

Minimum Wages and Firm Value

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Abstract

How does the value of a firm change in response to a minimum wage hike? The evidence we have to date is not well-suited to answer this question, principally because events that have been studied are not completely unknown to the stock market or have uncertainty associated with them. This paper exploits the announcement of a sizeable change in the minimum wage in the UK that was totally unanticipated and free of uncertainty. The stock market response of employers of minimum wage workers is examined in an event study setting, looking at minute-by-minute changes on the day of the announcement and at cumulative abnormal returns on a daily basis before and after the announcement. Both show significant falls in the stock market value of low wage firms. The size of the fall in value is compared to the fall in profitability in response to the wage cost shock that will be induced by the announcement and is seen to be of a comparable magnitude.

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“We strongly support the National Minimum Wage and want to see further real-terms increases in the next Parliament. We accept the recommendations of the Low Pay Commission that the National Minimum Wage should rise to £6.70 this autumn, on course for a Minimum Wage that will be over £8 by the end of the decade.”

Conservative Party Manifesto, April 14th 2015.

“I am today introducing a new national living wage. We will set it to reach £9 an hour by 2020. The new national living wage will be compulsory. Working people aged 25 and over will receive it. It will start next April at the rate of £7.20. The Low Pay Commission will recommend future rises that achieve the Government’s objective of reaching 60 percent of median earnings by 2020.”

Budget Speech, July 8th 2015.

“I’ve talked to several chief executives and been surprised by the impact on their profits. In one [big] company, it would wipe out all of their profits”

Paul Drechsler, CBI President, Sep 2015.

1. Introduction

Ever since minimum wage floors were first introduced to labour markets around the world, a perennial research question of high relevance for labour market policy has been how firms adjust to the wage cost increases brought about by increases in the minimum wage. The first port of call for much of the literature has been to study the labour demand response of firms, and this has at various points in time generated research controversies about what minimum wage increases do to employment or unemployment.¹ As evidence of employment losses from minimum wage hikes has proven elusive in a number of settings, a smaller body of research has placed a focus on looking for firm adjustment on other margins. Whilst there are many such margins,

¹ Surveying the (mostly US time series) literature that studied data up to the late 1970s, Brown, Gilroy and Kohen (1982) concluded that minimum wages reduced teenage employment, but had less effect on adult employment. The next phase of research were the more micro-based studies of the 1990s, spearheaded by the Card and Krueger (1994) paper on fast food restaurants and Card and Krueger’s (1995) book, which both questioned the earlier findings and found no evidence of disemployment effects. The introduction of the UK National Minimum Wage in April 1999 also generated a number of pieces of research failing to find significant employment effects (see, inter alia, Machin, Manning and Rahman, 2003, Stewart, 2002, 2004, or Dolton, Bondibene and Stops, 2015). In the US there has recently been another revival of research on minimum wage effects, focusing on geography and differences across state borders. As before this is proving controversial on whether or not minimum wages reduce employment (see, inter alia, Dube, Lester and Reich, 2010, Meer and West, 2015, or Neumark, Salas and Wascher, 2015).

which may differ for firms operating in different sectors, some areas considered in research have been the scope to pass minimum wages on in terms of higher prices (e.g. Aaronson and French, 2007; Lemos, 2008), whether firms cut back on wage increases for other higher paid workers and so reduce wage inequality (e.g. Lee, 1999; DiNardo, Fortin and Lemieux, 1996; Dickens and Manning, 2004) and on whether minimum wage increases squeeze firm profitability (e.g. Draca, Machin and Van Reenen, 2011).

In this paper we study minimum wage effects on firm profitability in a different way from the direct before/after analysis of changes in accounting profitability that result from minimum wage changes. Instead we study the impact of the announcement of a minimum wage change on the stock market value of firms. This approach has been adopted in a couple of studies before, by Card and Krueger (1995) who studied twenty three events in the US between 1987 and 1989 that eventually led to minimum wage increases in 1990 and 1991, and by Pacheco and Nalker (2006) who undertook an event study looking at changes in shareholder values following a significant reform to the youth minimum wage in New Zealand. Neither of these studies delivers very clear results, primarily because the nature of the ‘events’ that were examined do not allow for a clean event-study. Such a study would require a completely unexpected minimum wage change that had no uncertainty attached to its introduction. To take one example from Card and Krueger, on June 13, 1989 President Bush vetoed a minimum wage rise. The stock market reaction to this event shows no significant effect on firm value. But as Card and Krueger note, it is difficult to know whether this veto conveyed new information to the market, since the White House had promised to veto the bill when it was first passed by the House three

months earlier. And if it did contain new information, how did it change the probability of a minimum wage change?

The event studied in this paper is able to significantly improve upon such concerns. A completely unanticipated and sizable change in the UK minimum wage system was announced in the newly elected Conservative government's emergency budget that was called after its election to power in May 2015. As the quote from the budget speech of July 8 2015 reproduced at the top of the first page of this paper testifies, the Chancellor George Osborne announced that the UK government would introduce a new National Living Wage (NLW) of £7.20 per hour for workers aged 25 and over. Not only was this announcement from a right of centre government that has traditionally been against minimum wages, it was also totally unexpected, with other government ministers and the body which advises the government on minimum wages (the Low Pay Commission) not knowing that it would occur.² Thus the major advantage of our study compared to the other stock market reaction research in this area is that the announcement we study was completely unanticipated.

The event study approach has been very widely used in finance (Kothari and Warner, 2008), but it has also been used by labour economists in several settings, most notably as a means of studying the effects of unions on firm performance.³ The seminal paper studying union effects on stock market values was by Ruback and Zimmerman (1984) whose event study of union representation elections uncovered evidence of a negative effect of union wins on the equity value of US firms. Subsequently, Bronars and Deere (1990) uncovered similar effects while Lee and Mas (2012) used a much larger sample and wider time window to find a longer run impact

² The BBC News reported that day as follows: "In a surprise announcement at the end of his speech, he said workers aged over 25 would be entitled to a "national living wage" from next April, to soften the impact of in-work benefit cuts." <http://www.bbc.co.uk/news/uk-politics-33437115>

³ Another example of event studies in labour economics is Farber and Hallock's (2009) analysis of the stock market value effects of job loss announcements.

of unions on firm value. These union papers usefully inform the research design we adopt in our event study, but in the setting of minimum wage changes.

In this paper, the differential stock market response of employers of minimum wage workers is compared to that of employers of higher wage workers in an event study setting looking at minute-by-minute changes on the day of the announcement and at cumulative abnormal returns from sixty days before and after the announcement. Both show significant falls in the stock market value of low wage firms. Within ten days of the announcement, firm values were around three percent lower for the employers of minimum wage labour and this decline is sustained as the window is further widened. The size of this fall is compared to the fall in profitability in response to the wage cost shock that will be induced by the announcement and is seen to be of a comparable magnitude.

The remainder of the paper is structured as follows. In Section 2, the relationship between minimum wages and profitability is first considered, followed by a discussion of the system of minimum wages that operates in the UK and then how this has altered following the introduction of the new National Living Wage. Section 3 describes the data and event study methodology. The results are discussed in Section 4, and Section 5 offers some concluding remarks.

2. Minimum Wages, Profitability and the New National Living Wage

Minimum Wages and Profitability

For a competitive profit maximizing firm employing L workers at wage rate W , using other factors at price R and selling its output at price P , profits are maximized at $\Pi(W, R, P)$. The derivative of the profit function with respect to the wage rate is $\partial\Pi/\partial W = -L(W, R, P)$, the negative of the demand for labour and the second derivative is

$\partial^2\Pi/\partial W^2 = -\partial L/\partial W$. The introduction of a minimum wage at a level M , above the prevailing wage W , reduces firm profits by $\Delta\Pi = \Pi(W, R, P) - \Pi(M, R, P)$.

Following Ashenfelter and Smith (1979), this can be approximated as:

$$\Delta\Pi \cong -L\Delta W + \frac{1}{2} \frac{\partial L}{\partial W} (\Delta W)^2 \quad (1)$$

where $\Delta W = M - W$. The first term on the right-hand side of (1) is the wage bill effect on profits ($-L\Delta W$) and the second can be thought of as the labour demand ($\frac{1}{2} \frac{\partial L}{\partial W} (\Delta W)^2$) effect on profits.

Equation (1) can be rewritten as:

$$\Delta\Pi = -WL \left(\frac{\Delta W}{W} + \frac{\eta}{2} \left(\frac{\Delta W}{W} \right)^2 \right) \quad (2)$$

where $\eta = \frac{W}{L} \frac{\partial L}{\partial W} < 0$ is the elasticity of labour demand.

Equation (2) offers a means of thinking about the profit response of a firm to a minimum wage hike. If there is “no behavioural response”, which in this setting means no impact on labour demand, the second order effect in (2), $\left(\frac{\eta}{2} \left(\frac{\Delta W}{W} \right)^2 \right)$, is zero. The fall of profits that would result from the imposition of a minimum wage M is equal to the proportionate change in the wage multiplied by the wage bill.

If adjustment can occur, then the labour demand effect in the second term is non-zero. This can offset the profit loss to the extent that firms can substitute away from low-wage workers into other factors (e.g. capital). One interesting question is the speed at which such adjustment could occur. In the event study setting of the empirical work in this paper, this is particularly interesting when one attempts to

gauge the size of the profit reduction from a change in market value (which is the present discounted value of firm profits).⁴

Equation (2) also usefully illustrates the inverse relationship between a firm's initial wage and the profit change. It shows that, the lower the initial wage, then the greater the fall in profits associated with the imposition of a minimum wage. This logic underpins what we do in our empirical work where we focus on the stock market response of employers of minimum wage workers in an event study setting. The means by which we define firms that employ minimum wage workers is considered in Section 3 of the paper where we also describe the data that we use.

Minimum Wage Setting in the UK

A National Minimum Wage (NMW) was introduced to the UK labour market in April 1999. Prior to that, minimum wages did not play a role in wage determination as the system that used to operate (the Wages Councils who set sectoral minima in low wage sectors, only covering about 10 percent of UK workers) had been abolished by the Conservative government in 1993.

The rate at which the National Minimum Wage was introduced was determined by a body set up by the Labour government which was elected in May 1997. The Low Pay Commission (LPC) was instituted as an advisory body by the National Minimum Wage Act of 1998. The LPC has nine Commissioners, three of which are from business, three of which are from employee representation groups, and three are members who are independent from the social partners. These last three are the Chair and two academics who are experts in labour economics and industrial relations.

⁴ See also Abowd's (1989) classic study of union wage increases and firm performance. Abowd estimates a version of equation (2) examining the effects of unanticipated increases in the wage bill (which he defines as union wealth) on the present discounted value of profits as reflected in changes in stock market values (or shareholder wealth). Interestingly, the findings are unable to reject the simple no behavioural response model where the second order effect is zero.

The LPC remit is set by the government each Spring, with a main focus on coming up with evidence-based recommendations on the main adult minimum wage rate and the associated age-specific minima. The LPC assesses evidence from a wide range of sources (e.g. academic research, site visits, an annual consultation procedure with oral evidence taken from a wide range of stakeholders). It then makes recommendations in a report submitted to government in February, to which the government responds on acceptance or rejection of the recommendations, and then if accepted (as the main adult rate always has been since introduction) the NMW is updated on October 1st.⁵

Figure 1 shows the rates from 1999 to 2015. In April 1999 the National Minimum Wage was first introduced at a rate of £3.60 per hour for workers aged over 21, together with a youth development rate at £3.00 per hour for 18-21 year olds. Through time more rates have been introduced: in 2004 a minimum wage for 16-17 year olds was introduced, and an apprentice minimum wage in 2010. Also in 2010 the adult rate was extended to 21 year olds, so that by 2015 there were four rates in place: the adult minimum (now for those aged 21 and over) which had reached £6.70 by October 2015; the youth development rate for 18-20 year olds of £5.30; the rate for 16-17 year olds of £3.87; and the apprentice rate of £3.30.⁶

In many quarters, the operation of the LPC has been deemed a success. The Institute of Government's 2010 polling of 159 members of the Political Studies Association rated the NMW as the most successful government policy of the previous

⁵ For more detail on the functioning of the LPC see Brown (2002), Butcher (2012) and Metcalf (1999, 2002).

⁶ The UK government has almost always accepted the LPC's recommendations on rates. This has always been true for the recommendations adult, development and 16-17 year old rates. The recommendation on apprentice rates has twice been met with a government instituted change: first in 2011 when the LPC recommended a freeze of the rate but government intervened to increase it by 5 pence; then more markedly in 2015 when the LPC recommended raising the rate by 7 pence from £2.73 to £2.80 as the business secretary pushed the rate a further 50 pence up to £3.30.

thirty years.⁷ This reflects the evidence-based approach leading to little in the way of employment losses from the NMW, and the independence of the LPC in being able to make its deliberations largely free from political intervention.

The New National Living Wage

After being in a coalition government with the Liberal Democrats as the UK government in power between May 2010 and 2015, the Conservative party was elected outright in the May 2015 election. It called an emergency budget for July 8 2015 and in this budget the Chancellor George Osborne made the completely unexpected announcement of introducing a new National Living Wage that would raise the NMW for age 25 year olds and older workers by 50 pence from April 2016. The main reason for this was to offset the tax credit cuts that the Chancellor introduced in the budget in his strong programme of austerity cuts.

From a political economy perspective, this is a striking and radical intervention. It comes from a political party that has traditionally been strongly against minimum wages and, indeed, which strongly opposed the introduction of the NMW in the first place. The very poor real wage performance of most workers in the UK labour market since 2008 (when median real wages have fallen by around 10 percent, but such falls are seen across most of the wage distribution as well) has altered this standpoint to some extent.⁸ It is true that all of the main UK political parties (including the Conservatives) have recognised that minimum wages are both popular amongst the general public and that they can play a role in raising wages (and by association living standards).⁹

⁷ See: <http://www.bbc.co.uk/news/uk-politics-11896971>.

⁸ See Blundell, Crawford and Jin (2104) and Gregg, Machin and Fernandez-Salgado (2014) for more detail on the nature of real wage falls in the UK labour market.

⁹ On the popularity of the UK minimum wage a 2014 Gallup poll reported that 66% of those polled were in favour of increasing the minimum wage.

The surprise of the budget announcement and the size of the wage shock is what we exploit in our event study of the impact on the stock market value of firms.¹⁰ The 50 pence NLW supplement on adult minimum wages came as a complete surprise to the market. The Chancellor also introduced a target level for the adult minimum wage of £9 per hour to be reached by 2020. This was also news to the stock market, as the Conservative Manifesto before the May 2015 election (quoted at the start of the paper) was clear in the aspiration of reaching £8 per hour by that date.

The introduction of the NLW also alters the role of the LPC in its future deliberations, as it now has a target to work to. In practical terms the government intervention has also effectively introduced a new age band into the structure of minimum wages that operate for low wage workers in the UK. This is shown in Table 2 where the new structure of minimum wage rates that will apply from 2016 is compared to those of 2014 and 2015.

The new NLW also offers an ‘experiment’ not made possible by previous increases in the minimum wage coming from the LPC recommendations. In due course, it will be interesting to study the employment and other economic effects of this big increase, of 10.8 percent compared to the £6.50 rate at the time of the announcement, or of 7.5 percent compared to the already accepted LPC rate of £6.70 that was made effective after the budget in October 2015. By 2020, the targeted minimum wage of £9 is 12.5 percent higher than the £8 level that had previously been suggested.

¹⁰ In addition to being unanticipated, we noted earlier that a key additional requirement for a successful event study, particularly when trying to evaluate the size of any estimated effect, is that there be no uncertainty over the introduction of the new minimum wage. The announcement considered in this paper satisfies that requirement because the 1998 National Minimum Wage Act gives Government Ministers the power to set the minimum wage without reference to the LPC. The Government confirmed in writing to the LPC on Budget Day that such an order would be made.

As a result of the minimum wage changes and 2020 target, the number of workers in the UK labour market who are covered by the minimum is expected to rise significantly. Figure 2 shows actual coverage from 1999 to 2014 and expected coverage from 2015 onwards (defined as the number of workers paid at or below the relevant minimum and up to 5 pence above). There is a significant increase resulting from the change. In 2015 before the change the number of covered workers had risen gradually to reach 1.6 million by 2015. Afterwards, due to the new NLW of April 2016 and the 2020 target, there is a sharp increase, straight away jumping to over 2.5 million, and reaching 3.8 million by 2020.

3. Data and Modelling Approach

Data

The equity price data come from Datastream and Bloomberg. The principal sample frame is made up of the constituents of the FTSE All-Share Index. This index comprises eligible companies listed on the London Stock Exchange main market that pass screenings for liquidity and investability. The index captures 98 percent of the UK's market capitalization. There are 643 constituents of the index, with a mean (median) market capitalization of £3.1bn (£599mn).

We exclude from our analysis all investment trusts and private equity funds, giving a final sample of 442 firms. We have daily prices, total returns and volume. We also extract daily data on market capitalization, dividend yield and the price-book ratio. Trade-level data for the announcement date are taken from Bloomberg. These data contains the price, volume and exact time of every trade during the official trading day (8am to 4.30pm). We use this data to compute the volume-weighted price for each minute of the trading day.

Treatment Firms

To estimate the effect of the increase of the minimum wage on firm market values, we need to construct a sample of firms that are exposed to the treatment. We follow the approach of Draca, Machin and Van Reenen (2011) by using accounting information on the average wage of the firm to sort firms. The annual accounts report the total wage and salary costs for the firm and the average number of employees. This gives us a measure of the average annual wage per employee. Since the new minimum wage is set at £7.20, a worker who is employed full-year full-time would earn £14,976.

We therefore identify the quoted firms in our sample who are expected to be affected by the minimum wage announcement on the basis of their average wage per employee being less than £15,000 per year. The strength of this identification approach depends on the extent to which minimum wage workers are concentrated in firms at the lower end of the wage distribution. Unfortunately, firms are not required to report any information on the distribution of wages within the firm, only the average wage.

To assess the usefulness of the approach we adopt, we study a different data source looking at the segregation of wages across firms in the UK using the 2013 cross-section of the Annual Survey of Hours and Earnings (ASHE) and the Annual Business Survey (ABS). These are matched worker-firm level data that allows us to look at within-firm wage distributions and explore the association between average wages and the intensity of low-wage workers. We have a sample of 62,594 workers (and 7,795 firms) employed in the private sector who can be matched to firm-level data that includes the average wage per employee.

We follow the Low Pay Commission procedure of defining a minimum wage worker as any worker who receives an hourly wage (excluding overtime) that is up to five pence above the minimum wage effective at the time of the survey (April 2013). Overall, 6.2 percent of our sample are minimum wage workers. This is very similar to the 7 percent figure reported for all private sector workers in the UK in the 2014 Low Pay Commission report (page 22). Our final restriction is that firms must employ at least 100 workers and have an average wage of at least £5,000. These two sample restrictions reduce our sample to 59,535 workers (and 5,853 firms), but the share of minimum-wage jobs remains at 6.2 percent.

In Figure 3, we plot the proportion of minimum-wage workers in a firm against the firm's average annual wage for those firms with an average wage below £30,000 (40,046 workers in 3,684 firms). We split the sample into vigntiles of the average wage, with a sample of 186 firms in each bin. There is clearly a strong decline in the proportion of minimum-wage workers as the average wage rises. Only for those bins to the left of the £15,000 cutoff are at least 10 percent of the workforce on the minimum wage. On average, 21 percent of workers in firms with an average wage of less than £15,000 are minimum-wage workers. Alternatively, one can note that 75 percent of minimum-wage workers work in firms that have average annual wages of less than £15,000.

These figures underestimate the impact of the minimum-wage on our equity sample, because they reflect the average share of minimum-wage workers across all industries. Our equity sample however is heavily focused on two particular industries (see the list of firms and their sectors in the Appendix), namely non-specialised Retail Trade (47190) and Beverage Serving activities (56302). As Table 2 shows, if we further restrict the ASHE/ABS sample to only include these two industries, we have a

sample of 2,924 workers (and 84 firms). Within these particular industries, 30.3 percent of workers in firms with an average wage of less than £15,000 are minimum-wage workers.

We also require that the firm has a majority of its employees based in the UK. Some of the firms that have a low average wage are predominantly operating in low-wage economies but have chosen to list on the London stock exchange. Clearly these firms are not affected by the UK minimum wage and so are not subject to the treatment. Our final sample of NMW firms comprises the twenty companies that are listed (grouped by sector) in the Appendix. Together, these 20 firms employ over 600,000 workers.

Event Study Method

We follow the by now standard approach in the finance literature to estimate the effect of the minimum wage change on a firm's equity value. We compute the abnormal return as the difference between a stock's actual return and the expected return. For firm i at time t , the abnormal return is simply:

$$AR_{it} = r_{it} - E[r_{it}|X_t]$$

where r_{it} is the actual realized return and $E[r_{it}|X_t]$ is the expected return, with denoting and X_t the information set at time t . We then cumulate these abnormal returns around the event date.

We consider a number of alternative specifications for $E[r_{it}|X_t]$. Perhaps the most common approach is to use the Capital Asset Pricing Model (CAPM) and estimate the sensitivity of the i th firm's return to a market index (so that X_t is the market return) and use the predicted values as an estimate of the expected return. This is the approach adopted by Ruback and Zimmerman (1984), Card and Krueger (1995)

and Lee and Mas (2012). To implement this, we estimate a daily return model of the form:

$$r_{it} = \alpha_i + \beta_i r_{mt} + \epsilon_{it}$$

where r_{mt} is the return on the equal-weighted FTSE All Share index. The market model is estimated over a twelve-month period up to the 15th April 2015, which is 60 days prior to the minimum wage announcement. The abnormal return from the CAPM model is then simply:

$$AR_{it} = r_{it} - (\hat{\alpha}_i + \hat{\beta}_i r_{mt})$$

It is well-known however that the cross-section of stock returns can be predicted by more than simply the market return (Fama and French, 1992). We therefore also present results using a four-factor model for expected returns that includes the market return, a size return based on market capitalization, a value return based on dividend yield and a momentum return.¹¹

One important factor that may affect our results is that firms with sizeable minimum wage exposure tend to be heavily distributed in certain industries such as retail, hotels, restaurants and bars. Evidence suggests that stock returns have an important industry component (Moskowitz and Grinblatt, 1999; Fama and French, 1997) and if, by chance, these particular industries experienced abnormal returns relative to the market since the announcement date for reasons unrelated to the minimum wage, we would ascribe those returns to the minimum wage announcement. The expected return definition used above will not account for this. We therefore also

¹¹ We estimate each factor return by allocating all stocks in the FTSE All-Share index into (a) a large, medium and small-cap portfolio based on the 30th and 70th percentile rank on the previous trading day, (b) a high, medium and low dividend yield portfolio based on the 30th and 70th percentile rank on the previous trading day and (c) a high, medium and low momentum portfolio based on the 30th and 70th percentile rank on the previous trading day of returns over the period 126-21 days prior to the ranking. We then generate daily factor returns by taking the difference between the two extreme portfolios for each factor. See Dube, Kaplan and Naidu (2011) for another example of an event study using factor models.

construct two-digit SIC industry returns (excluding the minimum wage firms themselves) and use these as our measure of expected returns. So in our main results we consider estimates of abnormal returns from three alternative models: (1) the CAPM, (2) a 4-factor model and (3) a 2-digit industry model.

4. Results

In this section we discuss the results of our analysis. We begin by presenting intra-day evidence to demonstrate the strong reaction of our minimum wage sample to the exact announcement time of the minimum wage increase. We then examine the subsequent daily abnormal returns. Finally we present evidence from a regression model that suggests a significant ability of the market to isolate minimum wage firms from other, arguably similar, firms.

Intra-day Announcement Effect

The Chancellor of the Exchequer began the Budget statement at 12.33 on July 8th. At 13.35, he announced the decision to raise the minimum wage, one hour and two minutes into the speech. He concluded the speech four minutes later, at 13.39. We can therefore exploit the intra-day price change in our sample to examine whether there was any difference in returns between the NMW firms and the non-NMW firms prior to the announcement time (13.35) and whether there was a subsequent divergence. We have minute-by-minute data on the trade price and volume traded of each stock. We present results for both the equal-weighted index of NMW firms and a value-weighted index that accounts for the very different trading volumes that are present in the intra-day data.

To motivate the analysis, Figure 4 shows the intra-day share price moves for two of the companies in our NMW sample, namely WM Morrison (a large

supermarket chain) and the Restaurant Group. In both cases, we see a very dramatic drop in share prices at the precise time that the minimum wage announcement was made. The drop was of the order of 2-3 percent and was broadly sustained for the rest of the trading day.

Analysis of the whole sample of NMW firms is provided in Table 3. Panel A gives the cumulative abnormal returns (CAR (X, Y)) for the NMW stocks from the time of announcement ($X = 0$) over the subsequent Y minutes. In Panel B we report the pre-announcement returns. The abnormal returns are calculated for a market model (i.e. adjusting returns for the overall market return over the same period) and for the two-digit industry model. The first two columns of results use equal-weighting, whilst the final two columns are value-weighted. Figure 5 displays the cumulative raw returns to the NMW and non-NMW stocks over the course of the trading day and Figure 6 shows the equal-weighted abnormal return for the NMW stocks. The 95 percent confidence interval around the mean abnormal return is also shown for the latter.

For the pre-announcement effects, there are two key points. First, there was essentially no trend in the market in the hours prior to the Budget and no significant difference between the NMW and non-NMW stocks. Second, all of the Budget announcements prior to the minimum wage announcement had very little effect on market prices and almost no effect on the relative performance of the two groups of firms. From 13.35 onward, the picture is very different. There was a sharp fall in the price of NMW stocks. The NMW firms on average experienced a fall of as much as 73bp relative to the market on an equal-weighted basis, and 126bp on a value-weighted basis. Although these effects appear to weaken somewhat as the trading day

finished, all observations on the average abnormal returns of the NMW firms are negative from the announcement time.

Overall, we take this as strong evidence that the decline in NMW prices relative to non-NMW prices occurred as a direct result of the announcement of the minimum wage change and not as a result of other Budget changes (or indeed other events in the market that day). The decline was rapid and by the close of trading, the NMW firms were underperforming the general market by between 0.3 percent and 1 percent relative to the minute before the announcement was made.

Before we move on to the daily cumulative returns, it is interesting to look at the intra-day pattern for the day before (7th July) both as a placebo-type experiment and to see whether there was any general trend in the NMW abnormal returns the previous day. Figure 7 plots the equal-weighted abnormal returns for the NMW firms, together with 95 percent confidence intervals. At no point are the abnormal returns significantly different from zero (relative to the same time of day as the announcement on the 8th).

Cumulative Abnormal Returns

Having demonstrated an intra-day response to the minimum wage announcement, we now turn to cumulative abnormal returns from the announcement day onward. We compute these equal-weighted cumulative abnormal returns from day X to day Y relative to the minimum wage announcement date ($CAR(X, Y)$). So for example, $CAR(0, 10)$ measures the cumulative abnormal return on the NMW stocks for the first ten trading days from the announcement date. We use three expected return models: (1) the CAPM model, (2) a 4-factor model and (3) a two-digit industry-matched model. Given there are only 20 companies in the NMW sample, we also report the estimated CAR for the median firm at each horizon.

Tables 4 and 5 present the key results for the mean and median CAR respectively, whilst Figure 8 plots the CAR with associated 95 percent confidence intervals for the 15-days either side of the announcement. Panel A of both tables gives post-announcement returns for a one-, five-, ten-, fifteen-, thirty- and sixty-day horizon, while Panel B reports the pre-announcement returns for corresponding horizons in the pre-Budget period. The decline over the announcement day itself averages about -0.5 percent. Note that this is smaller than the intra-day returns on a value-weighted basis. This simply reflects the fact that stocks that were traded less actively on the announcement day had more positive returns than the more actively traded stocks. Over the five-day period, the decline is between -1.7 percent and -3 percent, depending on the expected return model we adopt. By day ten, the cumulative abnormal return has reached between -3 percent and -4 percent, and is significant across all expected return specifications. As the time horizon extends, the standard errors of the mean CAR rise as would be expected with idiosyncratic firm shocks and a sample of only 20 NMW firms, but the mean remains consistently negative and of an average magnitude of around -4 percent. The median returns are similar in pattern and magnitude but are more often statistically significant.

Panel B shows some tendency for the NMW firms to outperform the expected return model over the pre-announcement period. Whilst generally not statistically significant, this suggests that if anything the results may slightly underestimate the effect of the minimum wage announcement, since we know that stocks tend to have momentum over these holding-period horizons (see Jegadeesh and Titman, 1993).

Regression-Based Analysis

In a final analysis of the returns data, we examine the cross-section of all post-announcement abnormal returns for the full sample of 442 firms. We are interested

primarily here in whether there is evidence to suggest that the market was able to accurately identify the firms most at risk from the minimum wage rise and whether our identification approach to minimum-wage firms is plausible given the market response.

Table 6 reports some regression results for this cross-section of returns for the fifteen days following the announcement.¹² We use the CAPM model to estimate expected returns, but the results are robust to using any of the alternative return models considered before. In column (1) we simply report the coefficient on a dummy if the firm was in our NMW sample. The coefficient of -0.026 on this dummy is of course equal to the mean abnormal return after fifteen-days reported in the first column of Table 4. In column (2) we additionally add controls for 2-digit industry, market-capitalization, size decile and pre-announcement returns. These controls increase the size of the estimated negative effect for the NMW firms – and it is now almost exactly equal to the value in the final column of Table 4 which used a two-digit industry return model.

In column (3) we consider whether the negative cumulative returns for the NMW sample are merely a result of a more general decline for lower-wage firms. Since we use the cutoff of less than £15,000 average wage to identify the NMW firms, we consider whether firms in the £15-20k, £20-25k and £25-30k average wage bracket experienced any similar pattern (with £30k+ being the omitted group). There is no evidence to support this idea, suggesting that the market focused closely on the truly low-wage firms.

Finally in column (4) we divide the NMW sample into two equal-sized groups of 10 firms. One group, NMW High π Impact, are those firms in which the

¹² Comparable results based on the sixty day return are given in Table A1 of the Appendix.

mechanical percentage reduction in pretax profits from a 4 percent rise in the wage bill (the estimated effect of the minimum wage hike for the average firm in our sample – see below) is above the median, and the second group, NMW Low π Impact, are those for which it is below the median. We would expect the cumulative abnormal returns to be more negative for the NMW High π Impact group, and this is exactly what we find. Indeed one cannot reject that the entire abnormal return decline is a result of the declines for these firms, though the point estimate is negative for the NMW Low π Impact firms as well.

Impact on Profitability

Consider the sample of firms that have an average wage of less than £15,000 in the matched worker-firm data discussed in Section 3. We noted above that for the two principal industries in our equity sample, 30 percent of workers in these firms are minimum-wage workers. To evaluate the impact of a minimum-wage hike for these firms, we start by noting that for the low-wage firms in these industries, minimum-wage workers account for 21 percent of the wage bill. This of course is lower than their share of employment since they are by definition the lowest paid workers in the firm. So the simple direct effect of increasing the minimum wage by 10 percent for these workers would generate a wage bill rise of 2.1 percent. But this ignores two additional effects. First, all workers currently above the minimum wage but who would fall below the new minimum wage, must have their wages raised to at least the new minimum. 27 percent of workers are in this group, and to raise their wages at least to the new minimum adds an additional 1.3 percent to the wage bill, giving an overall increase of 3.4 percent. Second, it is usually assumed that workers seek to protect their relativities following a minimum wage increase. A simple method of capturing this is to assume that workers on the old minimum wage get the full 10

percent increase and that all workers within 20 percent of the old minimum receive some wage increase on a smoothly-sliding scale that maintains wage rank order, places everyone at least at the new minimum and tapers the minimum wage effect to vanish for all workers with wages already above 10 percent of the new minimum. This gives a total wage bill increase of 4.1 percent. We would argue that this suggests a fairly tight bound on the wage bill effect of the increase, for the average firm, to be between 3 and 4 percent.

How reasonable is this calculation? Perhaps the best evidence comes directly from one of the firms in our NMW sample. Next plc (a large clothes retailer) released its half-yearly report in September 2015. They provided a detailed calculation of the impact of the NLW on their wage bill. By 2020, the firm estimated that the wage bill would be £27m higher as a result of paying the NLW (including the associated costs of maintaining relativities) on a total wage bill of £720m, or 3.8 percent.

Table 7 calibrates the impact of this scale of wage bill shock on firm profits. We use data from the last three Annual Reports of the 20 firms in our equity sample. All these reports predate the minimum wage announcement. We normalize sales to be 100 and compute the average for each firm of the wage bill and pre-tax profits. The figures in column (1) report the baseline. On average, the wage bill is equal to 18.6 percent of total sales and the pre-tax profit equals 6.0 percent. This is a relative low profit margin, though is common for firms in these sectors. We focus on pre-tax profits because we assume that any hit to the wage bill feeds through all the profit measures e.g. firms cannot for example alter their financing costs to offset the wage bill rise. With a real interest rate of 3 percent, a pre-tax profit of 6 gives a present value of 200.

Now consider a rise in the minimum wage of 10 percent (the average rise over the next four years) that raises the wage bill by 4 percent (column (2)). Assuming no offsetting effects, pre-tax profits fall by 12 percent. If this rise in the wage bill is permanent (i.e. no future reduction in the minimum wage) and there are no offsetting effects, the present value of the firm drops by 12.4 percent to 175.2. Alternatively, suppose that the firm takes the hit in full for five years but then successfully generates fully offsetting effects elsewhere on the income statement. Then firm value declines by only 1.7 percent. Whilst these numbers are inevitably somewhat back-of-the-envelope, they do suggest that the size of the effect we have estimated in our empirical work (a 3-4 percent decline) is more consistent with the market believing that firms will be able to significantly offset the costs of the minimum wage, at least in the medium term.

How will firms achieve this offset? Again, we can look at corporate reports issued since the announcement that have commented on the NLW introduction. Four firms in our sample have released reports that discuss the NLW. To varying degrees, they all expect to be able to significantly mitigate the effects of the rise in the wage bill. Factors mentioned include increasing prices, raising productivity and increasing cost efficiency. Interestingly, none of the firms mentioned an employment response.

One other factor to consider is that the politicization of the setting of the minimum wage may result in expectations of further attempts by politicians to move the minimum closer to the median wage. In this case, the market may have priced in more substantial rises in the wage bill than illustrated in column (2) which would lead to somewhat larger declines in implied firm value. Finally, in column (3) of Table 7, we illustrate the effects of the minimum wage rise for a firm that has **only** minimum wage workers. None of our sample of quoted firms fall into this category, but there

are firms in a number of sectors (e.g. social care) where this is close to the reality. For these firms, the effect of the minimum wage rise is potential fatal. With no offset, the firm value declines by 32 percent. Even if the cost is fully offset within five years, the decline in value is 9 percent - and it is arguable whether firms in such circumstances will easily be able to exploit some of the offsets discussed above.

5. Conclusions

In a stock market event study the empirical research reported on in this paper looks at what happens to the value of firms employing minimum wage workers when a completely unexpected announcement of raising the minimum wage occurred. The setting is an emergency budget called promptly after the new election of a right of centre government in the UK. The UK Chancellor of the Exchequer made a surprise announcement on budget day (July 8 2015) that he would introduce a new National Living Wage some 11 percent higher than the prevailing National Minimum Wage for workers aged 25 and above.

The impact of the announcement is studied both intra-day and for up to 60 days before and after it occurred. Unlike the work on stock market responses to minimum wages in other settings, where the unanticipated nature and certainty of the announced rises are much less precise than in our setting, we find there to be a strong and lasting impact on stock market values. The size of this reduction in firm value resulting from the NLW announcement is compared to the fall in profitability in response to the wage cost shock that will be induced by the announcement and is seen to be of a comparable magnitude, assuming that firms can adjust over time. Thus the NLW introduction seems to have had the impact of significantly reducing the expected profits of UK firms when it is implemented in April 2016.

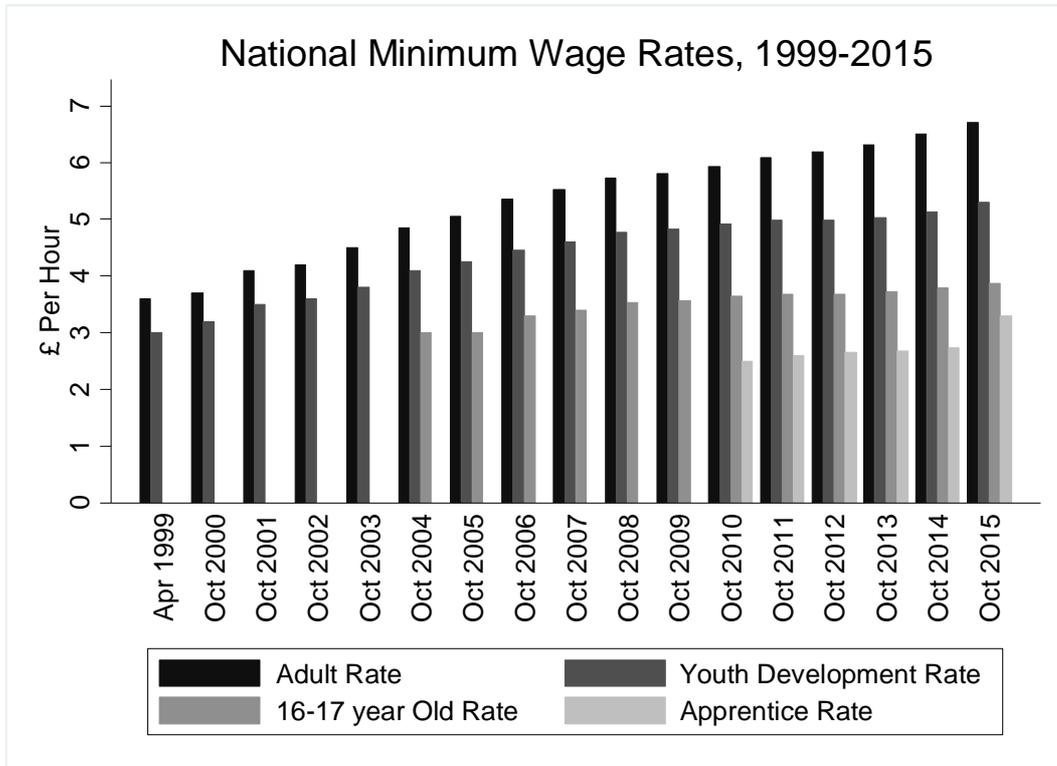
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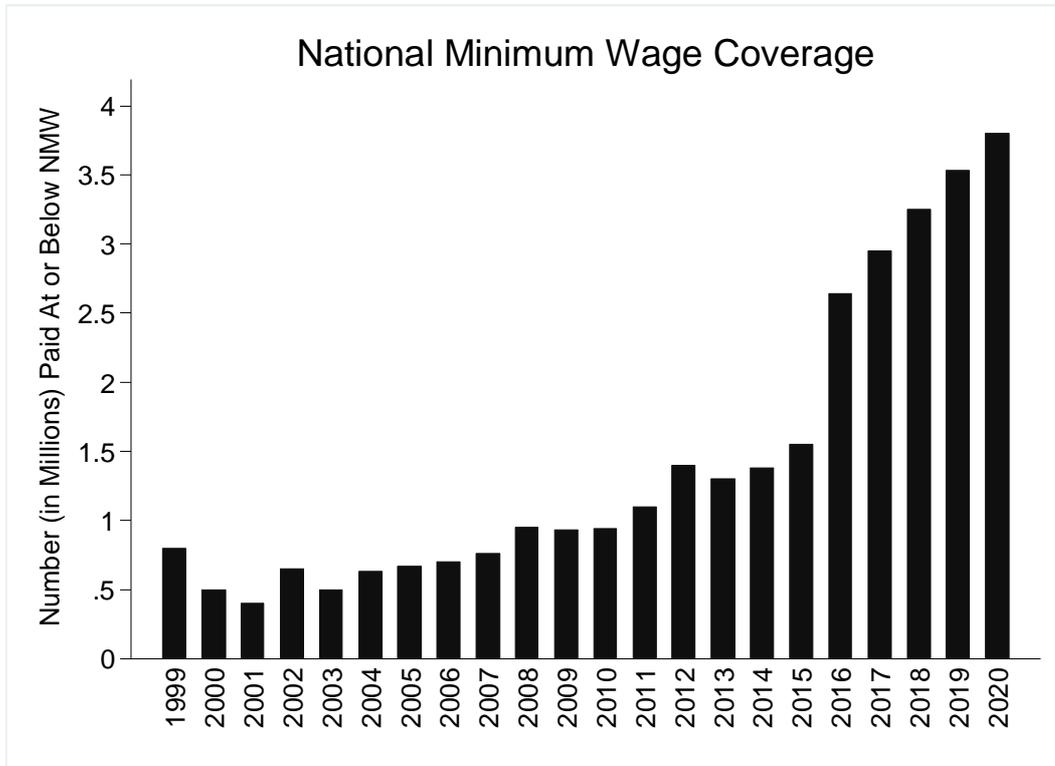
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**Figure 1:
UK National Minimum Wages, 1999-2015**



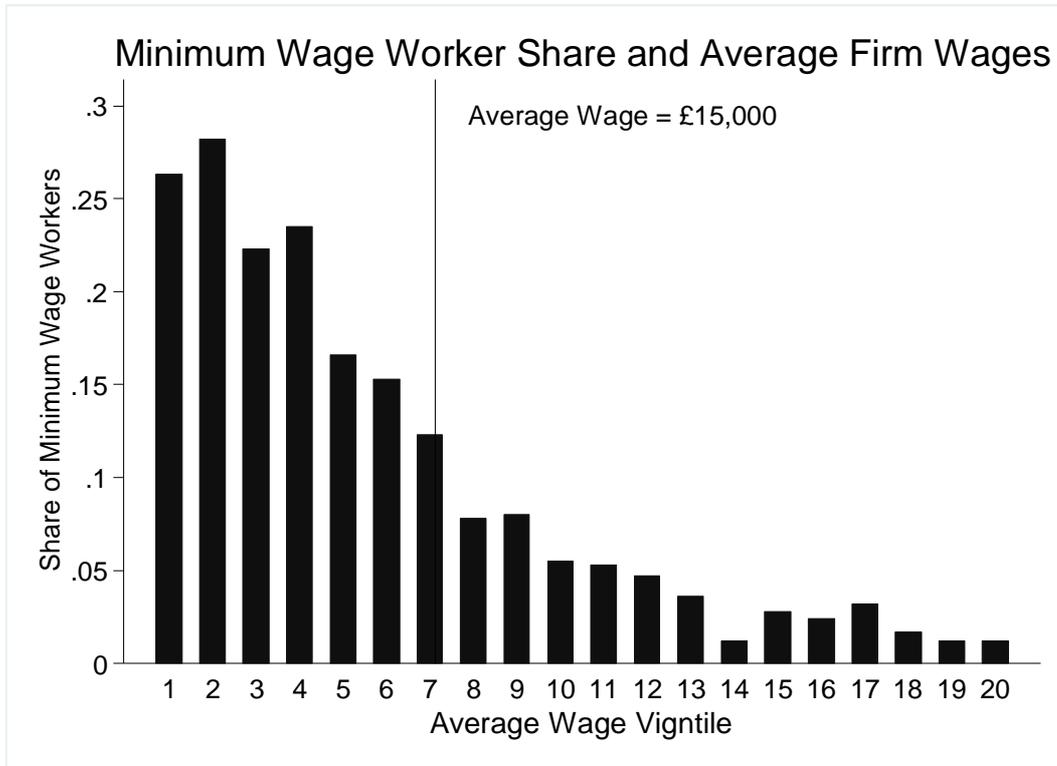
Notes: From Low Pay Commission annual reports.

**Figure 2:
Actual and Estimated Minimum Wage Coverage, 1999-2020**



Notes: Low Pay Commission calculations from Annual Survey of Hours and Earnings (ASHE) from 1999 to 2014 and from 2015 onwards using wage forecasts from ASHE 2014. Paid at or below the minimum is based upon the Low Pay Commission procedure of defining a minimum-wage worker as any worker who receives an hourly wage (excluding overtime) that is up to five pence above the minimum wage effective at the time of the survey

**Figure 3:
Minimum Wage Shares and Firm Average Wages**



Notes: The y-axis shows the proportion of minimum-wage workers in the firm. The x-axis shows the average annual wage in the firm divided into bins for 5 percentiles from lowest (left) to highest (right) – a total of 20 bins for annual wages from £5,000 to £30,000. Derived from matched worker-firm data (40,046 workers in 3,684 firms) from the 2013 Annual Survey of Hours and Earnings (ASHE) and the Annual Business Survey (ABS).

Figure 4:
Examples of Share Price Movements of NMW Firms on Budget Day, July 8 2015

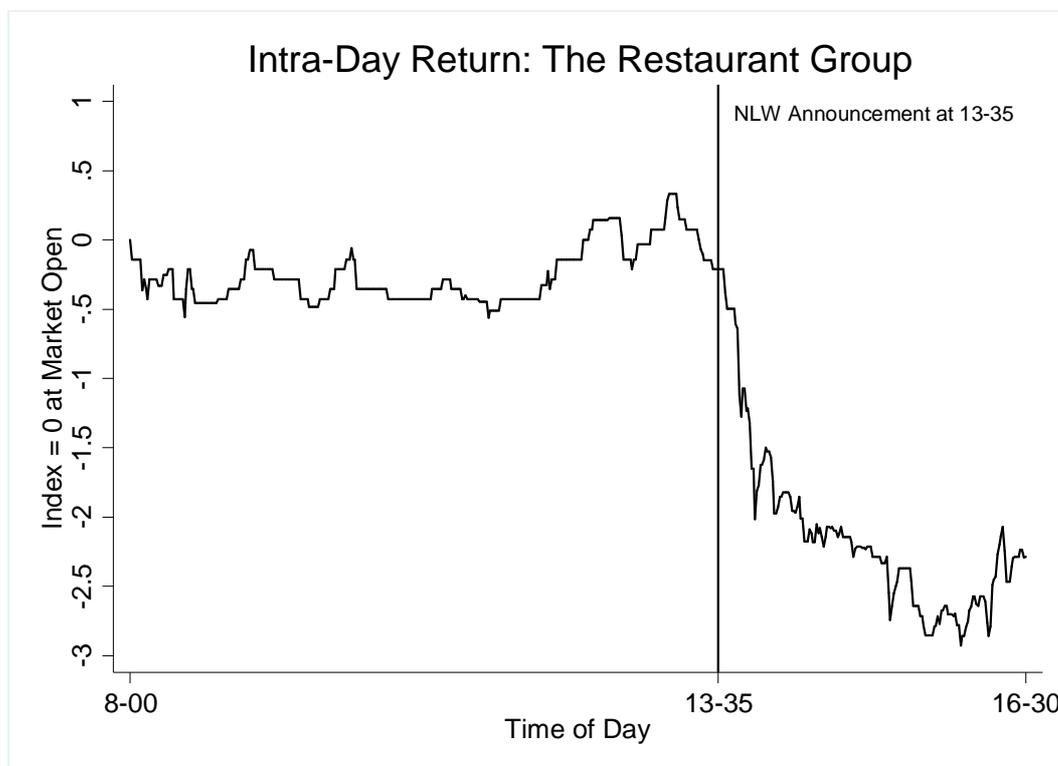
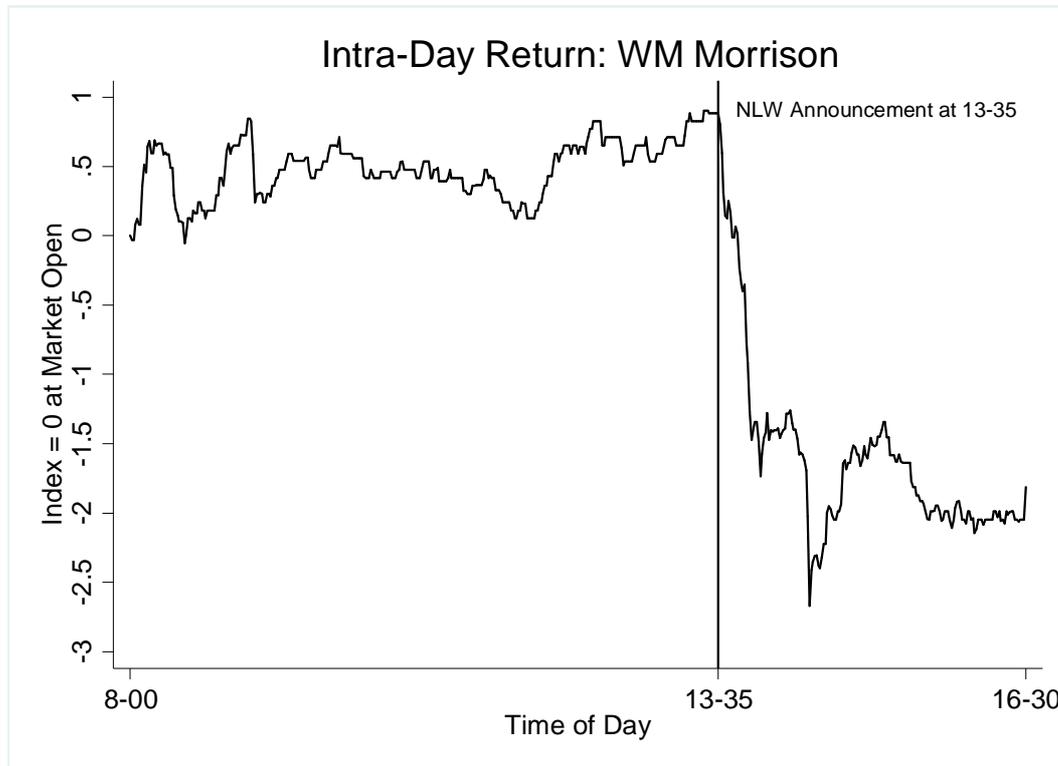


Figure 5:
Intra-Day Returns For Minimum Wage and Non-Minimum Wage Firms

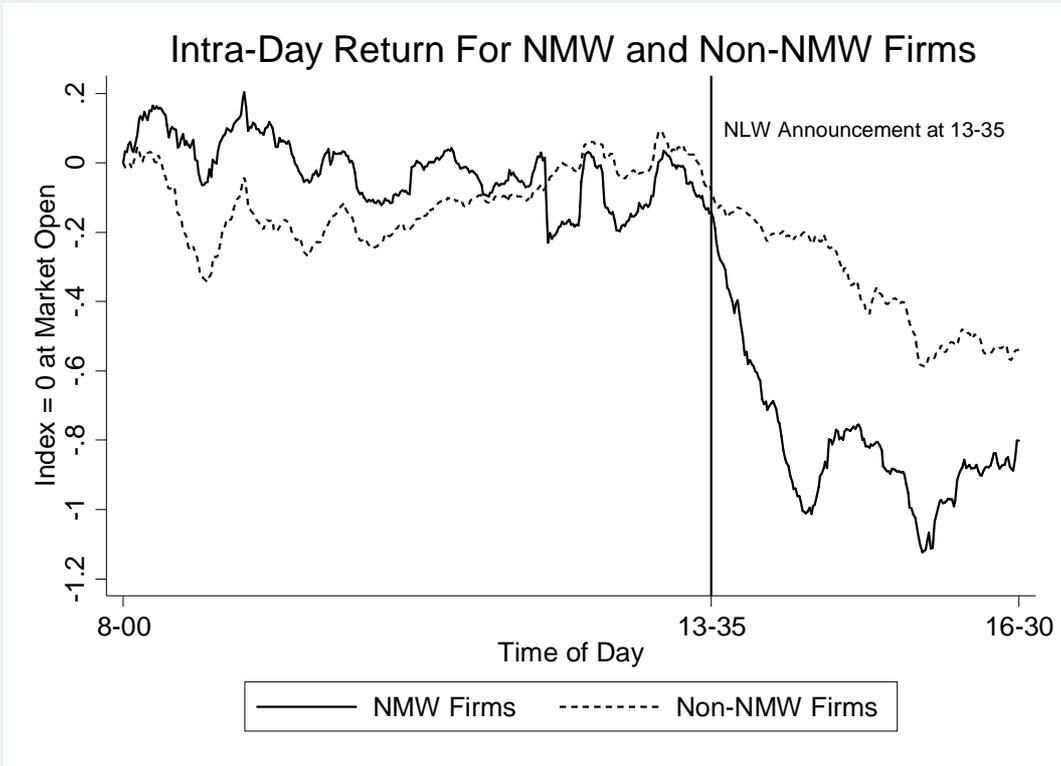
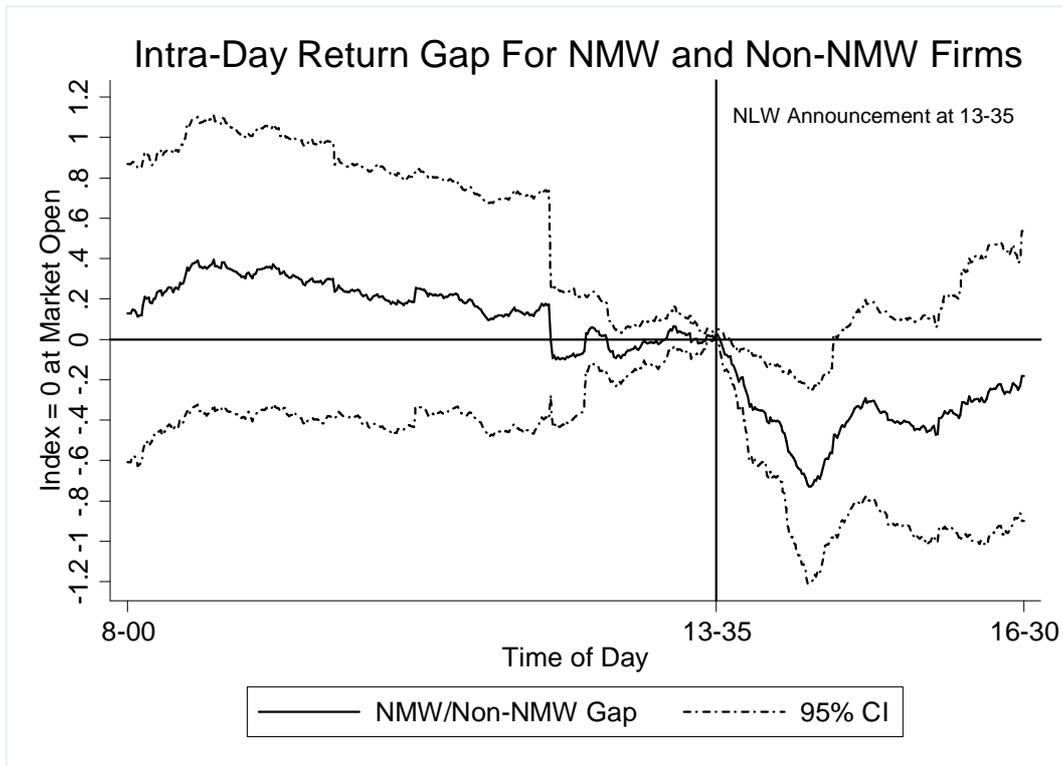
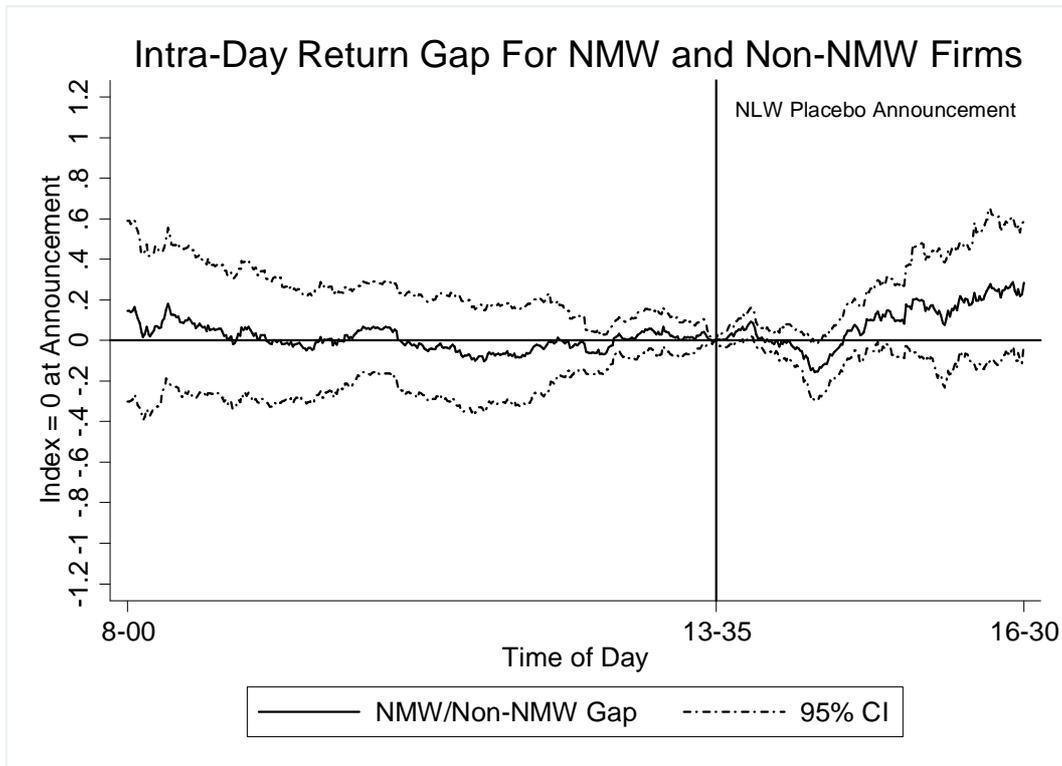


Figure 6:
Intra-Day Return Gap For Minimum Wage and Non-Minimum Wage Firms



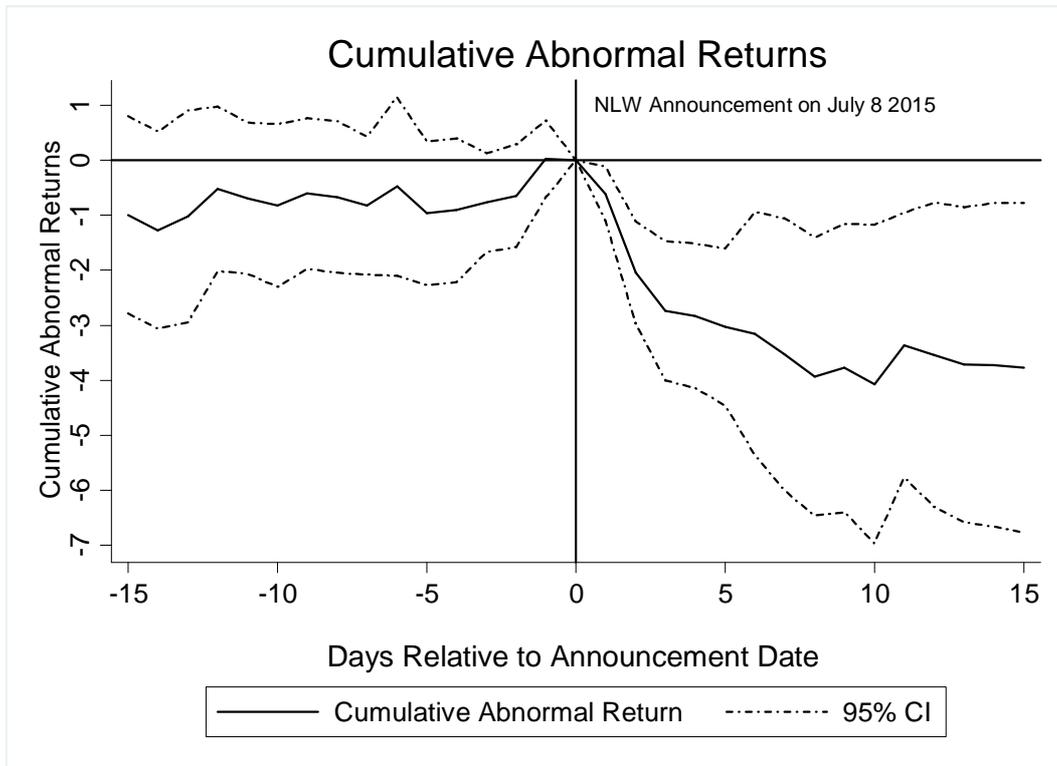
Notes: Based on 442 FTSE All-Share Index quoted firms, comprising 20 NMW firms and 422 Non-NMW firms. The 20 NMW firms are listed in the Appendix.

**Figure 7:
Placebo Test – Day Before Budget Day, July 7 2015**



Notes: Based on 442 FTSE All-Share Index quoted firms, comprising 20 NMW firms and 422 Non-NMW firms. The 20 NMW firms are listed in the Appendix.

Figure 8:
Daily Cumulative Abnormal Returns of National Minimum Wage Firms



Notes: Based on 442 FTSE All-Share Index quoted firms, comprising 20 NMW firms and 422 Non-NMW firms. The 20 NMW firms are listed in the Appendix. Cumulative abnormal returns for the NMW firms are measured using a 2-digit industry return index as the expected return measure. The announcement date (Day 0) was budget day on July 8 2015.

TABLE 1. AGE VARIATIONS IN MINIMUM WAGES, 2014-2016

Uprating Date	October 2014	October 2015	April 2016
Decision Process and Date	Government Accepted Low Pay Commission Recommendations in March 2014	Government Accepted Low Pay Commission Recommendations in March 2015	Chancellor Introduced National Living Wage For 25+ Workers in July 2015 Budget
Adult NMW, Age 21+	6.50	6.70	
Adult NMW, Age 21-24			6.70
Adult NLW, Age 25+			7.20
Youth NMW, Age 18-20	5.13	5.30	5.30
Youth NMW, Age 16-17	3.79	3.87	3.87

Notes: From Low Pay Commission annual reports and July 2015 budget.

TABLE 2. MINIMUM WAGE SHARES AND FIRM AVERAGE WAGES

	All Firms			Firms With Average Wage < £15,000		
	Number of Firms	Mean Wage	Share of Minimum Wage Workers	Number of Firms	Mean Wage	Share of Minimum Wage Workers
All	3684	16,943	0.096	1259	11,878	0.210
NMW Firms	84	14,046	0.247	58	11,736	0.303
Non-NMW Firms	3600	17,170	0.093	1201	11,894	0.206

Notes: Derived from matched worker-firm data (40,046 workers in 3,684 firms) from the 2013 Annual Survey of Hours and Earnings (ASHE) and the Annual Business Survey (ABS). The NMW firms are those in the two particular industries that dominate our equity sample, non-specialised Retail Trade and Beverage Serving activities.

TABLE 3. ESTIMATES OF INTRA-DAY CUMULATIVE ABNORMAL RETURNS

	Equal-Weighted		Value-Weighted	
	(1) Market Model	(2) Industry- Matched Model	(3) Market Model	(4) Industry- Matched Model
Panel A: MW Firms – Post-Announcement				
CAR(0,20)	-0.339** (0.131)	-0.268* (0.125)	-1.414** (0.551)	-1.245** (0.540)
CAR(0,60)	-0.687** (0.236)	-0.641** (0.241)	-1.748** (0.680)	-1.575** (0.666)
CAR(0,120)	-0.462 (0.283)	-0.582 (0.307)	-1.476** (0.447)	-1.413** (0.428)
CAR(0,Market Close)	-0.276 (0.321)	-0.278 (0.331)	-0.984* (0.494)	-0.832 (0.494)
Panel B: MW Firms – Pre-Announcement				
CAR(-20,0)	-0.037 (0.045)	-0.116* (0.054)	0.036 (0.038)	-0.072 (0.042)
CAR(Budget Start,0)	-0.017 (0.088)	-0.035 (0.091)	0.151 (0.086)	0.102 (0.075)
CAR(Market Open,0)	-0.063 (0.376)	0.200 (0.376)	-0.098 (0.160)	0.369* (0.146)

Notes: CAR(X, Y) denotes the cumulative abnormal return from minute X to minute Y relative to the minimum wage announcement time (13:35). There are 20 firms in the MW sample. Panel A reports results for the post-announcement period and Panel B reports results for the pre-announcement period. The market closed 175 minutes after the announcement, it opened 334 minutes before the announcement and the budget began 62 minutes before the announcement. The cumulative abnormal return for each firm is equal-weighted in columns (1) and (2) and weighted by their share of the total value of all trades in MW stocks over the relevant period in columns (3) and (4). ** denotes significance at 1% level; * denotes significance at 5% level.

TABLE 4. ESTIMATES OF MEAN DAILY CUMULATIVE ABNORMAL RETURNS

	(1) CAPM Model	(2) 4-Factor Model	(3) Industry-Matched Model
Panel A: MW Firms – Post-Announcement			
CAR(0,1)	-0.570* (0.251)	-0.485 (0.268)	-0.614* (0.252)
CAR(0,5)	-1.777** (0.603)	-1.797** (0.558)	-3.030** (0.727)
CAR(0,10)	-3.252** (1.258)	-3.265** (1.258)	-4.068** (1.477)
CAR(0,15)	-2.579** (0.965)	-2.727** (1.006)	-3.773** (1.525)
CAR(0,30)	-1.879 (1.523)	-2.259 (1.508)	-2.392 (2.347)
CAR(0,60)	-4.294* (2.160)	-4.981* (2.179)	-4.423 (3.382)
Panel B: MW Firms – Pre-Announcement			
CAR(-1,0)	0.122 (0.262)	0.105 (0.274)	-0.023 (0.356)
CAR(-5,0)	0.842 (0.597)	0.772 (0.576)	0.963 (0.666)
CAR(-10,0)	1.876* (0.741)	1.811* (0.710)	0.821 (0.755)
CAR(-15,0)	2.087* (0.941)	1.940* (0.890)	0.994 (0.914)
CAR(-30,0)	2.424 (1.245)	2.487 (1.304)	0.691 (1.300)
CAR(-60,0)	2.644 (1.487)	3.264 (1.748)	0.282 (1.515)

Notes: CAR(X, Y) denotes the cumulative abnormal return from day X to day Y relative to the minimum wage announcement date (8th July 2015). There are 20 firms in the MW sample. Panel A reports results for the post-announcement period and Panel B reports results for the pre-announcement period. ** denotes significance at 1% level; * denotes significance at 5% level.

TABLE 5. ESTIMATES OF MEDIAN DAILY CUMULATIVE ABNORMAL RETURNS

	(1) CAPM Model	(2) 4-Factor Model	(3) Industry-matched Model
Panel A: MW Firms – Post-Announcement			
CAR(0,1)	-0.949** (0.327)	-0.593 (0.324)	-0.943** (0.224)
CAR(0,5)	-1.703* (0.729)	-1.968** (0.678)	-2.449** (0.927)
CAR(0,10)	-1.931* (0.905)	-2.246** (0.680)	-2.903* (1.265)
CAR(0,15)	-2.100** (0.552)	-2.185** (0.570)	-2.825** (0.848)
CAR(0,30)	-2.349* (1.180)	-2.205 (1.216)	-4.168** (1.110)
CAR(0,60)	-3.522 (2.791)	-3.479 (2.230)	-7.754** (2.282)
Panel B: MW Firms – Pre-Announcement			
CAR(-1,0)	0.053 (0.349)	0.021 (0.305)	-0.410 (0.376)
CAR(-5,0)	1.368** (0.350)	1.515** (0.388)	1.543** (0.402)
CAR(-10,0)	2.401 (1.279)	1.986* (0.991)	0.774 (1.180)
CAR(-15,0)	2.792* (1.210)	1.972 (0.998)	1.153 (1.002)
CAR(-30,0)	3.065 (2.293)	2.651 (2.007)	1.260 (2.443)
CAR(-60,0)	3.282* (1.540)	3.877* (1.931)	0.275 (1.613)

Notes: CAR(X, Y) denotes the cumulative abnormal return from day X to day Y relative to the minimum wage announcement date (8th July 2015). There are 20 firms in the MW sample and results for the median return are reported. Panel A reports results for the post-announcement period and Panel B reports results for the pre-announcement period. ** denotes significance at 1% level; * denotes significance at 5% level.

TABLE 6. REGRESSION ESTIMATES OF FIFTEEN-DAY EXCESS RETURNS

	(1)	(2)	(3)	(4)
NMW	-0.026** (0.009)	-0.038** (0.011)	-0.036** (0.015)	
NMW High π Impact				-0.049* (0.020)
MNW Low π Impact				-0.022 (0.019)
Avg Wage £15-20k			-0.001 (0.015)	-0.001 (0.015)
Avg Wage £20-25k			-0.001 (0.012)	-0.000 (0.012)
Avg Wage £25-30k			0.013 (0.013)	0.013 (0.013)
Sample Size	442	442	442	442
2-Digit Industry	N	Y	Y	Y
15-Day Prior Return	N	Y	Y	Y
Size Deciles	N	Y	Y	Y

Notes: The dependent variable is the fifteen-day excess return using the CAPM model. NMW are our sample of 20 firms with average wage less than £15,000. NMW High π Impact are the 10 NMW firms for which a 4% rise in the wage bill would generate the largest percentage decline in pretax profits. NMW Low π Impact are the other ten firms in the NMW sample. Robust standard errors in parentheses. ** denotes significance at 1% level; * denotes significance at 5% level.

TABLE 7. THE NATIONAL LIVING WAGE EFFECT ON FIRM PROFITS

	Baseline Firm	10% Increase in Minimum Wage	Minimum Wage Only Firm
Sales	100	100	100
Wage Bill	18.6	19.3	20.5
Other Costs	53.9	53.9	53.9
Gross Profit	27.5	26.8	25.6
Operating Profit	8.7	8.0	6.8
Pre-Tax Profit	6.0	5.3	4.1
Present Value of Pre-Tax Profits	200	175.2	136.7
Percent Decline in Firm Value (Permanent)		-12.4	-31.7
Decline in Firm Value (Hit to 2020, Thereafter No Effect)		-1.7	-9.0

Notes: Assumes 3 percent real interest rate, 4 percent rise in wage bill (resulting from a 10% minimum wage increase, assuming 30% of workers are NLW workers; if the minimum wage increase is gradated as a path of 7%, 9%, 11% and 12% increases to get to the £9.00 per hour target in 2020 the calculation turns out to be almost identical).

Appendix: List of Minimum Wage Firms By Sector

Broadline Retail:

B&M European Value Retail
Debenhams plc
Marks and Spencer Group plc
Home Retail Group plc

Apparel Retail:

Next plc

Business Support Services:

Mitie Group plc

Food Retail:

McColl's Retail Group plc
WM Morrison Supermarkets plc
Greggs plc

Home Improvement:

Dunelm Group plc

Recreational Services:

Cineworld Group plc

Restaurants Bars:

Greene King plc
J D Wetherspoon plc
Marston's plc
Mitchells & Butlers plc
The Restaurant Group plc

Specialty Retail:

Card Factory plc
Game Digital plc
Poundland Group plc
WH Smith plc

TABLE A1. REGRESSION ESTIMATES OF SIXTY-DAY ABNORMAL RETURNS

	(1)	(2)	(3)	(4)
NMW	-0.043* (0.021)	-0.071* (0.029)	-0.071* (0.031)	
NMW High π Impact				-0.122** (0.035)
MNW Low π Impact				-0.016 (0.041)
Avg Wage £15-20k			0.003 (0.037)	0.005 (0.038)
Avg Wage £20-25k			-0.017 (0.031)	-0.015 (0.031)
Avg Wage £25-30k			0.012 (0.030)	0.012 (0.030)
Sample Size	442	442	442	442
2-Digit Industry	N	Y	Y	Y
60-Day Prior Return	N	Y	Y	Y
Size Deciles	N	Y	Y	Y

Notes: The dependent variable is the sixty-day abnormal return using the CAPM model. NMW are our sample of 20 firms with average wage less than £15,000. NMW High π Impact are the 10 NMW firms for which a 4% rise in the wage bill would generate the largest percentage decline in pretax profits. NMW Low π Impact are the other ten firms in the NMW sample. Robust standard errors in parentheses. ** denotes significance at 1% level; * denotes significance at 5% level.