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The UK National Minimum Wage in Retrospect*

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Abstract

This paper provides a retrospective summary of the effects of the UK national minimum wage (NMW) on labour market performance since its introduction in 1999. We use an 'incremental differences-in-differences' (IDiD) estimator to look at the effects of the NMW in each year through its differential impact across local labour markets. We find that the NMW is associated with a significant fall in wage inequality in the bottom half of the distribution. This suggests that geographical areas where the NMW 'bites' more have experienced larger declines in wage inequality than elsewhere. While the overall effect of the NMW on employment rates averaged over its existence is neutral, we do find small positive employment effects from 2003 onwards. Likewise, the association of the NMW with unemployment has been negative in recent years. NMW effects on hours have been mixed, but overall there is no compelling evidence to indicate that the NMW upratings have had an adverse effect on full-time total hours of work. Notwithstanding

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the clarity of these results, any causal interpretation of them might be compromised by the presence of concomitant policies that might have been correlated with the 'bite' of the NMW.

I. Introduction

The UK has a long history of involvement with minimum wages. For many industries, there was a sector-specific minimum wage from 1909 to 1993. These minimum wages were administered by separate Wage Councils, which were abolished in 1993. The UK then had six years of no minimum wage. Then, in April 1999, a national minimum wage (NMW) was introduced for the first time in the UK. Since its inception, the UK NMW has been uprated every year and has been administered on a national basis, with both adult and youth rates applying to all parts of the country.

The basic economic theory of the minimum wage suggests that it truncates the wage distribution, reducing wage dispersion and employment levels. However, this theory is applicable only if one assumes a perfectly competitive labour market, where workers can move costlessly from one job to another. Other theories suggest more complex stories. For example, in a monopsony model, the minimum wage may result in an increase in supply of and an increase in demand for labour due to employers' reduced search costs. This then helps to reduce any adverse effects on employment.[1] Other theories of the introduction of a minimum wage predict adjustments along margins other than employment – notably, prices, profits, productivity and hours.

Various recent papers focus on studying the employment impacts of the introduction of the NMW and its initial upratings, as summarised in Metcalf (2008). These studies suggest that the NMW has had limited, if any, adverse impact on employment.[2] There are also studies that find a small positive effect on employment.[3] There is some evidence of a small negative effect on average hours worked (Stewart and Swaffield, 2008), although this is not confirmed for women in the study of Connolly and Gregory (2002). There are also a number of important studies that clearly find that the NMW and its uprating improve inequality.[4] This evidence is consistent with the theory that most firms face an upward-sloping labour supply curve and hence have some degree of monopsonistic power, even when there are many firms competing for the same type of labour.

It is more than 10 years since the NMW was introduced in the UK. Now seems like an appropriate time to take a retrospective look at the labour

[1]See, for example, Lester (1946) and Dickens, Machin and Manning (1999).
[2]See Stewart (2002, 2004a and 2004b) and Dickens and Draca (2005).
[3]See, for example, Dickens, Machin and Manning (1999).
[4]See, for example, Dickens and Manning (2004).

market impacts of the NMW over its first decade. Most of the existing research on the UK, summarised in Metcalf (2008), has been limited to estimating short-run effects;[5] the question of the longer-run influences of the NMW has yet to be addressed. This paper makes use of the variation in both the real level of the NMW over time and its varied 'bite' across geographical locations to examine how changes in the local area incidence of the NMW over its existence are correlated with changes in a range of indicators of local area labour market performance. In particular, we examine the association between the NMW and a broader range of labour market measures than just employment, including wage inequality, the unemployment rate and working hours.

One of the motivations for the introduction of the NMW was to help 'make work pay' and address in-work poverty, against a background of rising wage inequality which characterised the British labour market in the 1980s and 1990s. At the outset, the Low Pay Commission (1998) hoped that the NMW might make 'greater inroads into pay inequality' without putting jobs at risk. There is a precedent here, since Lee (1999) uses the regional variation in the 'bite' of the federal minimum wage to show that falls in the real value of the minimum wage in the US during the 1980s were associated with widening wage inequality. Logically, one would then expect to find that in a period when the NMW was rising, wage inequality would be falling. This is precisely what we do find.

Since labour adjustments due to the minimum wage may take place either at the extensive margin or at the intensive margin,[6] looking at how changes in the local area minimum-wage incidence are related to changes in the employment rate, the unemployment rate and average working hours in the locality makes sense. Only a few studies evaluate the impact of the minimum wage by exploiting geographical variation in local or regional labour markets.[7] The longstanding geographic variation in wage rates across the UK has consequences for the 'bite' of the NMW in different areas. Stewart (2002) points out how the NMW reaches further up the wage distribution in certain parts of the country than in others. Our paper builds on that small literature by examining the impact of the NMW in the UK over the period 1997–2007, comparing the period two years before its introduction with the subsequent history of the NMW and its upratings.

Our additional insight is to differentiate between a period in which there was no NMW policy and the incremental uprating of the NMW each year,

[5]For extensive reviews of the literature in the US, see Card and Krueger (1995) and Neumark and Wascher (2008).

[6]'Extensive margin' refers to the number of inputs that are used. For example, hiring an additional worker would increase an extensive margin. 'Intensive margin' refers to the quantity of use extracted within a given extensive margin. For example, to reduce production from a given group of workers would diminish the intensive margin.

[7]See Card (1992) or Neumark and Wascher (1992) for the US and Stewart (2002) for the UK.

now afforded by the longer run of data available. A longer-run view can also presumably accommodate the time needed for any factor substitution to take place. One departure from previous research in this area is therefore to look at the incremental impact of the NMW by examining the different impacts the annual uprating of the NMW has in each year. Instead of using a simple 'policy on'–'policy off', differences-in-differences model, we examine a model in which each year's change in the NMW is considered as a separate effect. The methodology is described in detail in Dolton, Rosazza Bondibene and Wadsworth (2009) and summarised in Section III.

Our results suggest that over the medium term, together with a decrease in wage inequality, employment grew (slightly) faster and unemployment fell in areas where the minimum wage had the strongest 'bite' during the second half of the sample period. Causal interpretation of the results might be compromised by concomitant policy interventions over the sample period. The simultaneous presence of these policies may have effects that are also correlated with changes in the local 'bite' of the NMW.

In the interests of clarity and brevity, we attempt to summarise the main conclusions from underlying regression estimates in what follows. Section II describes the data and the logic of our identification strategy, while Section III outlines the methodology for the analysis. We then examine the effects of the NMW on wage inequality (Section IV), on employment (Section V), on unemployment (Section VI) and on hours of work (Section VII). Section VIII concludes.

II. Data

The central idea is to see whether geographic variation in the 'bite' of the minimum wage is associated with geographic variation in indicators of local market performance. The data are drawn primarily from three sources. Data on earnings, hours and a restricted number of covariates, all disaggregated by local geography, are provided by the New Earnings Survey (NES) from 1997 to 2003 and by the Annual Survey of Hours and Earnings (ASHE), which replaced the NES in 2004. In both surveys, conducted in April of each year, employers are asked to provide information on employees' hours and earnings. The geographic information collected is based on workplace rather than residence. This is the only UK data set that has hourly wage information from 1997 onwards at the various levels of geographical aggregation. Alongside the hourly wage, we compute estimates of different measures of wage inequality at the same geographic levels. We focus on the $50^{th}/5^{th}$ and $50^{th}/10^{th}$ percentile ratios. One limitation of ASHE/NES is that, being sourced from pay records, it has limited personal information.[8]

[8]For a detailed description of the variables and the limitations, see Appendices D and E, published online at http://www.ifs.org.uk/docs/fsdec10_doltonetal_appendices.pdf.

The geographic variation in wages will reflect the demographic and industrial composition of each local labour market. The changing industrial composition of an area and the extent to which industries are low and high paying will affect the incidence of the minimum wage in a locality, as will the skill, age and gender composition of the local workforce. To a certain extent, we can control for variation in these factors with a set of time-varying local labour market variables, either drawn from ASHE or matched in from complementary Labour Force Survey (LFS) data. However, the choice of what constitutes a local labour market is open to discussion; therefore we conduct the analysis at two different levels of aggregation. First, it is done at unitary authority and district level including 32 London boroughs, 238 districts,[9] 36 metropolitan districts and the 46 unitary authorities in England. The geography also includes the 22 unitary authorities in Wales and the 32 unitary councils in Scotland, resulting in 406 local areas in Great Britain. The median sample cell size is 311 and the smallest cell size is 37. The second level of analysis is the unitary authority and county level including 34 English counties, six English metropolitan counties, 46 English unitary authorities, Inner and Outer London, and 52 unitary authorities in Scotland and Wales.[10] This geography results in 140 local areas in Great Britain. Here, the median sample cell size is 575 and the smallest cell size is 42.

The NMW has a youth rate covering 18- to 21-year-olds and an adult rate.[11] Since young workers may be the most exposed to any potential negative effects of the NMW, we examine differential effects across age groups. Data availability means that the analysis is undertaken for three age groups:[12] all workers, from 16 years old to retirement age (65 years for men and 60 for women); adult workers, from 25 years old to retirement age;[13] and young workers, aged 16 to 24.

1. Measures of the bite of the minimum wage

One of the most widely used variables in the literature is the Kaitz index, which is the ratio of the minimum wage to some measure of the average wage – in our study, the median wage. The closer the Kaitz index is to unity, the 'tougher' the bite of the minimum wage in any area. However, the

[9]The City of London and the Scilly Isles are excluded from the analysis due to small sample sizes.

[10]The Orkney Islands, Isles of Shetland and Western Isles are aggregated together. The 36 English metropolitan districts are combined into six English metropolitan counties. London boroughs are aggregated into Inner and Outer London.

[11]Since 2004, there has also been a separate rate for 16- to 17-year-olds.

[12]Due to data restrictions, analysis of the impact of the NMW on the proportion claiming jobseeker's allowance and national credits is undertaken only for people from 16 years to retirement age.

[13]Due to the presence of age bands in the LFS data, it is not possible to analyse the impact of the NMW on adults aged 22 years to retirement age, as the adult rate of the NMW would require. Analysis is therefore restricted to those aged 25 years to retirement age.

denominator is the median wage, so the Kaitz index can be influenced by factors other than the minimum wage; also, the median wage is arguably endogenous in an employment regression. As such, two other minimum-wage variables are used in this study: the proportion paid at or below the minimum wage (the 'Share') and the proportion paid at the minimum (the 'Spike'). The larger the Spike or the Share, the larger the likely impact of the minimum wage on the local wage. The Share and the Spike should exclude the variation in real minimum wages that results from inflation or other aggregate factors (Neumark and Wascher, 2007). The Spike is more prone to measurement error than the Share. There are also other endogeneity concerns, regarding the validity of using the Kaitz index in a wage inequality regression, since it explicitly includes the median in its denominator. For this reason, we do not use the Kaitz index in the analysis of inequality.

All three measures can be estimated in the two years of the sample before the NMW was introduced and thereafter. Rather than record toughness at zero for 1997 and 1998, we deflate the nominal 1999 NMW level of £3.60 by the average earnings index to give us estimates of the Share, the Spike and the Kaitz index in each area for these years, along with the notional national minimum.[14]

2. Summary statistics

The logic of our identification strategy is evident in the descriptive statistics we present in Figures 1 to 5. Figure 1 shows how both the real and nominal levels of the NMW have been rising since 1999. Most marked is the rise in both since 2003, as shown by the rising gradient of these trends. Figure 2 shows how our three measures of the impact of the NMW have changed over the same period. The Kaitz index has been rising since 2001 and the Spike and the Share since 2003, which indicates that there has been a significant rise in the real value of the NMW in recent years. The variation in the NMW Share and the Kaitz index across local areas is evident in the shape and form of the distribution of these statistics in Figures 3 and 4 respectively. There has been a marked rightward shift in both distributions over time. This pattern is also evident in Figure 5, which shows the movement of the NMW Share over time and also its spread by geography. The spreads around the respective averages are quite large: the 95 per cent band for the Share is around 5 percentage points. While the average value of the Share first fell up to 2001 and then rose, there is less evidence that the spreads have risen or fallen consistently over time.

[14]We also try deflating by the retail price index, with no difference in our main results.

FIGURE 1

National minimum wage (nominal and real) over time: adults (25 to retirement age)

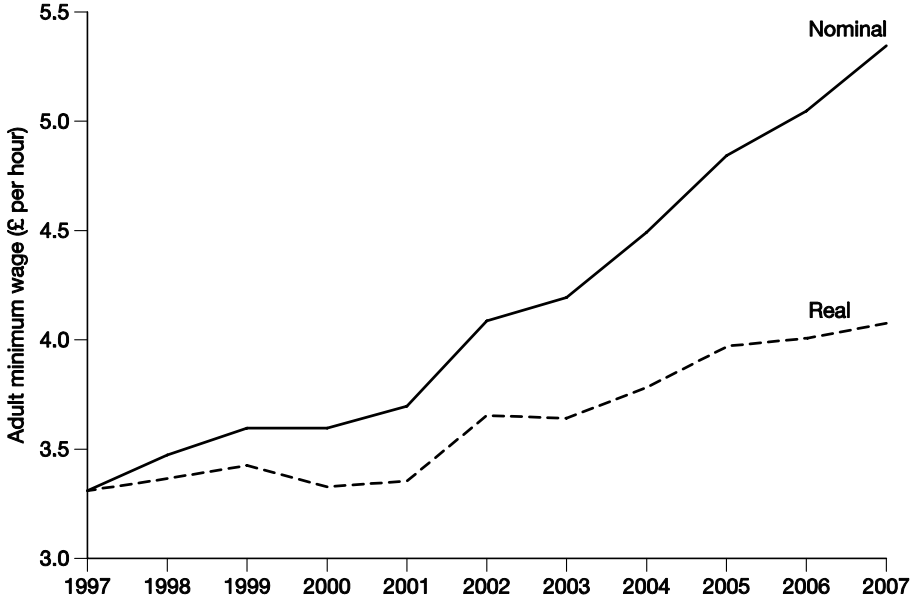


FIGURE 2

Different measures of the impact of the NMW over time

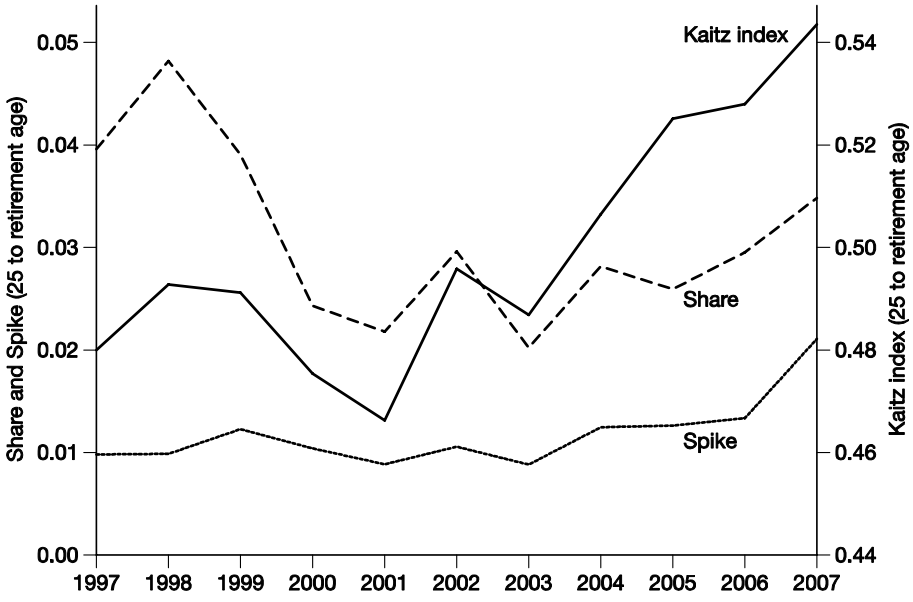


FIGURE 3

Distribution of the Kaitz index across areas, 2000 and 2007

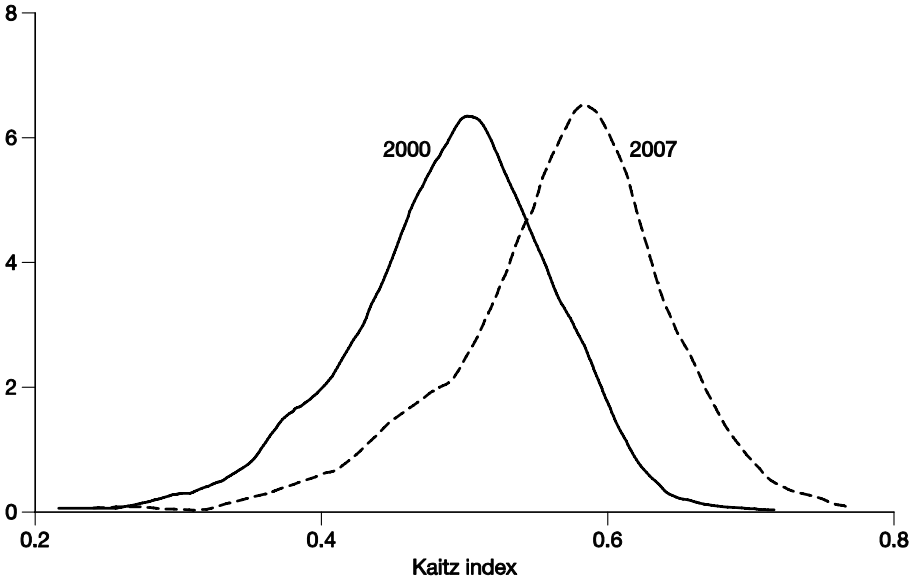


FIGURE 4

Distribution of the NMW Share across areas, 2000 and 2007

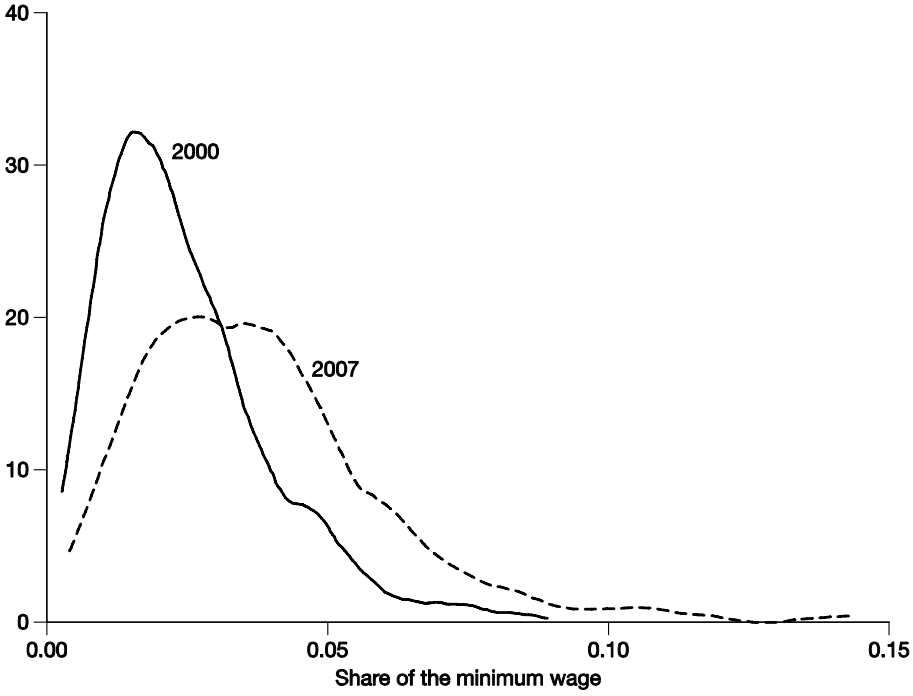


FIGURE 5

Distribution of the NMW Share across areas and time: all (16 to retirement age)

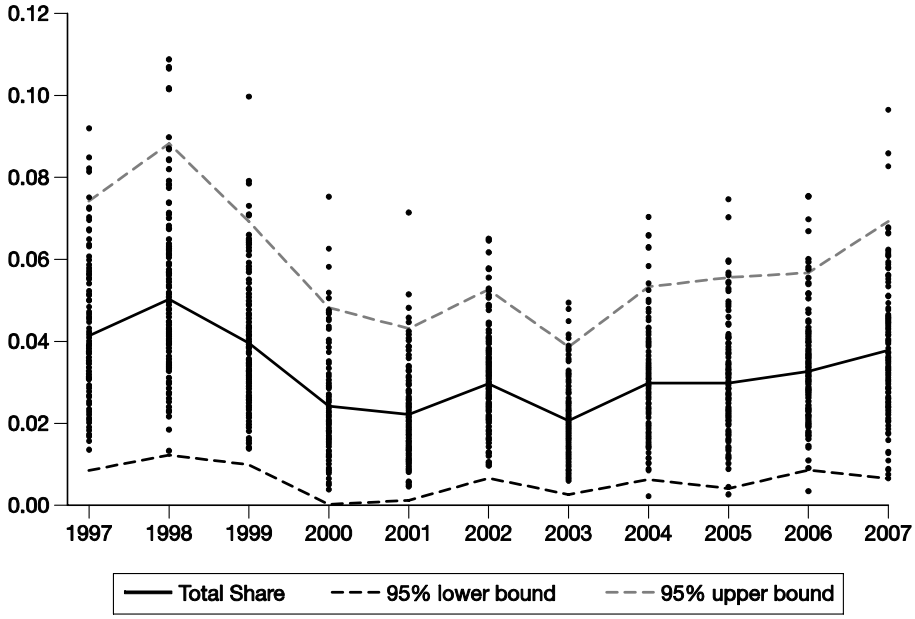


FIGURE 6

Kaitz index: all aged16 to retirement age

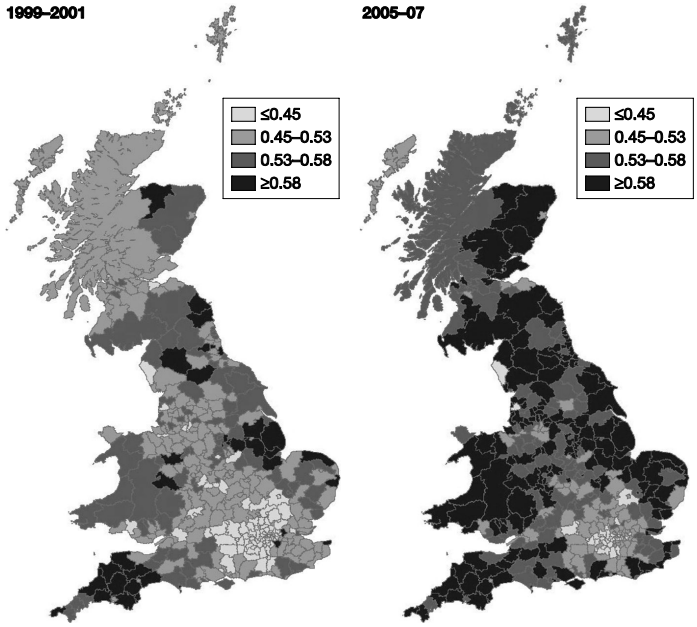


Figure 6 presents the UK map of the Kaitz index, from which it is immediately clear that there is a high level of variation in the bite of the minimum wage across areas. The extent to which the introduction of the NMW and the successive upratings influenced an area's wage distribution varies considerably. The bite of the minimum wage tends to be lower in the region around London than in the rest of the country. Areas particularly affected are the rural periphery of the country and the formerly industrialised urban areas. Over time, the maps show the bite of the minimum wage increasing across more areas.

III. Methodology and identification

The most recent methodological departure in the assessment of the effect of a national minimum wage is that suggested by Card (1992) and Stewart (2002) in which a 'structural' econometric model consists of two equations. The first is a form of labour demand equation which suggests that any change in the employment rate, E, in area j is a movement along the labour demand curve that results from a change in the wage level, W, in area j:

$$(1) \qquad \Delta E_j = \gamma_0 + \eta \Delta W_j + u_{1j}.$$

The second equation is a form of identity suggesting that the wage increase in area j is a function of the proportion in the area who are 'low paid', P_j:

$$(2) \qquad \Delta W_j = \alpha_1 + \lambda P_j + u_{2j}.$$

Substituting equation (2) into equation (1), we get

$$(3) \qquad \Delta E_j = \gamma_0 + \eta\alpha_1 + \beta P_j + \varepsilon_j$$

where $\beta = \eta\lambda$, with λ assumed to be positive, implying that β has the same sign as η, which basic economic theory would suggest is negative if the demand for labour falls as wages rise. According to Stewart (2002), the precondition for identification is that the proportion in the area who are 'low paid', P_j, is a predetermined instrument for the endogenous wage change. The effect of any NMW change on truncating the wage distribution will be higher, other things equal, in proportionate terms in a low-wage region than in a high-wage region. This means that the logic of the reduced form in equations (1) to (3) carries over to the case of measured income inequality.

The central idea of our paper is to see whether geographic variation in the 'bite' of the NMW is associated with geographic variation in indicators of labour market performance (specifically, wage inequality, employment, unemployment and hours of work). However, we also allow the effect of any

treatment to vary over time, given the differential pattern of upratings that we observe in the data. This can be done by pooling over the 11-year period and letting the treatment be the measures of the bite of the NMW in each area at time t, P_{jt}, so that the model estimated is

$$(4) \qquad E_{jt} = \gamma_0 + J_j + \sum_{t=1999}^{2007} \gamma_t Y_t + \theta_0 P_{jt} + \sum_{t=1999}^{2007} \theta_t^{IDiD} Y_t P_{jt} + \delta X_{jt} + \varepsilon_{jt}$$

where E_{jt} is a measure of area labour market performance in area j at time t, J_j is a set of area effects, Y_t is a set of year effects and X_{jt} is a set of confounding variables that also vary by area and time.[15] The range t is indexed from 1999 (the year in which the NMW was introduced and subsequently uprated). Area fixed effects are included to control for omitted variables that vary across local areas but not over time, such as unmeasured economic conditions of local areas that give rise to persistently tight labour markets and high wages in particular areas independently of national labour market conditions. Time fixed effects control for omitted variables that are constant across local areas but evolve over time. If the standard assumptions of differences-in-differences relating to the Stable Unit Treatment are applicable (namely, that no other systematic factors are varying across geography and over time), then we can interpret this as a causal impact of the upratings to the NMW.

The incremental differences-in-differences coefficients θ_t^{IDiD}, on the interaction of the year dummies and the measure of the bite, capture the average effect of the uprating of the NMW in each year, all relative to the 'off period' of 1997 and 1998, provided of course that the proportion in the area who are 'low paid', P_{jt}, is a valid instrument for the endogenous wage change. The advantage of using the IDiD estimation procedure is that it facilitates the estimation of year-on-year incremental effects of each year's uprating. So even if the average effect over all years is not significantly different from zero, this does not mean that the effect of any individual year's change in the NMW is also zero. Note that one cannot deduce the longer-run effect of all the changes in the NMW by simply summing all the year-on-year IDiD coefficients.[16] The effect over the 1999–2007 period (in so far as it is identifiable) can be measured in aggregate using one differences-in-differences coefficient for the whole period. For the purpose of this paper, we concentrate on the period-by-period IDiD.[17]

[15]The controls are average age and the gender and graduate shares. The addition of arguably more endogenous manufacturing and public sector shares makes little difference to the results.

[16]This is because some additional (untestable) assumption relating to independence of effects over time would be necessary. In addition, since we use a dummy variable interaction term, rather than a normalised metric on how large each increment was, this also makes aggregation of the individual interaction-term estimates difficult.

[17]For more discussion, see our companion report, Dolton, Rosazza Bondibene and Wadsworth (2009).

The literature is silent on how to untangle autocorrelation in panel data with very short time series such as ours. An additional concern is that of spatially contiguous areas giving rise to heteroscedastic errors. With regard to the latter problem, one approach is to model the form of these spatial relations. As all our geographical areas have bordering areas, it may well be that there is a clear relationship between these contiguous areas. The complex way in which these neighbouring areas have local labour markets that are interrelated and how to model these effects is left for future work. In the absence of an appropriate spatial model, we calculate standard errors robust to heteroscedasticity and serial correlation is of unknown form (Wooldridge, 2002, p. 275), which gives consistent, if inefficient, estimates. Another alternative is to simply cluster the data by local area.[18]

Identification issues

One important question to ask is how long it should take the introduction of (or changes in) the NMW to have its full effects on employment and other economic indicators (especially since some of the variables in the data are already measured with a lag). From an empirical point of view, this raises the specification issue about including a lagged effect of the minimum-wage variable in the regression. The debate on this question is still ongoing. On the one hand, employers might react relatively quickly to increases in minimum wages, and might even adapt before the implementation of the minimum wage. Brown, Gilroy and Kohen (1982, p. 496), regarding employment, argue that 'One important consideration is the fact that plausible adjustment in employment of Minimum Wage workers can be accomplished simply by reducing the rate at which replacements for normal turnover are hired'. Another reason given by the authors is that minimum-wage increases are announced months before they are implemented – typically six months in the UK; therefore firms may have begun to adapt before the minimum-wage increase comes effectively into force. On the other hand, it might take time for employers to adjust factors inputs to changes in factors prices. Hamermesh (1995) points out that, in the short run, capital inputs might be costly to adjust. If firms adjust capital slowly following an increase in the minimum wage, the adjustments of labour inputs might be slow as well. The use of a lagged minimum-wage measure as well as the inclusion of fixed effects in the regression also helps to decrease the possible endogeneity of the minimum-wage variable, which arises from correlation of either the proportion paid at the minimum or, in

[18]Clustering by local area rather than using the general robustness correction makes little or no difference to our conclusions.

the case of the Kaitz index, the minimum wage and the median wage with labour market conditions or productivity.[19]

A further identification issue arises from the 'common trends assumption' embedded in our estimation strategy, that the effect of market conditions will be the same across all geographic units in the absence of the introduction of the NMW. The NMW was not the only labour market policy instrument in operation over the period and it may be that identification of an NMW effect is compromised by any correlation of these other interventions with changes in the local bite of the NMW. One way of addressing some of these issues is to consider whether the employment rate has the same underlying trend across all our geographical units before the introduction of the NMW. We cannot do this because the small-geography LFS data that we use do not go back before 1997. However, it is possible to have a longer 'off period' starting from 1994 and using 95 areas, which correspond to the coding used in the NES up to 1996.[20] Using these data, we find evidence of common trends for employment, unemployment and hours of work, being unable to reject the null of a common trend at the 10 per cent level for all the age groups considered in the study.[21] Whilst this is no proof of the presence of common trends in our more disaggregated data, the results of the test give us some confidence about the internal validity of the model for these variables. The set of area- and time-varying covariates in the control vector X_{jt} will also help net out some of the concerns over common trends and other confounding factors.[22]

IV. Wage inequality and the NMW

There is good reason to expect that imposition and then raising of the NMW will have positive effects in reducing wage inequality at the bottom end of the income distribution. As a matter of definition, if one truncates the income distribution from the left by forcing employers to pay the lowest

[19]Using a lagged minimum-wage measure in our regressions makes little or no qualitative difference to our conclusions (see Tables A3 and A4 in the online appendices published at http://www.ifs.org.uk/docs/fsdec10_doltonetal_appendices.pdf).

[20]The areas comprise all existing counties, the counties abolished with the 1996 local government reform and the London boroughs. The City of London was deleted from the data set due to small sample size and the Scottish Islands were excluded from the analysis because they are not present in the data across all years.

[21]For employment of all workers of 16 years to retirement age, we cannot reject the null of a common trend at the 10 per cent level [$F(91,276) = 1.45$] if we omit three areas, all with small sample sizes (Scottish Borders, Gwynedd and Shropshire). Omitting these areas from our IDiD regressions does not change our main results.

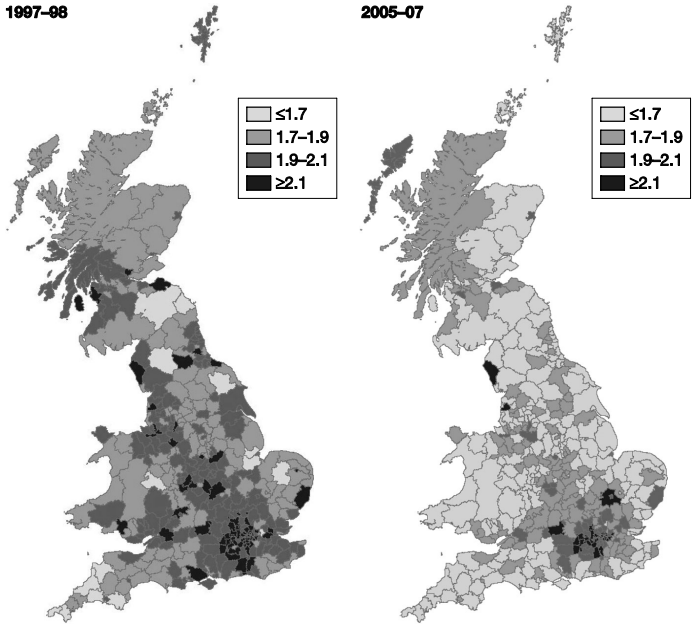
[22]As a means to identification, employment rates for groups more or less likely to have been affected by the NMW within areas could, in principle, be disaggregated by local area and industry or education from 2004 onwards using the Annual Population Survey, though the level of area disaggregation would have to be larger than that used in the present study because of sample size limitations. Wages could be disaggregated by (macro) region and industry back to 1997.

earners at a specified minimum, then one expects that (unless there are adverse spillover effects, and with any reasonable measure of inequality) inequality would be reduced as the NMW rises, other things equal. Dickens and Manning (2004) report evidence of these effects in the UK since 1999 and other authors report similar findings from the US.[23] What these studies did not have is any real way of identifying the inequality effect, as they were working with aggregate countrywide data. Here again, our data, like those of Lee (1999), disaggregated by geographical units give us an advantage in the attempt to identify inequality effects.[24]

Figure 7 draws the map of our first outcome measure, wage inequality (measured as the ratio of the 50th to the 5th percentile of the wage distribution in each local area), across the 406 areas over time. It is clear that over time, wage inequality in the bottom half of the wage distribution has fallen in most areas. So much so that, in contrast to the position in 1997–98, the only areas that have a 50:5 ratio above 2.1 by 2005–07 are a few districts within the Home Counties and rural Cumberland.

FIGURE 7

Wage inequality: ratio of 50th percentile to 5th percentile



[23]See DiNardo, Fortin and Lemieux (1996) and Tuelings (2000).

[24]Lee (1999) also discusses the implications for inequality in the presence of spillover and employment effects.

Together with tables of regression estimates, we also summarise our results in a graphical representation of the estimated coefficients from the underlying regression model detailed in Section III. This approach facilitates a convenient comparison across years and a simple retrospective look at the effect of the NMW since 1999. Figure 8 and Table 1 show the estimated NMW coefficients along with the 95 per cent confidence interval for both the 406- and 140-area levels of aggregation when the (log of) wage inequality is regressed on the NMW Share variable, a set of area fixed effects, time dummies and a set of within-area time-varying controls. The results are for all workers between 16 and retirement age. Two different

FIGURE 8

Incremental differences-in-differences inequality estimates: all aged 16 to retirement age

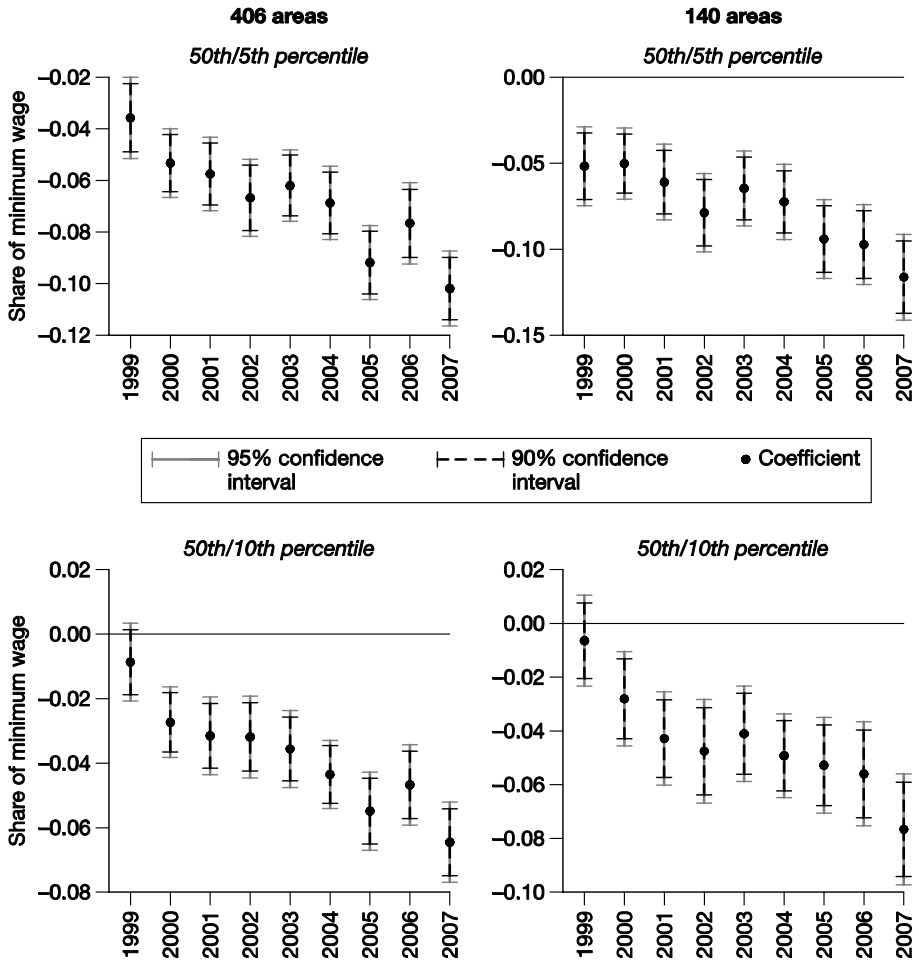


TABLE 1

Incremental differences-in-differences wage inequality estimates

	50:5 ratio		50:10 ratio	
	Total, 16–retirement, 406 areas	*Total, 16–retirement, 140 areas*	*Total, 16–retirement, 406 areas*	*Total, 16–retirement, 140 areas*
NMW	0.092**	0.095**	0.054**	0.060**
base period	(0.006)	(0.010)	(0.005)	(0.007)
NMW×1999	–0.035**	–0.052**	–0.009	–0.007
	(0.008)	(0.012)	(0.006)	(0.004)
NMW×2000	–0.053**	–0.050**	–0.027**	–0.028**
	(0.007)	(0.010)	(0.006)	(0.009)
NMW×2001	–0.057**	–0.061**	–0.031**	–0.043**
	(0.007)	(0.011)	(0.006)	(0.009)
NMW×2002	–0.067**	–0.079**	–0.032**	–0.048**
	(0.008)	(0.012)	(0.006)	(0.010)
NMW×2003	–0.062**	–0.064**	–0.036**	–0.041**
	(0.007)	(0.011)	(0.006)	(0.009)
NMW×2004	–0.069**	–0.073**	–0.043**	–0.049**
	(0.007)	(0.011)	(0.005)	(0.008)
NMW×2005	–0.092**	–0.094**	–0.055**	–0.053**
	(0.007)	(0.012)	(0.006)	(0.009)
NMW×2006	–0.077**	–0.097**	–0.047**	–0.056**
	(0.007)	(0.012)	(0.006)	(0.010)
NMW×2007	–0.102**	–0.116**	–0.064**	–0.077**
	(0.007)	(0.013)	(0.006)	(0.011)

** significant at 5 per cent level. * significant at 10 per cent level.

Notes: All regressions contain year dummies, area fixed effects and within-area time-varying controls. Heteroscedasticity autocorrelation (HAC) robust standard errors are given in parentheses. The NMW variable is the proportion of employees in each area paid at or below the national minimum wage (Share).

measures of wage inequality are used: the 50:10 wage ratio and the 50:5 wage ratio. The NMW appears to be associated with a significant narrowing of wage inequality in the bottom half of the distribution. The coefficients of our incremental differences-in-differences regressions are significant in almost all specifications, all negative and increasingly so over time, indicating that inequality fell more in areas where the NMW bit most.

The estimated effects are also smaller moving up the wage distribution, again consistent with the idea that the NMW is driving the fall in inequality. The NMW coefficients for the 50:10 wage ratio are smaller than the equivalent coefficients using the 50:5 ratio as an outcome. This may also indicate limited spillover effects of the NMW as the lower percentile used in the measure of inequality moves further away from the percentile at which the NMW bites. Figure 2 suggests that the average adult share hovers around the 4th percentile over time. If we use the 50:3 differential as the dependent

variable, the NMW effects are even larger.[25] When we repeat the same exercise at the 140-area level of aggregation, the results are qualitatively similar. The regression coefficients tend to be even more negative than the coefficients for the 406 areas, suggesting there may be a greater degree of attenuation bias in the 406-area level of disaggregation.

There is little difference between the estimates when the wage inequality rate for all age groups (including young people) is used as the dependent variable and those when only the adult (25 to retirement age) rate is used. When the analysis is repeated for youths, aged 16 to 24 – arguably the age group most likely to be at the margin of adjustment – the point estimates are similar to those for all workers, but are generally insignificant, no matter which measure of the bite of the NMW is used.[26]

V. Employment rates and the NMW

Existing UK evidence suggests that the employment effects of the introduction of the NMW have been small or zero.[27] One possible reason for these findings is that medium-term effects are not captured by previous studies. Since in the short run the costs of adjusting inputs tend to be high, the response of employment to NMW increases might not be immediate. As recently pointed out by Neumark and Wascher (2007), 'Most of the existing research on the United Kingdom has been limited to estimating short-run effects, and in our view, the question of the longer-run influences of the NMW on UK employment has yet to be adequately addressed'. Our data over the period 1997–2007 enable us to look at the medium-run effects of the NMW in the UK.

Figure 9 gives the map of employment rates across the same 406 areas over time. The employment rate was rising steadily for most geographical areas over the sample period. It is clear that many of the rural and provincial areas away from the South-East of England had higher employment rates in the 2005–07 period than in the 1997–98 pre-NMW period.

In our companion report (Dolton et al., 2009), we also report the estimates of the average impact of the NMW on employment over the full sample period by using a simple differences-in-differences, 'policy on'–'policy off' dummy variable as a covariate. These medium-run results are in accordance with the earlier literature, showing that, overall, there seems to be no significant impact of the NMW on employment. However, the short-run results using our IDiD estimator reported below suggest that the average

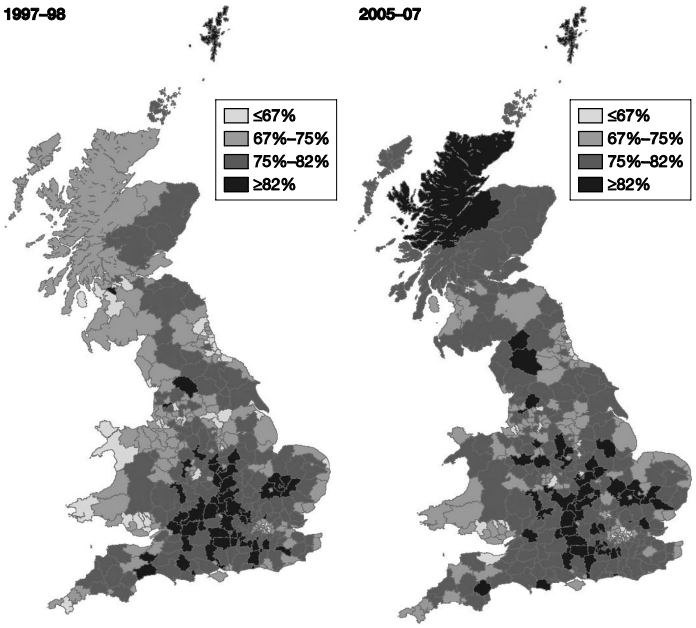
[25]See Table A5 in the online appendices at http://www.ifs.org.uk/docs/fsdec10_doltonetal_appendices.pdf.

[26]Results available from the authors on request.

[27]Stewart, 2002, 2004a and 2004b; Dickens and Draca, 2005.

FIGURE 9

Employment rate: all aged16 to retirement age



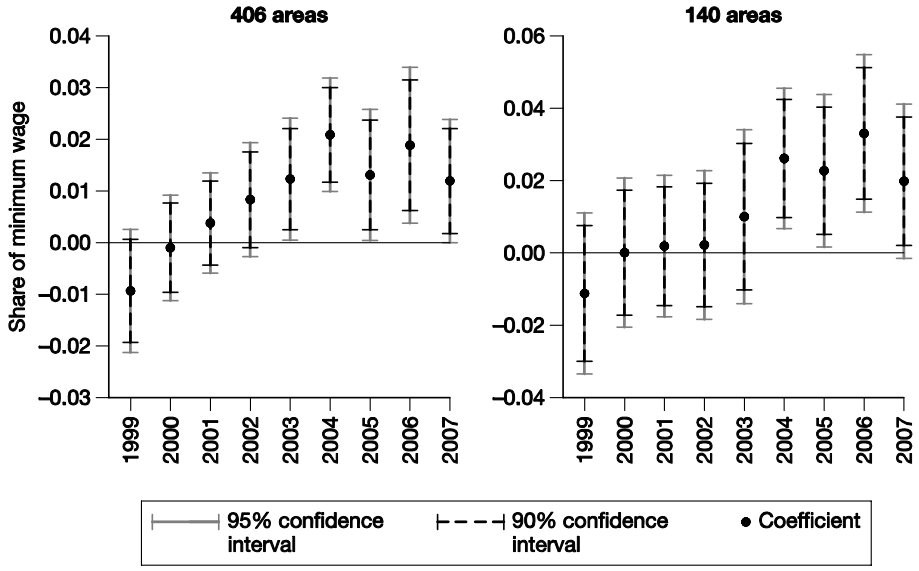
estimate of no association between the NMW and employment obscures significant changes over the sample period.

Figure 10 and columns 1 and 2 of Table 2 illustrate our results for all workers (aged 16 to retirement age) for the estimated NMW coefficients when the (log of) employment is used as the dependent variable. Over time, the initial (insignificant) negative association between employment and NMW toughness – given by the baseline coefficient estimates – becomes positive and statistically significant. This means that in the latter periods of the sample, areas where the NMW bit most experienced higher employment growth. This effect is small[28] but clearly it is masked when the simple differences-in-differences, 'policy on'–'policy off' variable is used. The correlation is even stronger when 140 areas are used rather than 406, again suggesting the presence of a greater degree of measurement error among the more disaggregated data. There is little difference between the estimates when the total employment rate is used as the dependent variable and those

[28]For example, the coefficient estimate of 0.021 for the 2004 interaction term means that a 10 percentage point rise in the NMW share in an area is associated with a 0.2 per cent higher employment rate change relative to the base period, other things equal. The differences between the individual year-on-year estimates are not statistically significant.

FIGURE 10

Incremental differences-in-differences employment estimates: all aged 16 to retirement age



when the adult (25 to retirement age) rate is used (results on adults are not reported but are available from the authors on request).[29]

In our companion report (Dolton et al., 2009), we report the estimates of the average impact of the NMW on youth employment (ages 16 to 24) over the full sample period. The conclusion from these is that, overall, there is little evidence of any significant association between area NMW toughness and the youth employment rate averaged over the sample period.

Notes to Table 2

** significant at 5 per cent level. * significant at 10 per cent level.

All regressions contain year dummies, area fixed effects and within-area time-varying controls. Heteroscedasticity autocorrelation (HAC) robust standard errors are given in parentheses. Sample is all aged 16 to retirement age. The NMW variable is the proportion of employees in each area paid at or below the national minimum wage (Share).

[29]If we control for one-digit industry shares in the local area, there are no qualitative differences from our main conclusions (see Tables A1 and A2 in the online appendices). We also tried a robustness check using lagged values of the NMW toughness measures. Again, there is little evidence of much difference across the dynamic specifications (see Tables A3 and A4 in the online appendices at http://www.ifs.org.uk/docs/fsdec10_doltonetal_appendices.pdf).

TABLE 2

Incremental differences-in-differences employment, unemployment and hours of work estimates

	Employment		Unemployment		Part-time		Full-time	
	406 areas	*140 areas*	*406 areas*	*140 areas*	*406 areas*	*140 areas*	*406 areas*	*140 areas*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
NMW	–0.006*	–0.002	0.008	0.008	–0.014*	–0.022**	0.003**	0.001
base period	(0.003)	(0.007)	(0.011)	(0.025)	(0.005)	(0.008)	(0.001)	(0.002)
NMW×1999	–0.009	–0.011	0.078*	0.100**	–0.002	0.009	0.002	0.001
	(0.006)	(0.011)	(0.016)	(0.033)	(0.008)	(0.012)	(0.002)	(0.003)
NMW×2000	–0.001	–0.001	0.094*	0.103**	0.001	–0.001	–0.002	0.002
	(0.005)	(0.011)	(0.016)	(0.031)	(0.006)	(0.011)	(0.002)	(0.003)
NMW×2001	0.004	0.002	0.091*	0.086**	0.005	0.001	0.001	0.003
	(0.005)	(0.010)	(0.015)	(0.031)	(0.007)	(0.011)	(0.002)	(0.003)
NMW×2002	0.008	0.002	–0.005	0.001	0.006	0.012	0.001	0.003
	(0.006)	(0.010)	(0.013)	(0.030)	(0.007)	(0.010)	(0.002)	(0.003)
NMW×2003	0.012**	0.010	–0.065*	–0.073**	0.009	0.011	0.001	0.001
	(0.006)	(0.012)	(0.014)	(0.032)	(0.007)	(0.011)	(0.002)	(0.003)
NMW×2004	0.021**	0.026**	–0.074*	–0.069**	0.015**	0.023*	–0.002*	–0.001
	(0.006)	(0.010)	(0.015)	(0.035)	(0.007)	(0.012)	(0.001)	(0.003)
NMW×2005	0.013**	0.023*	–0.063*	–0.059*	0.022**	0.026**	–0.003	–0.001
	(0.006)	(0.011)	(0.015)	(0.032)	(0.007)	(0.010)	(0.002)	(0.002)
NMW×2006	0.019**	0.033**	–0.066*	–0.132**	0.022**	0.024**	–0.001	0.006*
	(0.008)	(0.011)	(0.018)	(0.035)	(0.008)	(0.011)	(0.002)	(0.003)
NMW×2007	0.012*	0.020*	–0.019	–0.053	0.008	0.019*	–0.001	0.001
	(0.006)	(0.011)	(0.017)	(0.037)	(0.007)	(0.011)	(0.002)	(0.003)

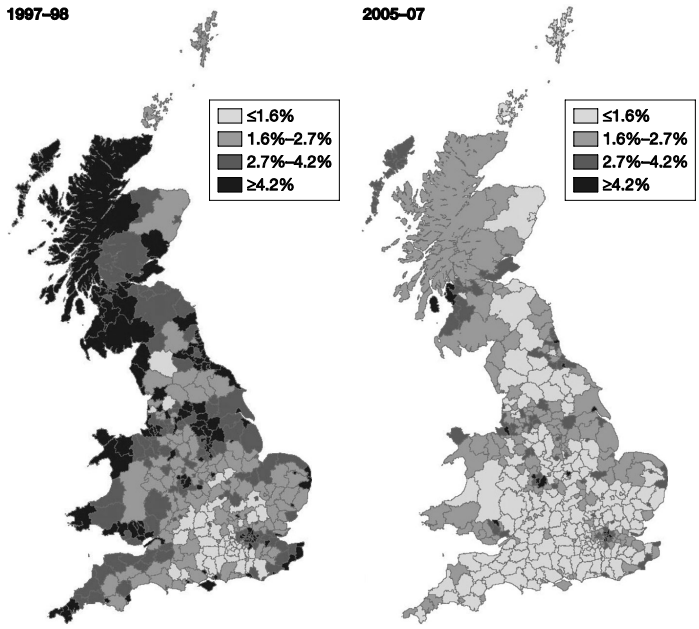
VI. Unemployment and the NMW

Figure 11 shows the pattern of change that has taken place in unemployment over the period 1997 to 2007. In the before-NMW period, the claimant count unemployment rate was above 4.2 per cent in many of the most outlying geographical areas in Scotland, Wales and the North, with those in most of the rest of the country being between 1.7 and 2.7 per cent. However, by 2007, the unemployment rate in most of the country was below 1.6 per cent, with just a few of the outlying geographical areas having a rate of up to 2.7 per cent and a very few being between 2.7 and 4.2 per cent.

For all workers (aged 16 to retirement age), the IDiD estimates in Figure 12 and in columns 3 and 4 of Table 2 suggest that there may have been some upward association between the NMW and the unemployment rate in the earliest years of the NMW's existence. Areas where the NMW has more bite appear to have experienced higher unemployment growth in the early years of the NMW. However, the IDiD estimates show significant negative effects in later years: unemployment rates fell more in areas more affected by the NMW after 2002. Again, the correlation is stronger when 140 areas are used rather than 406.[30]

FIGURE 11

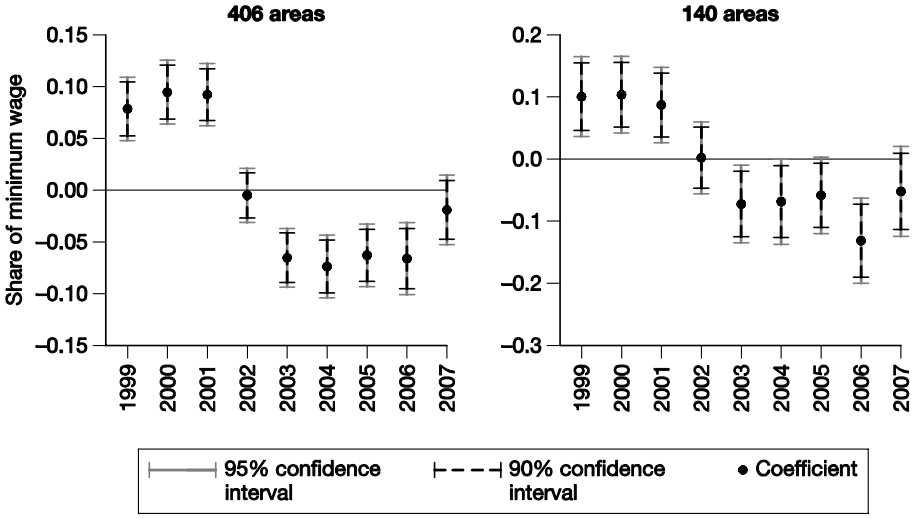
Claimant count: all aged16 to retirement age



[30]Unemployment rates disaggregated by age and local area are not available over the full sample period; therefore it is not possible to estimate the model for adult and young workers separately.

FIGURE 12

Incremental differences-in-differences unemployment estimates: all aged 16 to retirement age



VII. Hours of work and the NMW

Our fourth outcome variable of interest is the level of working hours, since one intensive margin at which change in the NMW may operate is through hours. When confronted by a higher NMW, firms may try to cut back on hours, while low-wage workers may seek to compensate by working more hours if the substitution effect dominates the income effect. Thus, a changing NMW may also impact directly on the fraction of workers who move from part-time to full-time employment. Stewart and Swaffield (2008) report small cuts in hours following the introduction of the NMW. Connolly and Gregory (2002) find no hours reductions for their sample of female workers. Dickens, Machin and Manning (2009) find no evidence of a consistent impact on hours worked.

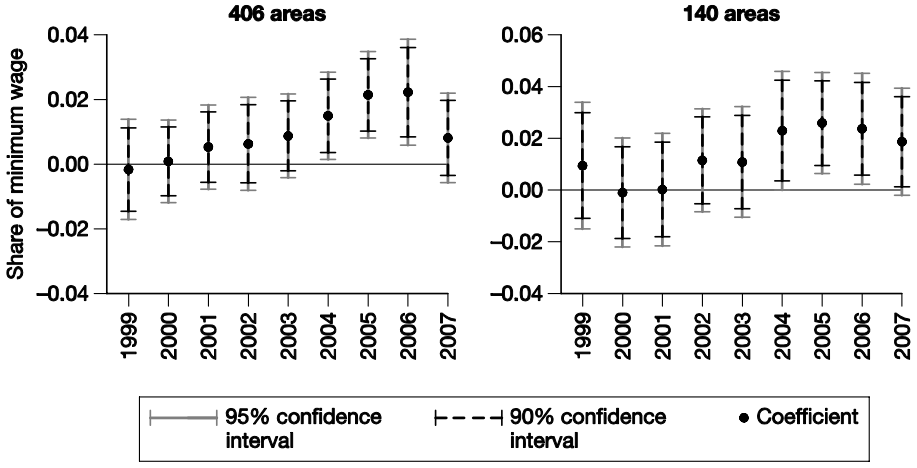
If one examines the geographical pattern of working hours, it is clear that there is a substantial year-to-year shift in the fraction working part-time. This may in part be due to the sampling frame rather than genuine labour supply shifts. Hence, we report in the four-panelled Figure 13 and in columns 5–8 of Table 2 our estimated year-on-year IDiD effects for both the 406 and the 140 geographies for part-time workers and for full-time workers. When looking at the NMW estimates on part-time hours (average total paid hours worked during the reference period, including overtime) for all workers in Figure 13, all of the coefficients become positive and significant

during the second half of the sample period, suggesting that hours worked by part-timers grew more in areas more affected by the NMW. When we consider the effect on full-time workers, it would appear that there are no significant effects. We suggest these results be interpreted with some caution, bearing in mind data limitations and the difficulty in modelling both hours of work and participation decisions endogenously.

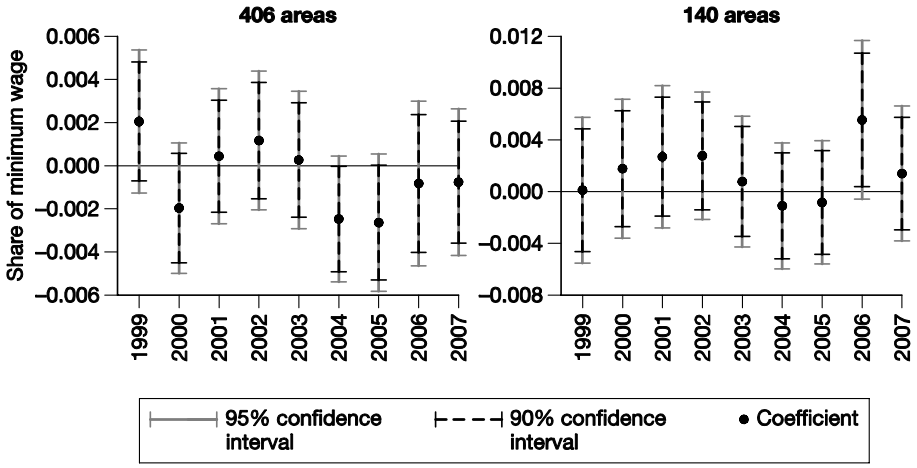
FIGURE 13

Incremental differences-in-differences total hours estimates

(a) Part-time employees: all aged 16 to retirement age



(b) Full-time employees: all aged 16 to retirement age



VIII. Conclusions

This paper summarises our estimated associations of the UK national minimum wage with a range of measures of local labour market performance, focusing on the incremental effects of each uprating of the NMW between 1999 and 2007 against a base period prior to 1999 in which no NMW operated. We estimate the effects of the NMW by looking at whether geographic variation in the 'bite' of the minimum wage is associated with geographic variation in wage inequality, employment, unemployment and hours of work.

Our estimation strategy uses two sources of variation to try to identify the effect of the NMW. The first is the natural variation in how the NMW bites in different geographical locations, although the minimum wage is set nationally. Our second source of variation is the effect of changes in the uprating of the NMW over the years since it was introduced. This estimation is based on an incremental differences-in-differences method, which allows us to estimate the marginal (interaction) effect of each year's change in the NMW.

The NMW appears to be associated with a significant narrowing of wage inequality in the bottom half of the distribution. Wage inequality is lower and has fallen further in areas where the NMW bit most in the latter half of the sample period. When estimating the marginal effect of each year's change in the NMW, we find a significant positive association between the NMW bite and employment growth in recent years. Similarly, the areas where the NMW bit most have experienced larger falls in unemployment, particularly in the latter half of the sample period. The evidence on working hours is mixed, but overall there is no compelling evidence to indicate that the NMW uprates had an adverse effect on full-time total hours of work and they may have been associated with an increase in hours worked by part-time employees.

One possible concern with the results is that they do not focus on the outcomes of groups thought to be potentially more at risk, or to be at the margin of adjustment, following any change in labour costs. Therefore, we repeated the analysis for youths, finding overall no compelling evidence to indicate that the NMW had an adverse effect on various indicators of youth local area labour market performance.

Our findings, consistent with much of the recent literature focusing on the introduction of the NMW, suggest that over the medium term, alongside a significant fall in wage inequality, employment grew (slightly) faster and unemployment fell further in areas where the NMW bit most during the latter half of the sample period. Of course, there may have been other policy instruments in operation over the period and it may be that identification of an NMW effect is compromised by any correlation of these other

interventions with changes in the local bite of the NMW. While positive employment effects of the NMW are in line with theories where firms have some degree of monopsonistic power or the existence of other labour market frictions, they are also consistent with the idea that there may have been adjustments along margins other than employment – notably, prices, profits, productivity and hours. The evidence collected in Metcalf (2008) suggests changes along all these margins in the UK. In the end, all we can say is that it seems employment did not fall over the period in which the NMW was in operation.

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