2006) suggest that a negative relationship between wage rates and sickness absence could come about through a sorting mechanism in which employees with a high (low) propensity for absence are matched with firms that due to the nature of their production technology have a high (low) tolerance for absence and the former are paid a low (high) wage in return.

up-rated on a number of occasions and on 1st October 2006 was increased to £5.35 for adults and £4.45 for youths.²

Research on the economic effects of minimum wage legislation tends to focus on the effects of minimum wages on levels of employment, hours worked, and the distribution of earnings. In contrast, the current study highlights a potential benefit that could accrue to employers from the introduction of an effective minimum wage, namely a reduction in the rate of sickness absence among low-wage employees. The introduction of the NMW is used to create instruments for the growth in employees' real wages, which are used in regression analysis to examine the determinants of changes in the rate of sickness absence of low-wage employees. The findings indicate that the introduction of the NMW raised the real hourly wage rate of individuals affected by just under 4% relative to the level that would have prevailed in the absence of the NMW and that this exogenous shock to real wage growth resulted in a significant reduction in rates of sickness absence amongst the employees affected. The evidence from the study indicates, therefore, that raising rates of pay might be an effective mechanism through which employers may seek to tackle problems of sickness absence, at least among low-wage employees. It also suggests a potentially beneficial effect of minimum wage legislation that typically has not been considered in previous studies.³

The remainder of the paper is structured as follows. In the next section we elaborate briefly on the theoretical considerations that underpin the analysis. This section also describes the method we use to construct the data on rates of sickness absence in the United Kingdom

² The NMW was extended to include 16-17 year olds in 2005. On 1st October 2006 the rate for individuals in this age group was increased to £3.30 an hour.

³ To date, little formal research appears to have been undertaken to examine the effects of minimum wages on levels of sickness absence. Instead, there is a limited amount of related work from the United States on the effects of Living Wage Ordinances, which have recently been introduced in a number of metropolitan areas. Living Wage Ordinances, where they are implemented, are applied to employees in city service contract firms and typically aim to raise the wages of such employees to a level that is greater than or equal to the amount required to bring a family of four above the federal poverty line. In a study of the effects of the Los Angeles

and the empirical method used in the study. Section 3 presents the results of the regression analysis. Finally, section 4 provides a summary and some concluding comments.

2. Theoretical Considerations, Data and Empirical Method.

Economic analyses of the incidence of sickness absence are frequently grounded in the standard labour-leisure framework used to analyse the determinants of household and individual labour supply behaviour.⁴ In this framework, an individual's decision concerning the number of hours they wish to work is determined by equating their marginal rate of substitution of goods for leisure (which reflects the value of an extra unit of non-work time) with the wage rate. If employees are assumed to choose between a range of jobs each offering a different number of contracted hours (a fixed number of hours per week, say) then if the number of weekly hours that an individual wishes to work does not coincide with the contracted hours an offer of an incentive for absence may arise. An individual may be able to accept a job with contracted hours that exceed their desired weekly hours of work and then take additional hours of leisure by absenting themselves from work.

Within this framework, an increase in the wage rate – due, for example, to the introduction of an effective minimum wage - that leads to an increase in the individual's desired hours of work (i.e. one for which the income effect is outweighed by the substitution effect) will be associated with a reduction in the rate of absence. The reduction in the rate of absence will be reinforced if, through an effect on the employer's labour demand decision, the increase in the wage rate leads to a reduction in the number of contracted hours.

In the United Kingdom, information on levels of sickness absence is available from a variety of sources, including the quarterly Labour Force Survey (LFS). Since 2000,

Living Wage Ordinance, Fairris (2005) finds that establishments subject to the Ordinance experienced a sizeable reduction in levels of employee absenteeism relative to a control group of establishments.

⁴ For a detailed overview see Brown and Sessions (1996).

respondents to the LFS have been asked questions on which weekdays they were off work because of sickness or injury in the ‘reference week’ (the last full working week before the respondent was interviewed) and which days they were contracted to work. From this information, an estimate of the number and proportion of working days lost due to sickness absence in the reference week can be made (Barham and Begum, 2005).⁵ Unfortunately, this information is of limited use for the purposes of the present study as the information on sickness absence is unavailable for the time at which the NMW was introduced. Instead, we calculate estimates of the rate of sickness absence for this earlier period using a method previously employed by Barmby, Ercolani and Treble (2002, 2004).

With respect to the reference week, respondents to the LFS are asked to report on whether they did any paid work in this week or if they were away from a job or business they would normally attend. They are then asked to state their usual work hours and the actual number of hours worked during the reference week, and the reason for any difference between the two. Our measure of the rate of sickness absence is constructed by treating an individual’s usual hours as contractual hours and any difference between usual and actual hours as absence. We focus only on absences that are reported as being due to sickness. For obvious reasons, self-employed workers are excluded from the analysis.

Specifically, the absence rate for any respondent i at time t ($abs\ rate_{it}$) is defined as the ratio of reported hours of absence in the reference week due to sickness (A_{it}) to contracted hours (C_{it}),

$$abs\ rate_{it} = \frac{A_{it}}{C_{it}} \tag{1}$$

⁵ Between 1992 and 1999, only the total number of days off was recorded with no reference to which weekdays these were, nor any reference to how many days the employee had been contracted to work.

The number of hours of absence due to sickness is computed by taking the difference between the individual's usual hours (C_{it}^u) and actual hours of work (C_{it}^a) and multiplying it by an indicator variable (s_{it}) which equals 1 if the absence is due to illness and zero if it is due to some other cause, i.e.,⁶

$$A_{it} = (C_{it}^u - C_{it}^a)s_{it} \quad (2)$$

The variables C_{it}^u , C_{it}^a and s_{it} are also used to construct the measure of contracted work hours by using the actual hours worked if there was no absence due to sickness and by usual hours if there was some absence due to sickness, i.e.,

$$C_{it} = C_{it}^a(1 - s_{it}) + C_{it}^u s_{it} \quad (3)$$

The quarterly LFS has a rotating panel design, in which respondents are interviewed at quarterly intervals on five occasions (waves 1-5). From the first quarter of 1997 questions on individuals' earnings have been included in the questionnaires at wave 1 and wave 5 – prior to this date questions on earnings were only asked of the outgoing, wave 5, respondents. From the first quarter of 1997, therefore, we have two observations on the earnings of respondents, which can be used to estimate the effect of the introduction of the NMW on employees' real wages and thence upon their absence behaviour.

⁶ Barmby et al. (2004) note two potential problems with this procedure:

- (i) It is possible for A_{it} constructed in this way to be negative in some cases; however, the incidence of such cases is likely to be very small (see Barmby et al. (1999).
- (ii) The measure may misrepresent absence in cases where overtime is worked. Using data for 1989 the authors calculate that including overtime working reduces the estimated absenteeism rate by 0.5 percentage points overall.

In this study, we focus our attention on a sample of low-wage employees who received an hourly wage of between £2.00 and £5.00 per hour. To measure the hourly wage, rather than use the LFS measure $hourpay = grsswk / (bushr + pothr)$, we use the widely adopted technique of assuming that overtime is paid at a higher rate than contracted hours and use the measure $Hour_Wage = grsswk / (bushr + 1.5 * pothr)$, where: $grsswk$ is usual gross weekly pay, $bushr$ is basic usual weekly hours and $pothr$ is usual paid weekly overtime hours. Our sample excludes about 72 percent of employees who earned an hourly wage above the upper limit of £5.00. The lower limit of £2.00 per hour is imposed as there is a risk that observations with estimated hourly wage rates below this level may reflect the effects of measurement error.⁷

The chief motivation for focussing on this group of respondents is that it is employees with wage rates in this range who are most likely to have been directly affected by the introduction of the NMW. Evidence from Dickens and Manning (2004) indicates that the introduction of the NMW impacted chiefly on the pay of employees who previously had been paid a wage rate of below £3.60 per hour and that it had negligible spillover effects on the pay of employees higher up the wage distribution.

In line with the preceding discussion, we carry out regression analyses to explain the change in an individual's rate of sickness absence between their interviews at wave 1 and wave 5. We relate this to the change in the log of the individual's real hourly wage rate between the two reference weeks and to a variety of personal and workplace characteristics that might be expected to influence their absence behaviour. We estimate regression equations both with and without the employee's number of contracted hours. In recognition of the potential endogeneity of the growth in the individuals' real wage rate in the context of their sickness absence behaviour and in order to exploit the exogenous variation in real wage growth created by the introduction of the NMW we use instrumental variables estimation. As

⁷ Over the period from 1997Q1-2000Q1 there are 2,682 observations for individuals for whom the calculated

instruments we use an indicator variable to denote whether the employee was initially paid an hourly wage rate below £3.60 – the level at which the NMW was introduced; a dummy variable for whether the period between the individual’s wave 1 and wave 5 observation spanned the period of the introduction of the NMW (i.e. this variable is set to equal 1 if the individual was first interviewed in the time period between the second quarter of 1998 and the first quarter of 1999 and zero otherwise); and a term that captures the interaction between these two variables.

3. Econometric Specification and Results.

We use data from the first quarter of 1997 to the first quarter of 2000, and focus on individuals who were aged 22-64 at the date of their first interview (i.e. employees who would have been eligible for payment at the adult rate following the introduction of the NMW). The sample is restricted to employees who worked for the same employer at the dates of their wave 1 and wave 5 interviews. By restricting the sample in this way there is a risk that we may introduce a bias into the analysis by ignoring employees who may have lost their job as a result of the introduction of the NMW. This could arise, for example, if employers used an employee’s absence record as a criterion in selecting individuals for redundancy in response to the increase in labour costs. However, the evidence from a number of studies indicates that the employment effects of the introduction of the NMW were negligible so that the extent of any bias emanating from this source should be small (see, e.g., Stewart, 2004a, 2004b).

The regression specification includes a variety of control variables suggested by previous work in this area (e.g., Barmby et al., 2004). These include controls for age and age squared – disaggregated by gender in each case – job tenure, and whether the individual

hourly wage is below £2.00 per hour.

worked paid or unpaid overtime in the reference week prior to their first interview. In addition, we include industry dummies and a full set of monthly time dummies. The latter capture the influence of seasonal changes, national events (e.g. major televised sporting events) and developments in the aggregate economy that might be expected to have a general effect on absence behaviour. We estimate separate equations both including and excluding the change in the level of the individual's usual contracted hours.

Table 1 provides summary statistics for the key variables used in our analysis, where the data relate to the observations on respondents at the date of their first interview. The mean rate of sickness absence over the sample period is 2.68 percent, though this is subject to substantial variation across individuals. The majority of individuals in the data sample have a zero rate of sickness absence in the reference week. The dependent variable in the regression analysis is defined as the change in the absence rate between the first and the last interviews: $\Delta abs\ rate = abs\ rate_{i,t+4} - abs\ rate_{it}$. The first and last interviews tend to be twelve months apart (97 percent of cases) so this transformation therefore does not create any spurious seasonal effects.⁸

A key feature of the data that stands out from Table 1 is that the majority – 75 percent – of our sample are female, reflecting the predominance of women among low paid employees. Average usual contracted hours are just below 28 hours per week, which reflects the presence of a significant number of part-time employees in the data sample. The average length of tenure at wave 1 is just over six and a half years, while around 28 percent of the sample worked some kind of overtime – either paid or unpaid – in the reference week. Measured in 2000 prices (based on the Retail Prices Index), the average hourly wage rate was £3.88 per hour, ranging from £2.06 to £5.30 per hour. The main sectors of employment for

⁸ Had we used *Absence* as the dependent variable, a censored regression of the Tobit type would have been appropriate because over 90 percent of the observations would have been censored at zero. However, given that the dependent variable is $\Delta abs\ rate$ the degree of censoring is negligible and therefore Tobit estimation is not

the employees in the sample are Wholesale, Retail and Motor Trade (27 percent), Manufacturing (15 percent) and Health and Social Work (15 percent).

Results from the regression analysis for the data sample as a whole are reported in Table 2. The sample size for the regression analysis (6,039) is slightly smaller than the number of observations used to produce the summary statistics in Table 1. This is mainly due to a number of missing observations on individuals' usual contracted hours at wave 5, which prevent the calculation of absence rates for these individuals at this date.

For purposes of comparison with later results, the first column of Table 2 shows the results from a simple Ordinary Least Squares regression of the relationship between the change in the rate of sickness absence and the change in the log of the individual's real wage rate, including the control variables outlined above. The results indicate a statistically significant negative effect of a higher rate of real wage growth on the change in the rate of sickness absence, suggesting that an increase in the real wage leads to an increase in the individual's desired working hours. Elsewhere in the equation there is support for the hypothesis discussed in the previous section that increases in the number of contracted hours lead to increases in the rate of sickness absence. In addition, rates of sickness absence are shown to increase for individuals who worked overtime (in particular, paid overtime) in the week prior to the date of their first interview. This suggests that individuals might be engaging in inter-temporal substitution of work for leisure, increasing work hours in response to opportunities for overtime but taking additional leisure time in the form of sickness absence at a later date.⁹ Finally, there is evidence that increases in the rate of sickness absence are a quadratic function of job tenure and the individual's age – though the latter is significant only for females. In the case of job tenure, increases in the rate of sickness

applied. The dependent variable lies in the range $-1 \leq \Delta \text{abs rate} \leq 1$ where -1 includes 1.59% of cases and 1 includes 2.34% of cases.

absence are a declining function of job tenure in the first instance, becoming weaker at higher levels of tenure, while in the case of age, the effect works in the opposite direction – positive at first but diminishing with increases in the employee’s age. Overall, the results are consistent with those of Barmby et al. (2004), who examined the determinants of the rate of sickness absence in level form.¹⁰

Column (2a) illustrates the effect of instrumenting the change in the log of the real wage to allow for the potential endogeneity of this variable with respect to the change in the rate of sickness absence, while column (2b) reports the results from the associated first stage regression for the change in the log of the real wage rate. In the latter, the coefficient for the interaction term between the variable *Low_paid* – which is a dummy variable to denote those who at the date of their first interview were paid less than £3.60 per hour - and *Intro_NMW*, a dummy variable for observations spanning the period of the introduction of the National Minimum Wage, provides, in effect, a difference-in-difference estimate of the effect of the introduction of the NMW on the pay of those directly affected, where the control group comprises those employees who initially were paid in excess of £3.60 per hour. The significance of this coefficient highlights the importance of the introduction of the NMW as an exogenous source of variation in the growth in the real wage of low-wage employees, while the size of the estimate indicates that other things equal the introduction of the NMW seems to have raised the pay of this group of employees by an average of 3.7 percent.^{11,12}

⁹ It is possible, of course, that working overtime may lead to increases in the incidence of ‘genuine’ sickness absence, for example because overtime working leads to an increased incidence of stress related illness or because overtime working is associated with a higher risk of workplace injury.

¹⁰ We have studied the effect of including additional control variables including dummies for firm size, whether the individual is female, whether he or she is a public sector employee, whether married or co-habiting, and the age of the youngest dependent child (including, for the latter terms, interactions with whether the respondent is female). None of these variables turned out to be statistically significant, though in some cases their inclusion resulted in a slight reduction in the significance of the coefficient for the change in the log of the real wage. Results are available from the authors, on request.

¹¹ The size of this estimate may be contrasted with the results of Stewart (2004b) who, using a narrower control group of employees who initially were paid a wage up to 10% above the minimum (i.e. up to £3.96 per hour), reports a slightly larger effect of the introduction of the NMW on the pay of low-wage employees, of around 5-6%.

Comparing the results for the change in the rate of sickness absence in column (2a) with the OLS estimates in column (1) it is apparent that the significance of the coefficient for real wage growth is weakened a little but that the size of the coefficient increases in magnitude. By instrumenting the change in the log of the real wage and exploiting the information contained in the natural experiment associated with the introduction of the NMW therefore, we obtain a larger negative effect of the growth in real wages on the change in the rate of sickness absence.

Column (3) illustrates the effect on the regression for the change in the rate of sickness absence of removing the change in usual contracted hours from the list of explanatory variables.¹³ The implication of this re-specification of the absence equation is that the coefficient for real wage growth should now pick up both the direct ‘labour supply’ effect of the growth in real wages on sickness absence behaviour and any demand-side effect induced by the relationship between the real wage rate and the level of contracted hours. Thus these equations should enable us to gain a better impression of the ‘total’ effect of real wage changes on the rate of sickness absence. A comparison of the results with those from column (2a) shows that in fact there is little change in the size of the coefficient for the change in the log of real wages, indicating that growth in real wages has little effect on the change in contracted hours.¹⁴

In column (4) we examine the effect of including the employee’s initial rate of sickness absence (i.e. their absence rate at wave 1) as an additional control variable in the

¹²Note that the coefficient for the dummy variable, *Intro_NMW*, is itself statistically insignificant, which implies that the introduction of the NMW, on average, did not result in significant real wage growth for employees who initially were paid above the minimum. This is consistent with the finding of Dickens and Manning (2004), that the introduction of the NMW had a negligible effect on the pay of employees higher up the wage distribution.

¹³ The change in contracted hours is also deleted from the set of variables used to instrument the change in the log of the real wage.

¹⁴ In contrast to this indirect evidence on the impact of the introduction of the NMW on contracted hours, Stewart and Swaffield (2006) find that the introduction of the NMW led to a significant reduction in the paid

regression equation. The inclusion of this variable permits recognition of the fact that an unobservable number of spells of sickness absence will reflect genuine instances of ill-health and that many of these are likely to be temporary. Ignoring this possibility could lead to bias in our estimate of the effect of increases in the employee's real wage.

The initial rate of sickness absence enters the regression with a sizeable and highly significant negative coefficient, indicating that changes in individuals' rates of sickness absence embody a significant element of 'error-correcting' behaviour. The inclusion of this variable removes any trace of significance from the variables for the employees' age and the extent of overtime working, implying that the significance of these variables in the earlier regressions was due to their association with the initial rate of employee absence. In contrast, the coefficient for the change in the log of the real wage remains statistically significant, though the level of significance is somewhat reduced. The magnitude of the coefficient is also a little smaller, becoming closer to the value of the OLS estimate in column (1).

In Tables 3 and 4 we report the results from equations estimated separately for males and females, respectively. The key difference between the two sets of results is that the effect of real wage growth on the rate of sickness absence is significant for females only, though the numerical values of the coefficients are similar for both sexes. Elsewhere, it is notable that age effects are significant only for males, while the effects of tenure and the change in contracted hours are generally stronger for females.

The estimates from column (4) of Table 2 imply that an increase of 1 percentage point in the rate of growth of real wages reduces the rate of sickness absence by about 0.05 percentage points, while the difference-in-difference estimates of the wage effect of the NMW imply that the introduction of the NMW raised the real wage of low paid employees in the United Kingdom by just under 4 percent. Taken together these estimates imply that the

working hours of low-wage employees. The evidence is strongest when the authors use data on working hours

introduction of the UK National Minimum Wage reduced the rate of sickness absence amongst low paid employees by an average of around 0.2 percentage points. In the context of an average rate of sickness absence for our data sample as a whole of 2.7 percent it appears therefore that the introduction of the NMW had a quantitatively, as well as statistically, significant effect in reducing the rate of sickness absence of low-wage employees.

4. Summary and Conclusions

Empirical evidence on the relationship between employee wages and rates of sickness absence typically does not allow for the potentially simultaneous nature of the relationship and therefore is relatively uninformative on the question of whether raising employee wages might be an effective instrument for tackling the problem of sickness absence in the workplace. The present paper has attempted to remedy this weakness in the literature by using the introduction of the National Minimum Wage in the United Kingdom as a natural experiment to evaluate the effects of an exogenous variation in real wage rates on the rate of sickness absence amongst low-wage employees.

Using a method outlined in previous studies by Barmby et al. (2002, 2004), we have calculated a measure of the rate of employee sickness absence in the UK using data from the quarterly Labour Force Survey and used this data to show that changes in the rate of sickness absence for employees between the dates of their first and final interviews for the LFS are negatively related to the growth of their real wage rate over this period. This finding holds both in OLS estimation and in equations estimated by Two-Stage Least Squares, in which the individual's real wage rate is treated as an endogenous variable and in which we exploit the exogenous variation in the real wage rate of low-wage employees created by the introduction of the National Minimum Wage. The study finds that the introduction of the NMW led to an

from the New Earnings Survey but the finding is echoed in analyses carried out using data from the LFS.

increase in the real wage of low-wage employees of some 4 percent above what it would otherwise have been. The implication is that the introduction of the NMW had a significant effect in reducing the rate of sickness absence for this sample of employees.

The results from the present study contribute both to an understanding of the determinants of sickness absence and to the burgeoning literature on the economic effects of minimum wage legislation. Through the finding that the introduction of the NMW helped to lead to a reduction in the rate of sickness absence amongst low-wage employees, the analysis suggests that minimum wage legislation can lead to beneficial productivity effects for firms and public sector organisations that employ significant numbers of low-wage employees. This may go some way towards explaining why the introduction of the NMW was greeted with apparent equanimity by a majority of employers in the UK. In future work it would be of interest to examine whether subsequent up-ratings of the NMW have had a similar impact in reducing rates of sickness absence among low-wage employees.

Table 1. Summary Statistics

	<i>Mean</i>	<i>Std. Dev.</i>	<i>Maximum</i>	<i>Minimum</i>
<i>Dependent variables:</i>				
Absence rate (<i>abs rate</i>)	0.0268	0.1495	1	0
Absence rate change (Δ <i>abs rate</i>)	0.0076	0.2157	-1	1
<i>Demographic variables:</i>				
Age	42.1755	10.9531	63	22
Female	0.7539	0.4308	1	0
Usual contracted hours	27.9172	12.945	97	1.3
Tenure (in years)	6.5650	6.7771	44	0.0833
Worked paid overtime	0.2253	0.4178	1	0
Worked unpaid overtime	0.0521	0.2223	1	0
Real hourly wage rate (£)	3.8816	0.6857	5.30	2.06
<i>Industry dummies:</i>				
Agriculture, hunting, etc.	0.0154	0.1232	1	0
Fishing	0.0003	0.0176	1	0
Mining & quarrying	0.0011	0.0330	1	0
Manufacturing	0.1532	0.3602	1	0
Electricity, gas & water	0.0009	0.0305	1	0
Construction	0.0193	0.1376	1	0
Wholesale, retail, etc.	0.2758	0.4470	1	0
Hotels & restaurants	0.0851	0.2790	1	0
Transport, storage, etc.	0.0479	0.2136	1	0
Financial intermediation	0.0114	0.1060	1	0
Real estate, renting, etc.	0.0692	0.2539	1	0
Public admin. & defence	0.0218	0.1456	1	0
Education	0.0899	0.2861	1	0
Health & social work	0.1511	0.3581	1	0
Other services	0.0576	0.2329	1	0

n = 6,428

Source: Quarterly LFS, 1997Q1-2000Q1, wave 1 interviews.

Table 2. Regression Results for the Change in the Rate of Sickness Absence and the Rate of Growth of Real Wages

	(1)	(2a)	(2b)	(3)	(4)
<i>Estimation Method:</i>	<i>OLS</i>	<i>2SLS</i>	<i>OLS</i>	<i>2SLS</i>	<i>2SLS</i>
<i>Dependent Variable:</i>	Δ abs rate	Δ abs rate	Δ log real wage	Δ abs rate	Δ abs rate
Δ log real wage	-0.0495*** (2.837)	-0.0777** (2.441)		-0.0808** (2.567)	-0.0512** (2.071)
Age * male	0.0034 (1.587)	0.0033 (1.543)	-0.0022 (1.351)	0.0034 (1.5810)	0.0011 (0.632)
(Age) ² * male	-0.0038 (1.444)	-0.0037 (1.399)	0.0030 (1.508)	-0.0038 (1.434)	-0.0006 (0.283)
Age * female	0.0038* (1.846)	0.0037** (1.817)	-0.0018 (1.154)	0.0038* (1.879)	0.0019 (1.182)
(Age) ² * female	-0.0042* (1.684)	-0.0041* (1.656)	0.0020 (1.101)	-0.0042* (1.721)	-0.0021 (1.334)
Δ Usual contracted hours	0.0015** (2.405)	0.0014** (2.151)	-0.0036*** (5.882)		0.0012** (2.064)
Worked paid overtime	0.0340*** (5.447)	0.0351*** (5.494)	0.0278*** (4.869)	0.0364*** (5.706)	0.0053 (0.968)
Worked unpaid overtime	0.0181* (1.911)	0.0181* (1.904)	0.0147 (1.528)	0.0175* (1.838)	-0.0019 (0.211)
Tenure	-0.0046*** (4.484)	-0.0046*** (4.486)	0.0018** (2.180)	-0.0047*** (4.540)	-0.0018** (2.072)
(Tenure) ²	0.0150*** (3.967)	0.0149*** (3.925)	-0.0093*** (3.073)	0.0150*** (3.950)	0.0059* (1.838)
Absence rate at wave 1					-0.8773*** (30.540)
Low paid			0.1688*** (24.933)		
Intro NMW			0.0317 (1.263)		
Low paid * Intro NMW			0.0369*** (3.811)		
Constant	-0.0176 (0.386)	-0.0163 (0.357)	-0.0197 (0.547)	-0.0190 (0.417)	0.0138 (0.382)
<i>F-Time</i>	1.485 ⁺	1.486 ⁺	1.862 ⁺⁺⁺	1.480 ⁺	1.499 ⁺
<i>R</i> ²	0.0184	0.0178	0.2420	0.0167	0.3822
<i>s.e.</i>	0.0105	0.2146	0.1646	0.2147	0.1702

Number of observations = 6,309

Notes: Δ log real wage denotes the change in the natural logarithm of the individual's real wage. This variable is treated as potentially endogenous in the equations estimated by Two Stage Least Squares. See text for definitions of other variables. All regression equations include time and industry (15 sectors) dummy variables. t-ratios based on White heteroscedasticity-consistent standard errors are given in parenthesis. An asterisk, * (**, ***), denotes a coefficient that is statistically significant at the 10% (5%, 1%) level on a two-tailed test. *F-Time* is an F-test for the joint significance of the monthly time dummies. A 'plus sign', +, (+, +++), denotes statistical significance at the 10% (5%, 1%) level.

Table 3. Regression Results for the Change in the Rate of Sickness Absence: Two Stage Least Squares Estimates for Males

Dependent variable: $\Delta abs\ rate$

Estimation method: 2SLS

	(1)	(2)	(3)
$\Delta \log$ real wage	-0.0834 (1.391)	-0.0865 (1.461)	-0.0532 (1.227)
Age	0.0069** (2.032)	0.0069** (2.014)	0.0041 (1.454)
(Age) ²	-0.0079** (1.964)	-0.0078* (1.948)	-0.0042 (1.253)
Δ Usual contracted hours	0.0010 (0.878)		0.0013 (1.351)
Worked paid overtime	0.0366*** (3.290)	0.0378*** (3.444)	0.0003 (0.032)
Worked unpaid overtime	0.0159 (1.024)	0.0153 (0.981)	-0.0009 (0.063)
Tenure	-0.0038** (2.087)	-0.0038** (2.083)	-0.0015 (1.020)
(Tenure) ²	0.0139** (2.266)	0.0138** (2.259)	0.0072 (1.348)
Absence rate at wave 1			-0.8315*** (12.708)
Constant	-0.1182* (1.678)	-0.1188* (1.684)	-0.0586 (1.005)
<i>F-Time</i>	1.262	1.255	1.110
<i>R</i> ²	0.0499	0.0493	0.4111
<i>s.e.</i>	0.2030	0.2030	0.1599

Number of observations = 1,513

Notes: Estimation method is Two Stage Least Squares, with $\Delta \log$ real wage treated as potentially endogenous. See text for variable definitions. All regression equations include time and industry (15 sectors) dummy variables. t-ratios based on White heteroscedasticity-consistent standard errors are given in parenthesis. An asterisk, * (**, ***), denotes a coefficient that is statistically significant at the 10% (5%, 1%) level on a two-tailed test. *F-Time* is an F-test for the joint significance of the monthly time dummies. A 'plus sign', +, (+, +), denotes statistical significance at the 10% (5%, 1%) level.

Table 4. Regression Results for the Change in the Rate of Sickness Absence: Two Stage Least Squares Estimates for Females

Dependent variable: $\Delta abs\ rate$

Estimation method: 2SLS

	(1)	(2)	(3)
$\Delta \log$ real wage	-0.0779** (2.076)	-0.0809** (2.176)	-0.0564* (1.902)
Age	0.0017 (0.677)	0.0019 (0.755)	0.77×10^{-4} (0.039)
(Age) ²	-0.0017 (0.569)	-0.0020 (0.648)	0.86×10^{-4} (0.037)
Δ Usual contracted hours	0.0016** (2.023)		0.0011 (1.551)
Worked paid overtime	0.0351*** (4.373)	0.0364*** (4.514)	0.0087 (1.206)
Worked unpaid overtime	0.0208* (1.799)	0.0203* (1.747)	-0.0018 (0.161)
Tenure	-0.0048*** (3.801)	-0.0049*** (3.877)	-0.0017* (1.701)
(Tenure) ²	0.0142*** (3.117)	0.0144*** (3.155)	0.0041 (1.152)
Absence rate at wave 1			-0.8945*** (28.660)
Constant	0.0451 (0.683)	0.0411 (0.622)	0.0596 (1.099)
<i>F-Time</i>	1.343	1.343	1.212
<i>R</i> ²	0.0159	0.0146	0.3795
<i>s.e.</i>	0.2185	0.2186	0.1735

Number of observations = 4,526

Notes: Estimation method is Two Stage Least Squares, with $\Delta \log$ real wage treated as potentially endogenous. See text for variable definitions. All regression equations include time and industry (15 sectors) dummy variables. t-ratios based on White heteroscedasticity-consistent standard errors are given in parenthesis. An asterisk, * (**, ***), denotes a coefficient that is statistically significant at the 10% (5%, 1%) level on a two-tailed test. *F-Time* is an F-test for the joint significance of the monthly time dummies. A 'plus sign', +, (+, +), denotes statistical significance at the 10% (5%, 1%) level.

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