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THE IMPACT OF THE 2016 MINIMUM WAGE INCREASE ON AVERAGE LABOUR COSTS, HOURS WORKED AND EMPLOYMENT IN IRISH FIRMS

PAUL REDMOND AND SEAMUS MCGUINNESS

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

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Seamus McGuinness

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THE AUTHORS

Paul Redmond is a Research Officer at the ESRI and an Adjunct Assistant Professor at TCD. Seamus McGuinness is a Research Professor at the Economic and Social Research Institute (ESRI) and an Adjunct Professor at Trinity College Dublin (TCD).

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EXECUTIVE SUMMARY

- The Earnings Hours and Employment Costs Survey (EHECS) data accurately measure the proportion of employees in receipt of the national minimum wage across firms in Ireland. We use these data to: (a) carry out a detailed profile of minimum wage employment in Ireland, by examining the level and intensity of minimum wage employment across various sectors of the economy; (b) examine whether there was a greater increase in average labour costs in firms employing minimum wage employees following the 2016 rate rise, compared to firms with no minimum wage employees; (c) examine whether any changes occurred to hours worked, or the number of employees, in high intensity minimum wage firms following the 2016 minimum wage increase.
- Regarding the incidence of minimum wage employment across firms in Ireland, we find that almost three-quarters of firms employ no minimum wage workers. Approximately 12 per cent of firms have less than 10 per cent of their workforce on the minimum wage. Just over three per cent of firms pay more than 50 per cent of their employees the minimum wage rate.
- The intensity of minimum wage employment is greatest in the retail and accommodation and food sectors. Almost half of all firms in these sectors have some minimum wage employees.
- Our analysis indicates that, following the 2016 minimum wage increase, average weekly labour costs increased by 5.4 per cent more in firms with 100 per cent of employees on the minimum wage relative to firms with no minimum wage workers. However, the evidence suggests that these higher labour costs were confined to very high intensity firms, with more than 50 per cent of employees on the minimum wage. These firms account for just 3 per cent of all firms. For firms with between 10 and 50 per cent of employees on the minimum wage, we detect no statistically significant impact on average labour costs.
- It is important to note that 2016 was a period of strong economic growth and that earnings, in general, were increasing throughout the economy during this period. As such, our analysis is framed in this context. If the minimum wage had increased by the same amount in a recessionary period, such as in 2010, when GDP growth was negative and average hourly earnings were declining, it is possible that certain sectors would have seen greater relative growth in average labour costs.
- A unique contribution of our paper is the detailed study of overtime hours. We have shown that, in response to the 2016 minimum wage increase, firms with more than 50 per cent of employees on the minimum wage reduced the probability of offering any overtime hours to part-time workers by approximately six percentage points.

- There is some evidence of an increase in the number of full-time hours, which coincided with a decrease in part-time hours. This is consistent with theoretical predictions of labour-labour substitution whereby employers substitute from lower productivity to higher productivity workers following an increase in the wages of low productivity workers.
- Finally, we do not find any evidence of a reduction in the number of employees among high intensity minimum wage firms following the 2016 minimum wage increase.

CHAPTER 1

Introduction

Minimum wage policies, and their impact on employers and employees, have received a great deal of attention in recent decades. Much of the focus has been on whether minimum wage increases lead to negative employment effects for low paid workers. A priori, this depends on the nature of the labour market. In the case of perfect competition, a binding increase to the minimum wage may lead to a reduction in employment of minimum wage workers. However, in a monopsony setting, where employers have a degree of market power, minimum wage increases may have no impact, or may even increase employment. The empirical evidence in this regard is mixed. Several recent papers find no discernible impacts (see, e.g. Dolton et al., 2015; Hirsch et al., 2015), while others find negative employment effects (see, e.g. Clemens and Wither, 2019; Lordan and Neumark, 2018). Okudaira et al. (2019) attempt to directly link the employment effects to the level of market power of the firm. They find no employment effects in firms with greater market power and negative effects in firms with less market power. This supports the idea that regional or industry variation in the structure of labour markets (monopsony vs perfect competition) can generate different employment outcomes. Aside from the extensive margin, minimum wage effects may arise at the intensive margin due to changes in hours worked. There is recent evidence showing a reduction in hours worked of minimum wage employees following the uprating or introduction of a minimum wage (see e.g. McGuinness and Redmond, 2019; Stewart and Swaffield, 2008).

A related strand of literature examines the impact of minimum wage increases on firm-level outcomes, such as average labour costs and profitability. Harasztosi and Lindner (2019) carry out a comprehensive assessment of how firms in Hungary respond to a very large minimum wage increase.[1] Not surprisingly, given the magnitude of the minimum wage increase, firms employing minimum wage workers experienced substantially higher average labour costs, relative to firms with no minimum wage workers, following the minimum wage increase. While this led to some job losses, most firms responded to the increased labour costs by raising their prices, suggesting the incidence fell mainly on consumers. Riley and Bondibene (2017) and Draca et al. (2011) also find an increase in average wages among firms employing high numbers of low paid workers following a minimum wage increase. Riley and Bondibene (2017) find evidence to suggest that affected firms improve productive efficiency, though the

[1] The minimum wage went from 35 per cent of median wages in 2000 to 55 per cent in 2002.

precise channels are unknown. However, Draca et al. (2011) find that affected firms experience reduced profitability, with no evidence of productivity gains.

In this paper, we use firm-level data to study the impacts of the 2016 minimum wage increase in Ireland. A significant advantage of our data is that they allow us to precisely identify the percentage of minimum wage employees within firms. Therefore, we can exploit variation in the treatment intensity across firms following a minimum wage increase. In the absence of such data, previous studies have relied on identifying treated and control firms using average labour costs within firms.[2] We utilise these data to make three main contributions. Firstly, we carry out a detailed profile of minimum wage employment, by examining the level and intensity of minimum wage employment across various sectors of the economy. Secondly, we examine whether there was a greater increase in average labour costs in high intensity minimum wage firms following the 2016 rate rise, and whether this varied by sector and the level of minimum wage intensity within the firm. Finally, our dataset contains detailed information on hours worked within the firm, including overtime hours split by full-time and part-time employment status. We use these data to analyse whether the minimum wage increase impacted the hours worked of employees within firms. We test for changes in the number of overtime hours, as well as the probability of any overtime hours being offered, following the minimum wage increase. To our knowledge, ours is the first paper to study the impact of a minimum wage increase on overtime hours in such detail. We also test for potential impacts to the extensive margin to see if the minimum wage increase led to a decrease in employment among high intensity minimum wage firms.

Our analysis indicates that, following the 2016 minimum wage increase, average weekly labour costs increased by 5.4 per cent more in firms with 100 per cent of employees on the minimum wage relative to firms with no minimum wage workers. However, while high intensity minimum wage firms were impacted, our results indicate that for the majority of firms employing minimum wage workers, their average labour costs increased by approximately the same amount as firms with no minimum wage workers. Specifically, the increased labour costs appear to be confined to the very high intensity firms, i.e. those with more than half of their employees on the minimum wage. It is important to note that these high intensity (50 per cent plus) minimum wage firms account for just 3 per cent, approximately, of the total sample. We find some evidence of a reduction in overtime hours. There was a 3.5 to 5.5 percentage point reduction in the probability that a high intensity minimum wage firm offered any overtime hours to their part-time employees. While we detect a

[2] For example, Riley and Bondibene (2017) and Draca et al. (2011).

decrease in part-time hours in high intensity firms following the minimum wage increase, there is evidence of a corresponding increase in full-time hours. As minimum wage workers are more likely to be part-time employees, this is consistent with labour-labour substitution, whereby employers substitute from lower productivity to higher productivity workers following an increase in the wages of low productivity workers (Fairris and Bujanda, 2008). We find no evidence of a reduction in employment following the minimum wage increase.

It is important that evidence relating to minimum wage policies covers all aspects of the business cycle. Studies such as Clemens and Wither (2019) and Okudaira et al. (2019) provide insights into minimum wage effects during recessionary periods.[3] However, our analysis is framed in the context of strong economic growth and a buoyant labour market. When setting minimum wages, policymakers take account of prevailing economic conditions. The Irish Low Pay Commission takes into account the 'economic context' when making yearly recommendations to the Irish government concerning the minimum wage.[4] Therefore, providing a broad evidence base in periods of recession as well as economic growth is necessary. We provide evidence pertaining to the latter.

1.1 POLICY BACKGROUND

A minimum wage was first introduced in Ireland in 2000 following the implementation of the National Minimum Wage Act. The initial minimum wage was €5.58 per hour (or £4.40 in Irish Punts). There were several increases in the minimum wage in subsequent years. By 2007, the minimum wage rate was €8.65 per hour. However, following this there was an extended period of time during which the minimum wage did not increase. This coincided with a sharp, and prolonged, economic downturn in Ireland, during which time unemployment increased dramatically. In 2015, the minimum wage was at the same level as it had been in 2007, at €8.65 per hour. By this time, the Irish economy had started to recover from recession and unemployment rates were declining. The Irish Low Pay Commission was established in 2015, with the aim of providing yearly recommendations to the Irish government regarding the appropriate minimum wage rate. Their aim is to set a minimum wage that assists as many low paid workers as possible, without creating adverse employment effects.

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[3] Holton and O'Neill (2017) also show that minimum wages are particularly important in a recession. By protecting the wages of the lowest paid workers in the economy, minimum wages stop wage inequality from increasing substantially in recessionary periods.

[4] The Low Pay Commission's 2019 yearly report and recommendations can be found at http://www.lowpaycommission.ie/Publications.

In 2016, following recommendations from the Low Pay Commission, the Irish minimum wage was increased from €8.65 per hour to €9.15 per hour, an increase of approximately 6 per cent. This was the first time the minimum wage had been increased since 2007. It is this 2016 minimum wage increase that is the focus of this paper.

CHAPTER 2

Data and descriptive statistics

The data for this study come from the Earnings, Hours and Employment Costs Survey (EHECS), which is a panel dataset that follows firms over time. This is a quarterly survey that collects firm-level data on average hourly and weekly labour costs across economic sectors in Ireland. The EHECS survey began in 2008. From 2008 to 2016 there were 195,231 quarterly firm-level observations. In cases where there is a gap in the panel for a particular firm, for example if they complete the survey in Quarter 1, do not complete the survey in Quarter 2, but complete it again in Quarter 3 of a given year, then the missing quarter may be imputed. Of the 195,231 quarterly observations, 42,845 are imputed. We restrict our analysis to non-imputed observations, leaving 152,386 quarterly observations. We utilise the pooled sample of quarterly observations to construct descriptive statistics and to implement a pooled difference-in-differences estimator, which is explained in detail later in the paper. We also utilise the panel component to implement a panel estimator. In doing so, we work with a sample of firms with a balanced panel (of non-imputed data) for all quarters in 2015 and 2016. There are 1,948 firms that meet this criterion.

The data contain detailed information on average hours worked within the firm, including overtime hours of full-time and part-time employees. The sampling frame for the survey is taken from the Central Business Register (CBR). All enterprises with 50 or more employees are included as well as a sample of enterprises in the three to 49 employee range. The EHECS data contain measures of the number of employees, allowing us to control for firm size. The key advantage of the dataset is that it collects information on the proportion of minimum wage workers employed within the firm. This allows us to clearly identify the minimum wage intensity of a firm. In doing so, we can measure whether firms with greater exposure to the minimum wage were more affected by the minimum wage increase. Most of the variables are well populated in the dataset, that is, there are not many missing values. One exception is overtime hours. Of the 152,386 quarterly observations, 71,052 have overtime information. Of the 71,052 observations, 6,011 record zero overtime hours. Therefore, our sample sizes when estimating models using overtime as the outcome variables are more restricted in terms of sample sizes.

We pool all of the quarterly observations in the dataset to calculate summary statistics relating to the prevalence of minimum wage employment. The timeframe spans the years 2008 to 2016. Table 2.1 shows, for each sector, the percentage of firms that have

any (at least one) minimum wage worker, denoted '*anyMW*'. Also shown in Table 2.1 is the percentage of minimum wage workers, on average, employed within firms, denoted '*% on MW*'. In the second panel on the right of Table 2.1, we also show the '*% on MW*' conditional on firms that employ at least one minimum wage employee. For example, on average, 13.02 per cent of employees in firms in the accommodation sector are minimum wage workers and just under 50 per cent of firms in this sector employ at least one minimum wage employee. Of the firms in the accommodation sector that employ some minimum wage workers, the average incidence of firm-level minimum wage employment is 26.16 per cent. The five sectors with the highest concentration and intensity of minimum wage employment are accommodation, food and beverage, retail (excluding motor retail), manufacture (of food, drink and clothing) and domestic / personal services.[5] At the other end of the spectrum, less than 1 per cent, on average, of employees within firms in the finance and insurance sector are paid the minimum wage, with under 10 per cent of firms in this sector employing at least one minimum wage worker. There are some sectors with very few firms employing minimum wage workers, but of the ones that do, the incidence of minimum wage employment is quite high. For example, less than 10 per cent of firms in the construction sector employ minimum wage workers. However, of the firms that do, approximately 18 per cent of their employees are on the minimum wage.

Table 2.2 shows the distribution of Irish firms by the percentage of minimum wage workers employed within the firm. Approximately three-quarters of firms employ no minimum wage workers, with a further 12 per cent employing less than 10 per cent of their workforce on the minimum wage. Approximately 13 per cent of firms employ more than 10 per cent of their workforce on the minimum wage and just over 3 per cent have more than 50 per cent of employees on the minimum wage.

Table 2.3 shows the distribution of firms by minimum wage intensity. We separately analyse the five sectors that employ the largest number of minimum wage workers, as shown in Table 2.1. We then combine the remaining sectors that employ fewer minimum wage workers into an 'other' sector grouping.[6] The sectors with the greatest incidence of very high intensity minimum wage employment are the retail and accommodation and food sectors, where 7.64 per cent and 8.70 per cent of firms, respectively, have more than half of their employees on the minimum wage.

5 Due to Nace sector groupings in the EHECS data, quarrying and mining workers are also included with manufacturing workers in food, drink and clothing.

6 The accommodation and food sectors are combined into one 'accommodation and food' sector.

TABLE 2.1 CONCENTRATION OF MW EMPLOYMENT BY SECTOR (2008-2016)

	All Firms			MW Firms	
Sector	**anyMW %**	**% on MW**	**Obs**	**% on MW**	**Obs**
Accommodation	49.77	13.02	6,767	26.16	3,368
Food / beverage	43.67	13.86	8,782	31.75	3,835
Retail	43.31	12.35	17,745	28.51	7,685
Manufacture (food/drink/clothing)	33.12	8.32	5,900	25.13	1,954
Domestic / personal services	28.05	7.65	9,118	27.26	2,558
Residential care	27.31	2.32	5,998	8.50	1,638
Education	27.07	2.48	5,293	9.16	1,433
Motor retail/wholesale	24.78	2.97	3,216	12.00	797
Non-motor wholesale	22.59	3.86	10,981	17.08	2,481
Leasing/travel	22.17	4.10	3,591	18.50	796
Health	21.36	1.19	3,890	5.59	831
Manufacture (pharma/plastic)	20.36	2.06	4,071	10.13	829
Publish/broadcasting	19.87	3.48	3,297	17.54	655
Manufacture (wood/paper)	19.45	2.64	3,614	13.57	703
Air transport/courier	19.09	1.68	2,609	8.81	498
Manufacture (metal/electrical)	18.83	2.04	6,868	10.85	1,293
Security/support services	18.39	2.99	4,307	16.26	792
Social work	17.89	2.78	6,021	15.51	1,077
Finance/real estate	17.40	1.91	4,183	10.98	728
Public admin	17.15	0.40	3,925	2.32	673
Manufacture (furniture)	16.50	1.88	3,225	11.41	532
Transport (land/water)	16.36	2.98	2,708	18.19	443
Elec/gas/water	15.94	2.37	1,487	14.86	237
R&D & veterinary	13.19	2.44	2,873	18.51	379
Legal/management/architecture	12.34	1.27	6,979	10.31	861
IT	12.27	0.95	3,570	7.77	438
Construction	9.59	1.75	8,163	18.29	783
Finance/insurance	8.55	0.61	3,205	7.13	274
Total	**25.31**	**5.16**	**15,2386**	**20.39**	**38,571**

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

TABLE 2.2 DISTRIBUTION OF IRISH FIRMS BY MINIMUM WAGE INTENSITY (2008-2016)

%MW	Obs	Per cent
None	113,815	74.69
Less than 10%	18,191	11.94
10-20%	6,305	4.14
20-30%	4,276	2.81
30-40%	2,966	1.95
40-50%	2,074	1.36
50-60%	1,594	1.05
60-70%	1,179	0.77
70-80%	721	0.47
80-90%	496	0.33
90-100%	769	0.5
Total	**152,386**	**100**

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

TABLE 2.3 DISTRIBUTION OF IRISH FIRMS BY MW INTENSITY

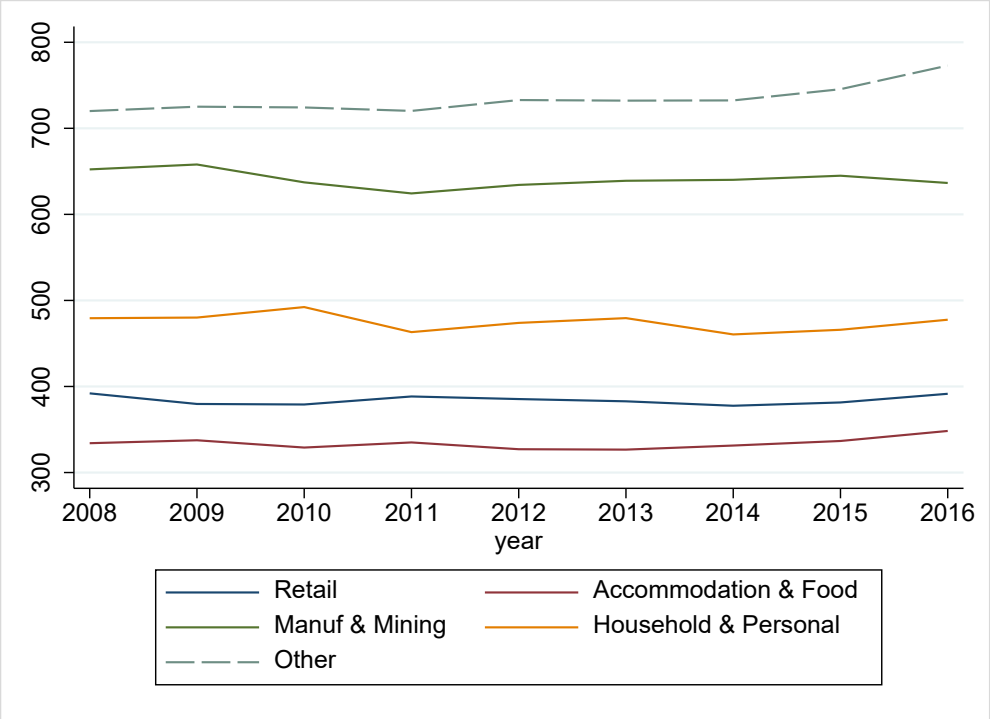
MW Intensity	Retail (%)	Accomm. & Food (%)	Manuf. (%)	Domestic & Personal (%)	Other Sectors (%)
None	56.69 (n=10,060)	53.68 (n=8,346)	66.88 (n=3,946)	71.95 (n=6,560)	81.58 (n=84,903)
Less than 10%	9.88 (n=1,753)	11.21 (n=1,743)	12.32 (n=727)	10.2 (n=930)	12.53 (13,038)
10-20%	9.04 (n=1,604)	9.26 (n=1,440)	5.53 (n=326)	4.66 (n=425)	2.41 (n=2,510)
20-30%	7.78 (n=1,381)	6.95 (n=1,081)	3.83 (n=226)	3.67 (n=335)	1.2 (n=1,253)
30-40%	5.29 (n=938)	5.45 (n=848)	3.27 (n=193)	2.62 (n=239)	0.72 (n=748)
40-50%	3.69 (n=654)	4.75 (n=738)	2.24 (n=132)	1.51 (n=138)	0.4 (n=412)
50-100%	7.64 (n=1,355)	8.70 (n=1,353)	5.93 (n=350)	5.38 (n=491)	1.16 (n=1,210)
Total	100	100	100	100	100

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

We pool all of the quarterly observations and calculate the average weekly earnings and average hourly earnings for our five sectoral groupings for each year from 2008 to 2016. The average weekly earnings are shown in Figure 2.1 and the average hourly earnings in Figure 2.2. The graphs provide initial descriptive evidence that, on average, the 2016 minimum wage increase did not lead to substantial increases in average labour costs in sectors that employed larger numbers of minimum wage workers. The increases in average labour costs appear to be greatest in the 'other' sector that consists of firms with the lowest incidence of minimum wage employment. It is important to reiterate that we are studying a period of strong economic growth, with

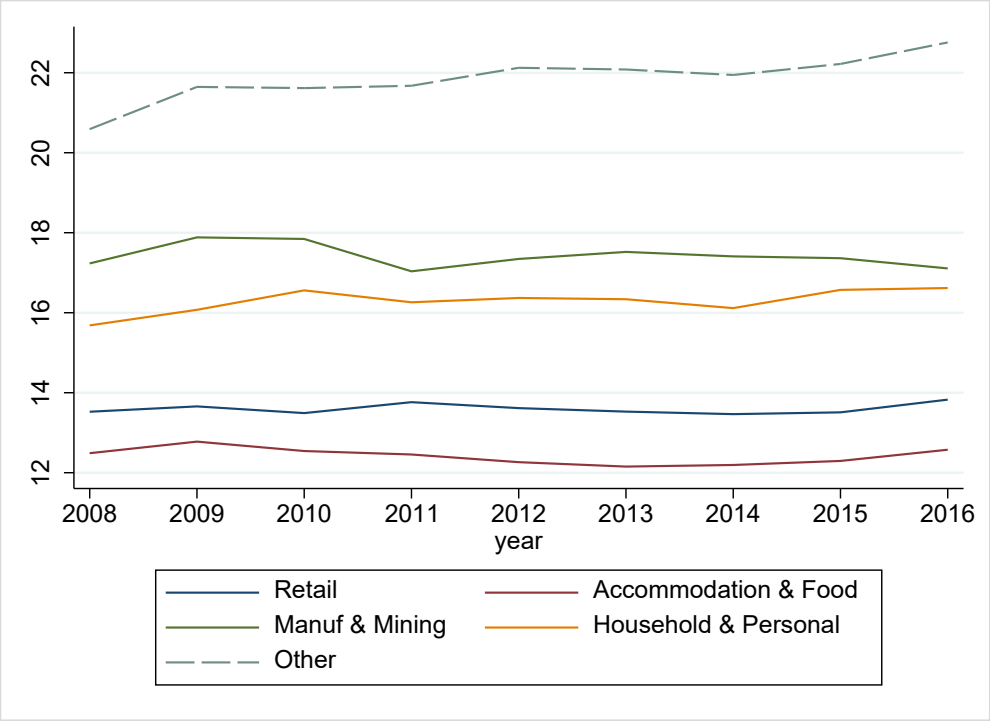
a 4 per cent GDP growth rate in 2016 and a 2.5 per cent increase in average hourly earnings (ESRI, 2019). Therefore, earnings in general were growing throughout the economy during this period. As such, our analysis is framed in this context. If the minimum wage had increased by the same amount in a recessionary period, such as in 2010 when GDP growth was negative and hourly earnings declined by 1.5 per cent (ESRI, 2013), it is possible that affected sectors would have seen greater relative growth in average labour costs. However, as mentioned earlier, the economic context is typically a key component in the decision to raise the minimum wage, and in this regard, our paper provides important evidence on the impact of a minimum wage increase in a growing economy.

FIGURE 2.1 AVERAGE FIRM-LEVEL WEEKLY EARNINGS FOR BROAD SECTOR GROUPINGS (2008-2016)



Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

FIGURE 2.2 AVERAGE FIRM-LEVEL HOURLY EARNINGS FOR BROAD SECTOR GROUPINGS (2008-2016)



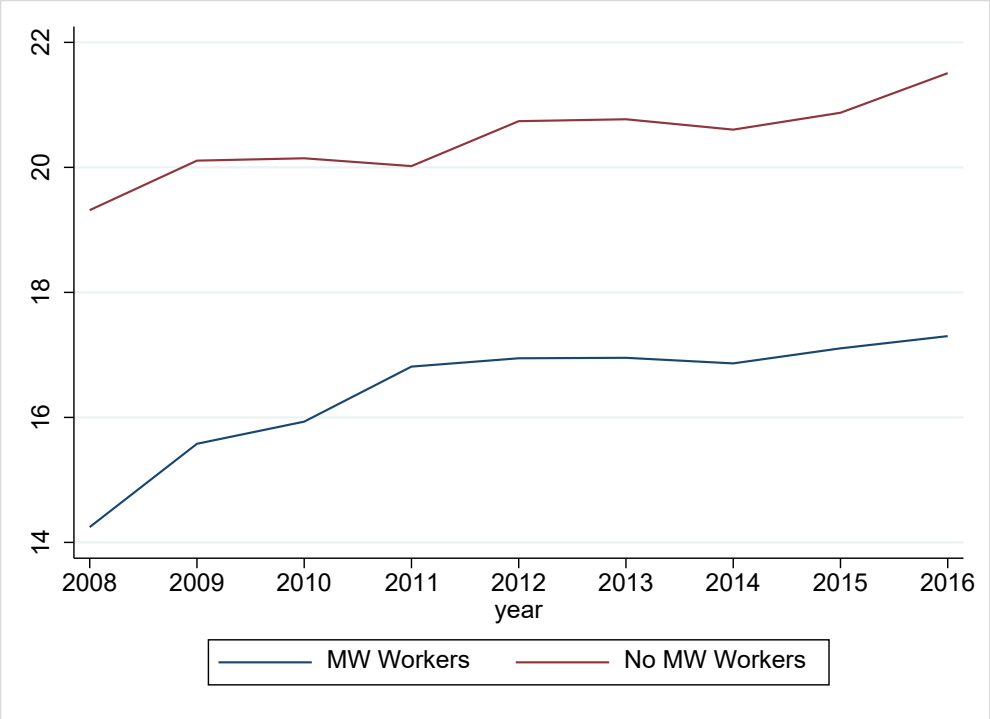
Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

In Figures 2.3 and 2.4, we split firms into two groups: those with no minimum wage employees and those employing some (at least one) minimum wage employee. We plot the average firm-level hourly (Figure 2.3) and weekly (Figure 2.4) earnings for both groups across all sectors. On average, the labour costs for firms employing minimum wage workers did not appear to increase by more than the labour costs of firms employing no minimum wage workers following the 2016 increase. In Figures 2.5 and 2.6, we further disaggregate minimum wage firms by the level of intensity. We show average labour costs over time for firms with more than 10 per cent, 20 per cent, 30 per cent, etc., of their employees on the minimum wage. We go as far as 70 per cent, as going beyond this threshold leads to small sample sizes. Just 1 per cent of all observations consist of firms with more than 70 per cent of employees on the minimum wage. The overall sample size for the nine years for this group is just under 2,000, with an average yearly sample size of 220.

We see that average hourly and weekly wages for firms with no minimum wage workers are between 1.5 to 2 times higher than hourly and weekly wages of minimum wage firms. The higher the minimum wage intensity, the lower the average labour costs. The average weekly earnings in 2016 for firms with no minimum wage workers was €716, compared to just €294 for firms with more than 70 per cent of employees

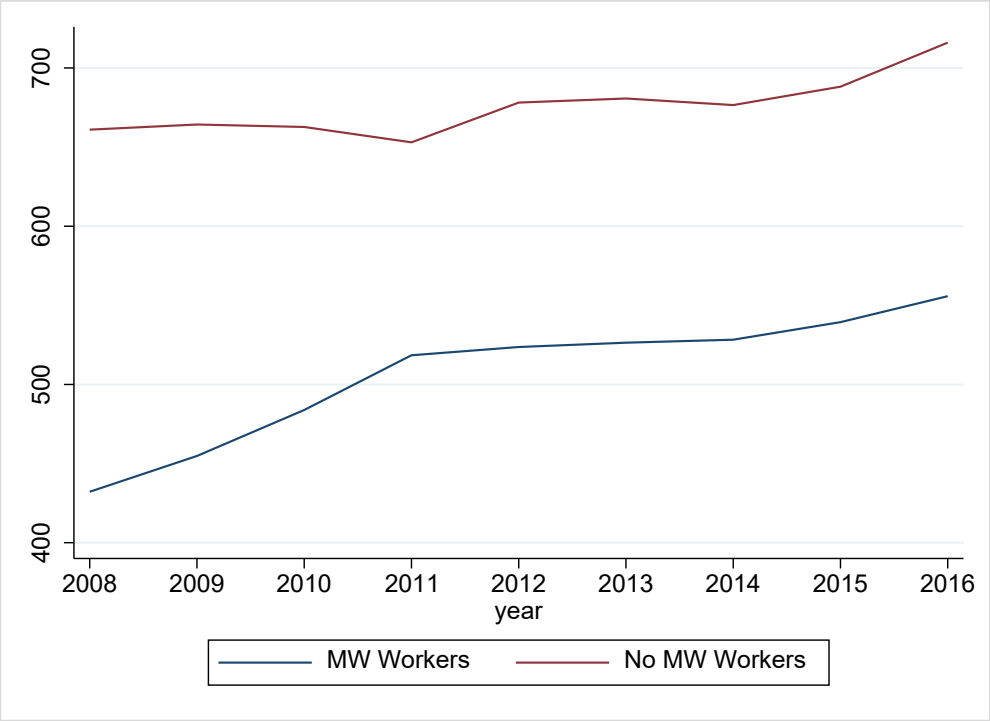
on the minimum wage. The average hourly earnings for these groups in 2016 was €21.51 and €11.35 respectively. While there are differences in the levels, in general, the trend in labour costs over time for all groups looks relatively similar. However, it is difficult to evaluate from the graphs alone whether the 2016 minimum wage increase had an impact on labour costs of affected firms. We will investigate this in further detail using more advanced econometric techniques.

FIGURE 2.3 AVERAGE FIRM-LEVEL HOURLY EARNINGS (2008-2016)



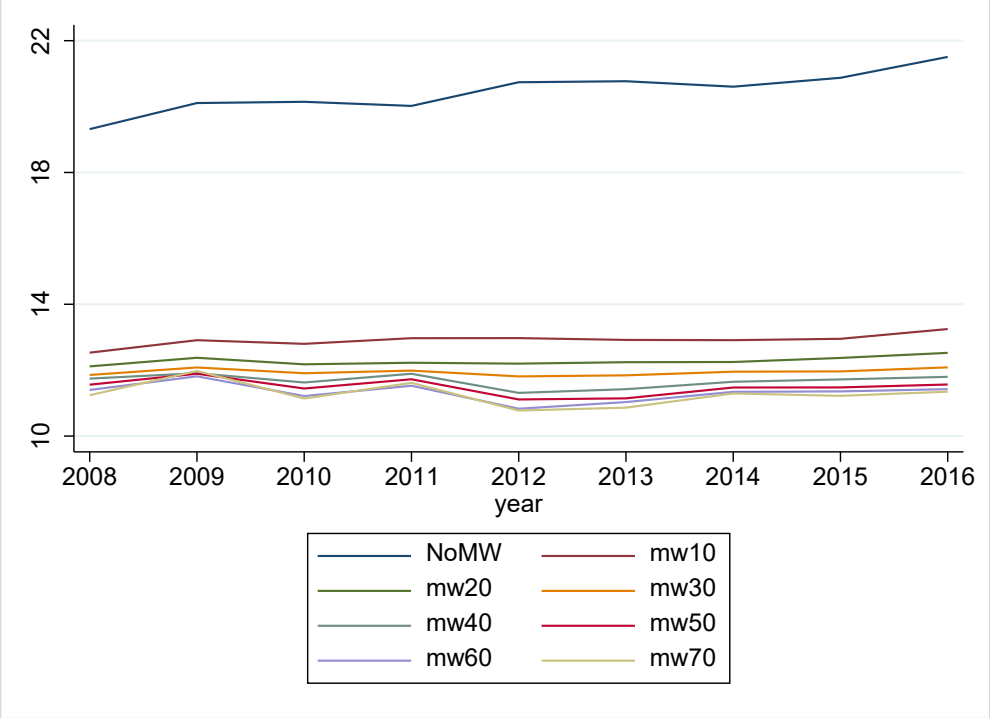
Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

FIGURE 2.4 AVERAGE FIRM-LEVEL WEEKLY EARNINGS (2008-2016)



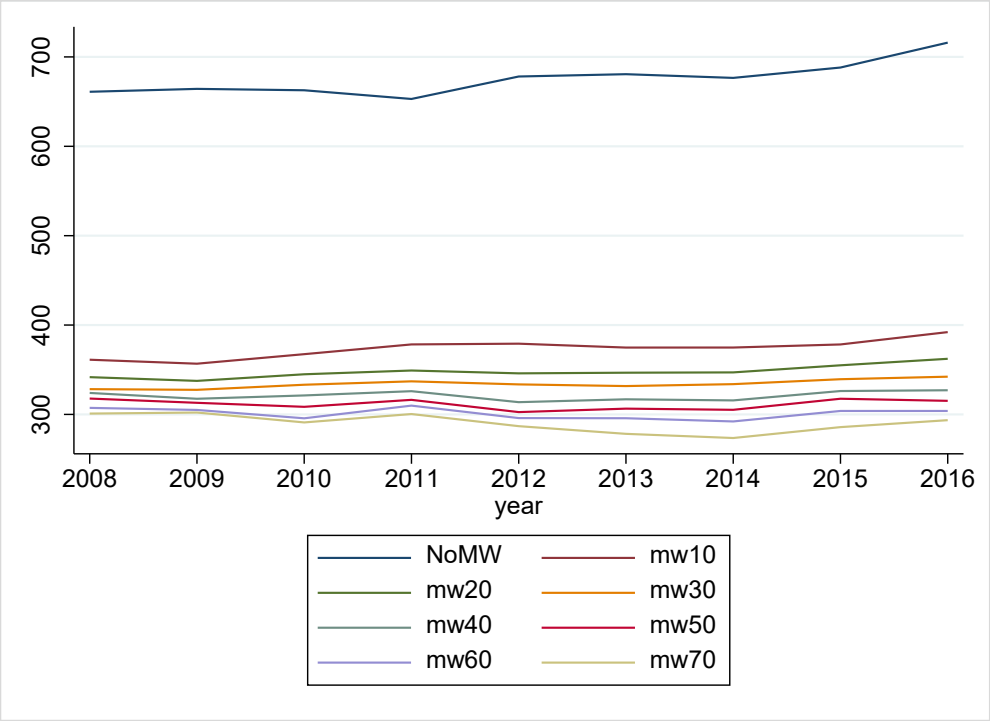
Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

FIGURE 2.5 AVERAGE FIRM-LEVEL HOURLY EARNINGS BY MW INTENSITY (2008-2016)



Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

FIGURE 2.6 AVERAGE FIRM-LEVEL WEEKLY EARNINGS BY MW INTENSITY (2008-2016)



Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

CHAPTER 3

Methodology

Our identification strategy involves comparing the outcomes of high intensity minimum wage firms to the outcomes of low intensity minimum wage firms. We exploit the panel characteristic of the data and implement a difference-in-differences type strategy. Our approach is similar to that used by Harasztosi and Lindner (2019), who investigate the impact of a minimum wage increase in Hungary. We implement the methodology using the following regression,

$$Y_{i,t} = \beta_1 Year_t + \beta_3 Year_t * MW_i + \alpha_i \qquad (1)$$

where the outcome $Y_{i,t}$ is regressed on a year dummy, $Year_t$, which equals one for 2016 and zero for 2015. The outcome variable is averaged across the four quarters for each year to produce a yearly average outcome for each firm. The variable MW_i captures the exposure of firm *i* to the minimum wage and α_i denotes firm fixed effects. We directly observe firms' exposure to the minimum wage, *MWi*, which is defined as the percentage of minimum wage employees in firm *i* in the year before the minimum wage increase.[7] The ability to precisely measure minimum wage exposure within firms is a significant advantage of our data. In the absence of such information, Harasztosi and Lindner (2019) must predict exposure based on average labour costs within the firm. The coefficient on the interaction term, β_3, is our estimate of interest. This captures the relationship between exposure to the minimum wage and the outcome variable.[8] For example, if the outcome variable is the log of average labour costs, then β_3 can be interpreted as the difference in the change in labour costs (from 2015 to 2016) of firms with 100 per cent of employees on the minimum wage, compared to firms with no minimum wage employees. A β_3 of 0.05, for example, would indicate that, following the minimum wage increase, firms with 100 per cent of employees on the minimum wage experienced an increase in labour costs that was 5 per cent higher than firms with no minimum wage employees. We examine the following outcome variables: average weekly labour costs, average hourly labour costs, average hours worked (part-time and full-time), average overtime hours worked (part-time and full-time) and employment (changes in the number of workers in the firm).

When implementing the panel estimator, we restrict our sample to a balanced panel of firms with eight complete quarters of data covering the years 2015 and 2016.

7 As with the outcome variable, this is averaged over four quarters in 2015 to produce a minimum wage intensity variable.

8 Note that another way of estimating Equation (2) would be to regress the change in the outcome variable on MW_i. This is the approach used by Harasztosi and Lindner (2019). Both approaches are identical and produce the same results.

In doing so, we restrict our sample size by ignoring observations that do not meet this criterion. However, we implement an additional estimator which pools all quarterly observations across all years to estimate a difference-in-differences model based on repeated yearly cross-sections. While the panel method has clear advantages, as we are following the same firms over time, the pooled model allows us to work with a larger sample size by including all of the observations. Each quarterly firm-level data point is treated as an independent observation. No restriction is made regarding the size of the panel dimension. A firm may appear for just one quarter in the data, or could be present for the full eight quarters. Therefore, for each year, we have a sample of quarterly firm-level observations. Each observation contains information on the percentage of minimum wage workers, along with information on the outcome variables as well as other additional covariates. Our pooled difference-in-differences estimator aggregates all observations within a given year, and examines how the average outcomes changed over time among firms of differing minimum wage intensities, relative to firms with no minimum wage workers. We estimate the pooled difference-in-differences model, with robust standard errors, using the following regression,

$$Y_{i,t} = \alpha + \sum_{\tau=2013}^{2016} \beta_\tau I_t^\tau + \beta_1 D_i + \beta_3 D_i \cdot Post_t + X_{i,t}{}'\theta + \epsilon_{i,t} \qquad (2)$$

We pool data for the years 2012 to 2016, giving us four pre-treatment years (2012 to 2015) and one post-treatment year (2016). The variable I_t^τ is a dummy variable for year τ.[9] The variable D_i is the treatment dummy variable which equals one for firms employing minimum wage workers and zero for firms with no minimum wage workers. As we have a larger sample size in the pooled model, we can estimate separate models to test for heterogeneous effects. By estimating separate models using various treatment indicators based on minimum wage intensity, we can investigate potential non-linear effects. For example, it may be the case that no effects are present for low intensity firms (e.g. over 10 per cent of workers on the minimum wage), but are present for higher intensity firms (e.g. over 50 per cent). Accordingly, we vary the definition of treatment according to the intensity of minimum wage employment within the firm. For example, we estimate a model where D_i=1 if the firm has greater than 10 per cent of employees on the minimum wage. We then estimate models where the treatment threshold for minimum wage employment is 20 per cent, 30 per cent etc. The interaction term $D_i \cdot Post_t$ equals one for treated firms in the period after the minimum wage increase and zero otherwise. The coefficient β_3 is the difference-in-

[9] We include 2012 to 2015 as pre-treatment years. In January 2011 there was a temporary reduction in the minimum wage from €8.65 to €7.65 per hour, which was reversed in July of the same year. By including 2012 to 2015, we ensure that no policy change took place in any of the pre-treatment years. Furthermore, the period before 2011 was very different to the later years as it was characterised by a severe recession. Figure 2.4 indicates an absence of parallel trends between minimum wage and non-minimum wage firms in this period. For this reason also, we exclude these years from the analysis.

differences estimate. Finally, $X_{i,t}'$ is a vector of additional control variables, including firm size and the percentage of full-time employees in the firm. In addition to testing for heterogeneous effects by minimum wage intensity, we also estimate separate models for different sectors to examine whether the minimum wage has differential impacts across sectors.

The validity of the difference-in-differences estimator is based on the assumption of parallel trends. In the absence of a policy change, the change in outcomes of the treated firms should be equal to that of the control firms. One way to verify the validity of this assumption is by examining whether parallel trends existed in the outcome variables prior to the policy change (i.e. prior to 2016). Figures 2.1 to 2.6 provide graphical evidence that is broadly consistent with the parallel trends assumption, by showing that the labour costs of minimum wage firms over time, prior to the policy change, was similar to non-minimum wage firms. However, as a more robust test of parallel trends, we undertake placebo analysis. This involves estimating our difference-in-differences models on a time period where no policy change occurred. If we observed a statistically significant result in the treatment period and subsequently detect a statistically significant effect in the placebo period, this would call into question the validity of our results. However, if we observe a statistically significant treatment effect after the policy change and no effect in the placebo analysis, this is supportive of a causal effect of the minimum wage change. For the panel model, we implement the placebo analysis based on a full panel of firms for the years 2014 and 2015, thereby designating 2015 as the placebo treatment year. For the pooled model, we also allocate 2015 as the placebo treatment year and implement the estimator using yearly cross-sections from 2012 to 2015.

CHAPTER 4

Results

4.1 PANEL SPECIFICATION

The results from estimating Equation (1), using various firm-level outcome variables, are shown in Table 4.1. We detect statistically significant effects for average labour costs. The point estimate in column (1) indicates that, following the 2016 minimum wage increase, average weekly labour costs increased by 5.4 per cent more in firms with 100 per cent of employees on the minimum wage relative to firms with no minimum wage workers. For average hourly labour costs, the effect is 2.8 per cent, but this is only statistically significant at the 10 per cent level. When looking at total average hours worked, column (3), the results indicate a slight increase in overall hours in the order of 2.6 per cent. However, again, this is only marginally statistically significant and should be interpreted with some caution, especially given the fact that no significant results emerge when we analyse full-time and part-time hours separately, in columns (4) and (5) respectively. In column (6), we use average overtime hours as our dependent variable, and in columns (7) and (8) we examine part-time overtime hours and full-time overtime hours separately.

The following definition of overtime hours is listed in the survey instructions to employers.

> *Overtime hours consists of hours worked in excess of contracted hours. These hours, irrespective of the hourly pay rate applied, should be entered as hours. For example, 2 hours worked at double time should still be regarded as 2 hours. Please exclude overtime hours where leave in lieu is taken instead of pay.*

We detect no effects on overtime hours. Note that when looking at overtime hours, we are faced with a reduced sample size. The reason is that some firms record zero overtime hours. As we are dealing with the log of hours as our dependent variable, these will be dropped from the analysis. Moreover, a firm that goes from some positive overtime hours, to no overtime after the minimum wage increase, would not be included. As such, we employ two additional specifications in columns (9) and (10), where we look at the probability of a firm offering some overtime hours. Our dependent variable is a binary variable that equals one if a firm offers some overtime,

and zero if no overtime is recorded. Again, we detect no statistically significant effects.[10]

In Table 4.2, we implement placebo analysis by estimating our model using the years 2014 and 2015, during which time no minimum wage change occurred. Therefore, in Equation (1), the variable $Year_t$ now equals one if the year is 2015 and zero for 2014. As we can see, there are no statistically significant results in the placebo analysis. This indicates that the statistically significant results detected in Table 4.1 are likely to be attributable to the 2016 minimum wage change, as opposed to any diverging trends between high and low intensity minimum wage firms that may have existed before the policy change.

We examine whether the 2016 minimum wage increase had any impact on employment within high intensity minimum wage firms. To do so, we exploit a variable in the EHECS data that captures the percentage change in employment in any given quarter, relative to the previous quarter. As this employment outcome variable is reported as the difference between two time periods within firm *i*, our estimator for employment takes the form of a difference-in-difference-in-differences (D-i-D-i-D) strategy. We take two approaches. In the first approach, we look at the employment change in firm *i* from Quarter 4 of 2015 to Quarter 1 of 2016 compared to the change from Quarter 4 of 2014 to Quarter 1 of 2015. We then check whether the difference in these differences varied with minimum wage intensity (hence the D-i-D-i-D). The fact that we are using the D-i-D-i-D approach overcomes concerns regarding seasonality. For example, high intensity minimum wage firms may encounter seasonal changes to their outcome variables from Quarter 4 to Quarter 1 of any given year, which may be different to low intensity firms. However, as we are comparing the Q4 to Q1 difference for firm *i* in the treatment period (2015 to 2016) with the Q4 to Q1 difference in the previous non-treatment period (2014 to 2015), we implicitly control for seasonality. This estimator will detect any employment effects that occur immediately after the policy change. However, it is possible that employment effects take longer than one quarter to manifest. For our second approach, the dependent variable is the average change in employment across all four quarters of the year. The results for both specifications are shown in Table 4.3. We detect no employment effects associated with the 2016 minimum wage increase.

[10] We use a linear probability model, as the interaction terms in non-linear models such as logit or probit are not interpretable in the same way as standard linear regression, making it difficult to interpret the difference-in-differences coefficients (Karaca-Mandic et al., 2012).

TABLE 4.1 EFFECT OF 2016 MW INCREASE – PANEL ESTIMATION

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Weekly Labour Costs	Hourly Labour Costs	Hours	FT Hours	PT Hours	OT Hours	OT-PT Hours	OT-FT Hours	Prob of PTOT	Prob of PrFTOT
D-i-D Estimate	0.054***	0.028*	0.026*	0.020	0.021	0.065	0.135	-0.069	-0.002	0.003
	(0.017)	(0.015)	(0.014)	(0.014)	(0.043)	(0.077)	(0.148)	(0.094)	(0.045)	(0.031)
Year	0.019***	0.015***	0.004**	0.003*	0.009*	-0.020	-0.034	-0.022	0.003	-0.007
	(0.002)	(0.002)	(0.002)	(0.001)	(0.005)	(0.015)	(0.030)	(0.016)	(0.005)	(0.005)
Constant	6.402***	2.944***	3.459***	3.598***	3.067***	-0.334***	-0.551***	-0.363***	0.962***	0.970***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.007)	(0.013)	(0.007)	(0.002)	(0.002)
Observations	3,896	3,896	3,896	3,878	3,444	2,347	1,496	2,283	3,896	3,896
R-squared	0.070	0.044	0.008	0.005	0.003	0.002	0.002	0.003	0.000	0.001
Number of firms	1,948	1,948	1,948	1,939	1,754	1,235	830	1,201	1,948	1,948

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 4.2 PLACEBO ESTIMATES (2014 AND 2015)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Weekly Labour Costs	Hourly Labour Costs	Hours	FT Hours	PT Hours	OT Hours	OT-PT Hours	OT-FT Hours	Prob of PTOT	Prob of PrFTOT
Placebo D-i-D	0.009	0.007	0.005	0.013	0.055	-0.015	-0.195	0.060	-0.005	0.006
	(0.018)	(0.013)	(0.018)	(0.017)	(0.041)	(0.150)	(0.179)	(0.146)	(0.045)	(0.028)

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 4.3 EFFECT OF 2016 MINIMUM WAGE INCREASE ON EMPLOYMENT

	(1)	(2)
VARIABLES	Emp Change (Q4 2015 to Q1 2016)	Av Emp Change(2015 to 2016)
D-i-D Estimate	-1.005	0.168
	(4.721)	(1.936)
Year	-0.250	-0.542**
	(0.717)	(0.246)
Constant	2.366***	2.015***
	(0.325)	(0.113)
Observations	3,896	3,896
R-squared	0.000	0.003
Number of firms	1,948	1,948

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

4.2 POOLED DIFFERENCE-IN-DIFFERENCES SPECIFICATION

4.2.1 Average labour costs

We begin by estimating Equation (2) using the log of average weekly and hourly labour costs as the dependent variables. We present separate results for each of the five different sectors for varying minimum wage intensities. As mentioned, the higher the minimum wage intensity threshold, the fewer the number of firms. For example, just over 3 per cent of firms have more than 50 per cent of employees on the minimum wage. The number of firms in a given year with more than 50 per cent of employees on the minimum wage is approximately 500. For firms with more than 60 per cent of employees on the minimum wage, the figure is just 300. Further disaggregating these samples by sector produces very few treated firms, leading to imprecise estimates. Note that the sample sizes may appear large in the high intensity threshold estimators. However, even though the sample sizes are large, the vast majority of these firms are not treated firms. As such, there is very little variation in the interaction variable that produces the difference-in-differences estimate (i.e. very few '1's). As such, the degree of imprecision increases as the intensity threshold increases. Therefore, while we show results separately for each sector, up to the 40 per cent threshold, we show results for the very high intensity firms, (50 per cent – 70 per cent) by pooling the sectors together and including sectoral variables as covariates in the pooled difference-in-differences analysis. Note that we do not go beyond 70 per cent, as 99 per cent of firm-level observations have fewer than 70 per cent of minimum wage workers. The total yearly sample size for over 70 per cent of minimum wage workers is approximately 200 (i.e. pooling all of the quarterly observations that record minimum wage intensity in excess of 70 per cent yields just 200 observations per year).

Table 4.4 shows results for average weekly earnings, where the treatment firms are those with more than 10 per cent of employees on the minimum wage and the control group are firms with no minimum wage employees. Additional controls include the size of the firm, the average weekly hours of employees in the firm and full time employment as a percentage of total employment. The difference-in-differences estimates are shown in the first row (*D-i-D*). The results indicate that firms with at least 10 per cent of employees on the minimum wage did not see their average weekly wage bill increase by more than firms with no minimum wage workers. The coefficients on the treatment dummy variable, *D*, indicate that average wages in the treated groups (the minimum wage firms) are lower than average wages in the control groups. For firms in the accommodation and food sector and retail sector respectively, average weekly wages are 3.5 per cent and 10.5 per cent lower compared to non-minimum wage firms. The magnitude is higher, at approximately 30 per cent, for firms in the manufacturing, household and other sectors. The firm size coefficients show that average weekly wages are highest in the largest firms (with more than 500 employees). We also see that average weekly wages are higher in firms with more full-time employees and firms with higher average weekly working hours. Table 4.5 shows the corresponding results for average hourly earnings. As with weekly earnings, there is no effect on hourly earnings when treatment is defined as firms with over 10 per cent of employees on the minimum wage.

TABLE 4.4 EFFECT OF 2016 MW INCREASE ON AVERAGE WEEKLY EARNINGS – TREATED: >10% ON MW

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All	Acc & Food	Retail	Manuf	Household	Other
D-i-D	0.007	0.006	0.003	0.014	0.031	0.007
	(0.008)	(0.011)	(0.012)	(0.032)	(0.030)	(0.015)
D	-0.287***	-0.035***	-0.105***	-0.305***	-0.228***	-0.336***
	(0.004)	(0.005)	(0.006)	(0.017)	(0.014)	(0.007)
Firm Size (Ref: 500+)						
3-19	-0.235***	0.005	-0.113***	-0.459***	0.105*	-0.225***
	(0.006)	(0.018)	(0.012)	(0.029)	(0.061)	(0.007)
20-49	-0.177***	0.107***	-0.181***	-0.354***	0.235***	-0.152***
	(0.006)	(0.018)	(0.012)	(0.028)	(0.062)	(0.008)
50-99	-0.166***	0.088***	-0.184***	-0.340***	0.340***	-0.141***
	(0.006)	(0.017)	(0.011)	(0.027)	(0.062)	(0.007)
100-249	-0.153***	0.075***	-0.126***	-0.395***	0.251***	-0.122***
	(0.006)	(0.017)	(0.012)	(0.026)	(0.063)	(0.008)
250-499	-0.094***	0.113***	-0.065***	-0.301***	0.370***	-0.084***
	(0.008)	(0.020)	(0.018)	(0.028)	(0.070)	(0.009)
Weekly hours	0.027***	0.040***	0.036***	0.025***	0.028***	0.025***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Full-time (%)	0.726***	0.119***	0.322***	0.480***	0.585***	0.721***
	(0.007)	(0.012)	(0.015)	(0.040)	(0.027)	(0.010)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Constant	5.149***	4.570***	4.895***	5.472***	4.762***	5.269***
	(0.009)	(0.020)	(0.018)	(0.052)	(0.066)	(0.011)
Observations	67,438	6,642	7,994	2,661	4,085	46,056
R-squared	0.606	0.693	0.606	0.486	0.609	0.517

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 4.5 EFFECT OF 2016 MW INCREASE ON AVERAGE HOURLY EARNINGS – TREATED: >10% ON MW

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All	Acc & Food	Retail	Manuf	Household	Other
D-i-D	0.003	-0.007	-0.001	0.013	0.024	0.004
	(0.008)	(0.009)	(0.012)	(0.032)	(0.029)	(0.014)
D	-0.302***	-0.041***	-0.108***	-0.307***	-0.233***	-0.341***
	(0.004)	(0.004)	(0.006)	(0.016)	(0.014)	(0.007)
Firm Size (Ref: 500+)						
3-19	-0.252***	-0.120***	-0.107***	-0.444***	0.102*	-0.243***
	(0.006)	(0.015)	(0.011)	(0.029)	(0.060)	(0.007)
20-49	-0.190***	-0.016	-0.182***	-0.346***	0.234***	-0.162***
	(0.006)	(0.015)	(0.012)	(0.027)	(0.060)	(0.007)
50-99	-0.176***	-0.035**	-0.188***	-0.336***	0.341***	-0.145***
	(0.006)	(0.015)	(0.011)	(0.027)	(0.061)	(0.007)
100-249	-0.154***	-0.039***	-0.129***	-0.393***	0.273***	-0.115***
	(0.006)	(0.015)	(0.012)	(0.026)	(0.062)	(0.007)
250-499	-0.093***	0.001	-0.047***	-0.301***	0.380***	-0.082***
	(0.007)	(0.017)	(0.018)	(0.027)	(0.069)	(0.009)
Weekly hours	-0.011***	-0.005***	-0.001**	-0.002*	-0.011***	-0.012***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Full-time (%)	0.739***	0.155***	0.339***	0.407***	0.602***	0.693***
	(0.007)	(0.010)	(0.015)	(0.039)	(0.026)	(0.010)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.937***	2.625***	2.636***	2.929***	2.569***	3.064***
	(0.009)	(0.017)	(0.017)	(0.051)	(0.065)	(0.010)
Observations	67,438	6,642	7,994	2,661	4,085	46,056
R-squared	0.311	0.099	0.196	0.303	0.283	0.207

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

We repeat our difference-in-differences analysis, separately by sector, for the alternative specifications where the treated group are firms with higher minimum wage intensities (20 to 40 per cent). While all specifications include the same additional covariates as Tables 4.4 and 4.5, for brevity we report the difference-in-differences estimates only in Appendix Table A1. Even for these higher intensity minimum wage firms, we find that their average weekly and hourly labour costs did not increase by more than firms with no minimum wage employees.

For firms with more than 50 per cent of employees on the minimum wage, we pool all sectors and include sectoral dummies. The difference-in-differences estimates for this pooled model are shown in Table 4.6. There is evidence that firms with greater than 50 per cent of employees on the minimum wage experienced an increase in average weekly and hourly earnings that was 4.2 and 3.4 per cent higher, respectively, than firms with no minimum wage workers. For the highest intensity firms that we study,

those with over 70 per cent of minimum wage workers, the magnitude of the estimates is similar, however they are not statistically significant at conventional levels. It is important to note that there are relatively few firms with such a high level of minimum wage intensity; this can lead to large standard errors. These estimates are broadly in line with the estimates from the panel model, which showed that average weekly and hourly labour costs in fully saturated minimum wage firms (i.e. those with 100 per cent of workers on the minimum wage) increased by 5.4 per cent and 2.8 per cent more, respectively, relative to firms with no minimum wage workers.

We estimate placebo models to verify the validity of the estimates detected in Table 4.6. This involves estimating the same regression, but designating 2015 as the treatment year, as opposed to the true treatment year of 2016. The placebo results are shown in Appendix Table A2. For weekly earnings, our main analysis (Table 4.3) indicated that the 2016 minimum wage increase was associated with higher labour costs of approximately 4 per cent for firms with more than 50 per cent of workers on the minimum wage. The estimates were statistically significant for the 50 per cent and 60 per cent minimum wage intensity thresholds. In the placebo analysis, there is a marginally significant coefficient for the 50 per cent group, with a point estimate of 3.4 per cent. The point estimates for the 60 and 70 per cent groups are not significant, and are lower in magnitude, at 1.7 and 1.4 per cent respectively, compared to the treatment coefficients of 4 per cent. However, some caution is called for, as the placebo analysis shows positive and statistically significant coefficients for the 30 and 40 per cent group. As such, it may be the case that average weekly labour costs were increasing more for some mid-intensity minimum wage firms, relative to firms with no minimum wage workers, even before the minimum wage was increased. The results of the pooled model, taken in conjunction with the panel results presented earlier, tend to indicate that the 2016 minimum wage increase led to higher weekly labour costs among very high intensity minimum wage firms, compared to firms with no minimum wage workers.

A similar pattern emerges for average hourly earnings. Our main analysis showed a statistically significant increase in average hourly earnings, of 3.4 per cent, among firms with more than 50 per cent of employees on the minimum wage. We detect no such impact in the placebo analysis. However, as with weekly earnings, the placebo analysis shows positive and statistically significant coefficients for the 30 and 40 per cent groups.

TABLE 4.6 EFFECT OF 2016 MW INCREASE ON AVERAGE LABOUR COSTS – TREATED: >50% TO >70% ON MW

	(5)	(6)
VARIABLES	Average Weekly Earnings	Average Hourly Earnings
D-i-D: >50%	0.042**	0.034**
	(0.017)	(0.016)
D-i-D: >60%	0.041**	0.029
	(0.021)	(0.020)
D-i-D: >70%	0.040	0.027
	(0.027)	(0.026)

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A number of factors warrant attention when interpreting the results on average labour costs. Firstly, the minimum wage increase occurred during a time of strong economic growth, during which time wages were increasing generally across the labour market. Had the same increase been implemented during a time of recession, with flat or negative wage growth, it is possible that affected firms would have seen a stronger increase in their relative labour costs. Secondly, spillover effects may impact the wages of higher paid workers as individuals strive to preserve their relative position in the wage distribution (Dube et al., 2019). Redmond et al. (2019) document spillovers up to the 25th percentile of the wage distribution following the 2016 minimum wage increase in Ireland. If spillovers occur across firms, as well as within firms, then it is possible that the 2016 minimum wage increase also affected the average labour costs of firms employing no minimum wage workers. While perceptions of fairness and wage spillovers have been found to exist among co-workers within organisations (see, e.g. Card et al., 2012; Breza et al., 2018; Dube et al., 2019), there is also evidence that minimum wages can increase reservation wages generally (Falk et al., 2006), which could lead to increased labour costs in firms with no minimum wage workers.

It is also important to note that minimum wage employees typically work fewer hours than higher paid workers (Maître et al., 2017). This will have a dampening effect on the impact on overall labour costs. We can illustrate this using a hypothetical example. Consider a firm with 20 per cent of their employees on the minimum wage and the remaining 80 per cent earning €17 per hour, which is approximately the median wage over these years. Assume that the minimum wage employees each work 20 hours per week and the higher paid employees each work 40 hours per week. If the higher paid workers' wages remain constant, a 6 per cent minimum wage increase would only increase average weekly and hourly labour costs by 0.3 per cent. Therefore, due to lower average hours worked by minimum wage employees generally, the full

percentage increase in the minimum wage does not fully pass through into changes in total average labour costs.

4.2.2 Hours worked

We begin by looking at overall average hours worked within the firm. Table 4.7 shows results for each sector where treatment is defined as firms employing more than 10 per cent of their workforce on the minimum wage.[11] There is no evidence that the minimum wage increase significantly impacted the overall average hours worked within firms in any of the five sectors. In Appendix Table A3, we gather the difference-in-differences estimates from our alternative specifications that use different definitions of minimum wage intensity, i.e. >20% to >70%, to identify treatment firms. Again, we see no clear evidence of impacts on the overall hours worked within affected firms.

We estimate our difference-in-differences model separately for average part-time and average full-time hours worked. For brevity, and for the remainder of the analysis, we collect all of our estimates from the different minimum wage intensity thresholds, along with the estimates from the placebo analysis, and plot them graphically. The estimates for part-time hours worked are shown in Figure 4.1. We indicate statistical significance using the conventional labels that are used in tables throughout the paper.[12] The difference-in-differences estimates for the treatment year indicate a decrease in part-time hours in high intensity minimum wage firms following the minimum wage increase. Specifically, there was a decrease of 5.3 per cent in average part-time hours in firms with over 60 per cent of workers on the minimum wage, relative to firms with no minimum wage workers. The point estimate for firms with over 70 per cent of workers on the minimum wage was almost identical (5.2 per cent), however it is not statistically significant. Again, it is worth noting that as we increase the minimum wage intensity threshold, a greater degree of imprecision is introduced due to fewer treated firms, which can lead to large standard errors. We do not observe any negative part-time hours effect when we run the placebo analysis. For the 60 and 70 per cent thresholds, the placebo estimates are not statistically significant. However, for the 30, 40 and 50 per cent thresholds, the estimates are positive and statistically significant. Prior to the minimum wage change, some mid-intensity minimum wage firms may have experienced an increase in the number of part-time hours. Despite the presence of positive effects in our placebo analysis, our finding of negative effects for the treatment year is not necessarily invalid. However, it warrants some discussion.

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11 As hours worked is our outcome variable, we do not include it as a covariate. The same applies for the percentage of full-time workers.

12 A label of * indicates significance at 10 per cent, ** 5 per cent and * 1 per cent. No label indicates the estimates are not statistically significant.

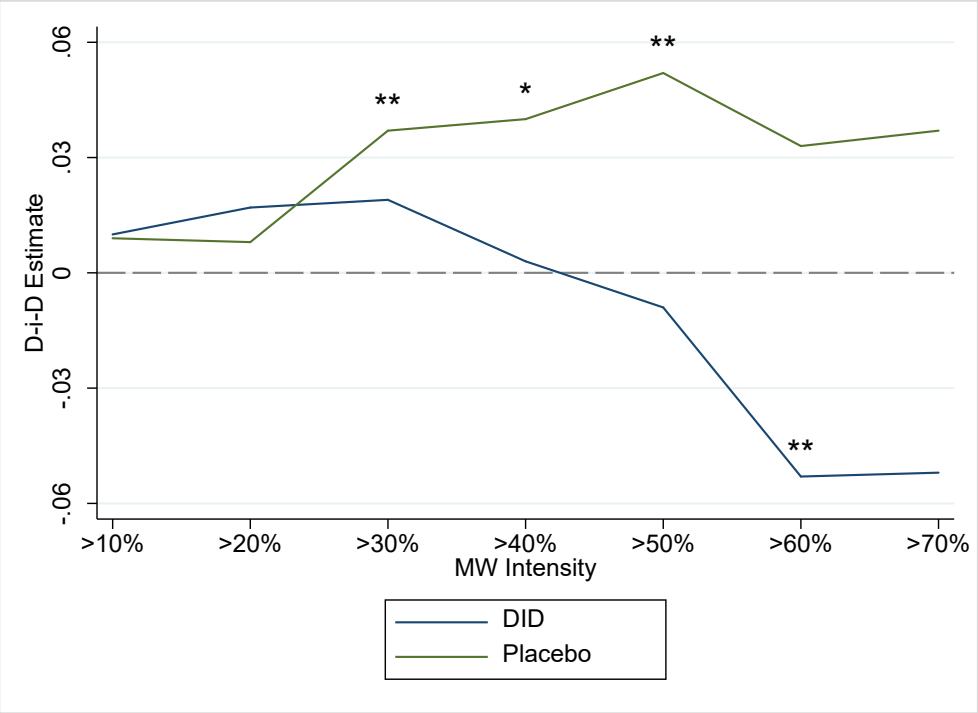
Had we found negative and significant impacts in the placebo years, then we could not have attributed our negative hours finding in the treatment year to the minimum wage increase. If the positive findings in the placebo years were indicative of a positive hours trend before the policy change, then it is possible that our estimates of negative effects in the treatment year are an understatement. However, some caution is called for. If the placebo effects are indicative of year-on-year volatility in hours, we should be cautious in interpreting our treatment results too strongly. However, it is worth restating that the negative hours effect for the treatment year occurs for the 60 per cent group, with no effect in the placebo year for this same group.

TABLE 4.7 EFFECT OF 2016 MW INCREASE ON AVERAGE WEEKLY HOURS – TREATED: >10% ON MW

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All	Acc & Food	Retail	Manuf	Household	Other
D-i-D	0.002	0.001	-0.011	0.001	0.033	0.000
	(0.008)	(0.018)	(0.013)	(0.017)	(0.031)	(0.013)
D	-0.100***	-0.008	-0.043***	-0.042***	-0.112***	-0.040***
	(0.004)	(0.009)	(0.006)	(0.009)	(0.015)	(0.006)
Firm Size (Ref: 500+)						
3-19	-0.118***	0.035	-0.008	-0.206***	-0.302***	-0.100***
	(0.005)	(0.030)	(0.012)	(0.015)	(0.067)	(0.006)
20-49	-0.045***	0.140***	0.018	-0.117***	-0.193***	-0.026***
	(0.006)	(0.030)	(0.013)	(0.015)	(0.067)	(0.007)
50-99	-0.029***	0.192***	0.034***	-0.052***	-0.164**	-0.017***
	(0.006)	(0.030)	(0.012)	(0.014)	(0.068)	(0.006)
100-249	-0.019***	0.217***	0.024*	-0.072***	-0.211***	-0.015**
	(0.006)	(0.030)	(0.013)	(0.014)	(0.069)	(0.007)
250-499	0.029***	0.262***	-0.042**	-0.022	-0.020	0.010
	(0.007)	(0.035)	(0.020)	(0.015)	(0.076)	(0.008)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Constant	3.476***	3.110***	3.314***	3.684***	3.488***	3.497***
	(0.005)	(0.030)	(0.012)	(0.014)	(0.067)	(0.006)
Observations	69,168	6,843	8,179	2,670	4,447	47,029
R-squared	0.033	0.051	0.013	0.124	0.052	0.016

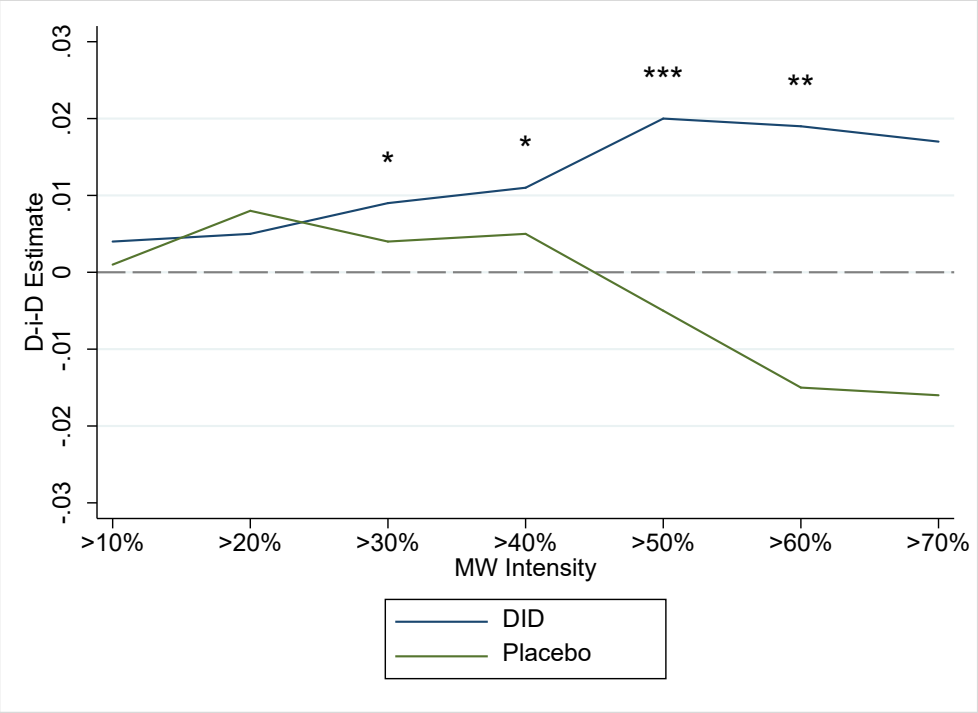
Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

FIGURE 4.1 D-I-D AND PLACEBO ESTIMATES FOR PART-TIME HOURS WORKED



Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: *** p<0.01, ** p<0.05, * p<0.1.

FIGURE 4.2 D-I-D AND PLACEBO ESTIMATES FOR FULL-TIME HOURS WORKED



Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: *** p<0.01, ** p<0.05, * p<0.1.

Figure 4.2 shows the corresponding estimates for average full-time hours. There is evidence of an increase in average full-time hours following the 2016 minimum wage increase. Specifically, firms with over 50 per cent of workers on the minimum wage saw an increase in average full-time hours that was approximately 2 per cent higher than firms with no minimum wage workers. We observe no statistically significant effects for the placebo analysis. This is consistent with theoretical predictions, and previous empirical evidence, relating to labour-labour substitution between full-time and part-time workers. Assuming that full-time workers are generally more productive than part-time workers, then firms may substitute away from lower productivity workers towards higher productivity workers if the wages of lower productivity workers increase due to a minimum wage (Fairris and Bujanda, 2008). This may explain the reduction in average part-time coinciding with an increase in full-time hours.

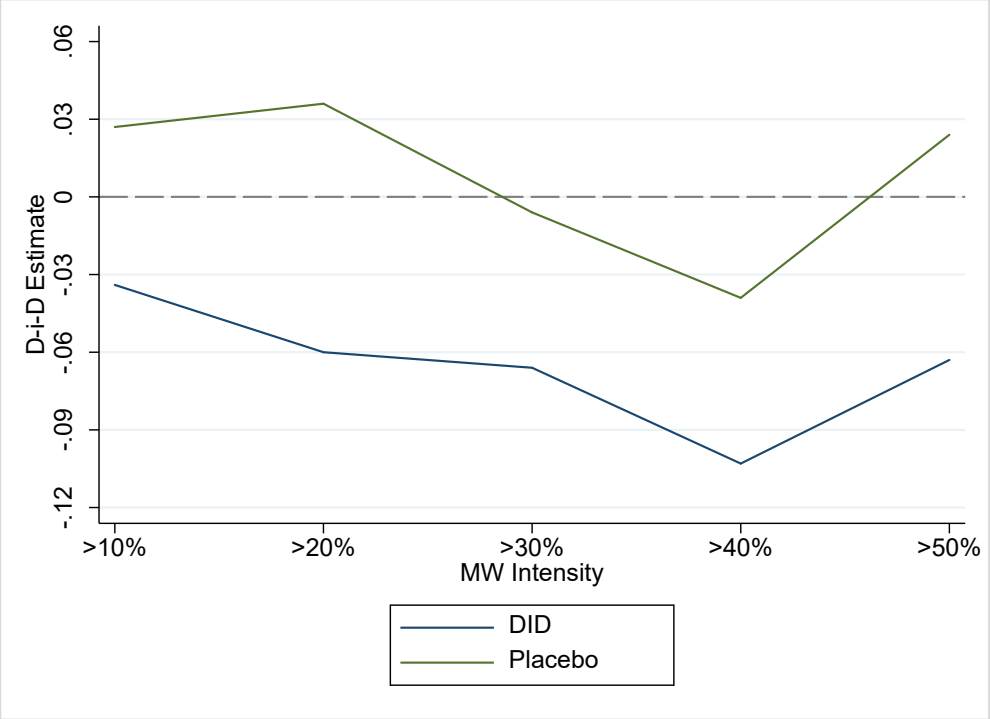
We next look at overtime hours. Our sample sizes are smaller when looking at overtime due to unreported information.[13] In addition, not all firms offer overtime; of the firms that report overtime information, just under 9 per cent report offering zero overtime hours. When using the log of hours as the outcome variable, the zeros will be dropped from the analysis. Therefore, as with the panel estimation, we implement two types of specification. The first uses the log of overtime hours as the dependent variable and the second estimates the probability that the firm offers any overtime hours. Therefore, the dependent variable equals one if the firm offers at least one hour of overtime, and zero if they report offering no overtime. As we are dealing with a smaller sample size, we estimate the pooled model, with the inclusion of sectoral dummies, as opposed to separate models for each sector. Furthermore, while in previous analyses we went as far as the 70 per cent threshold, in this analysis, we go as far as 50 per cent, due to small numbers of high intensity minimum wage firms in this restricted sample. We disaggregate overtime hours by reporting separate results for average overtime hours of part-time workers and average overtime hours of full-time workers.

Figures 4.3 and 4.4 show the results for part-time overtime hours. In Figure 4.3, we see that the estimated coefficients for the log of part-time overtime hours following the 2016 minimum wage change are all negative. While the some of the coefficients are relatively large in magnitude, for example a 10 per cent reduction in part-time overtime hours for firms with more than 40 per cent of minimum wage employees, the estimated effects are not statistically significant at conventional levels. The placebo estimates, on the other hand, are generally zero or slightly positive but, again, are not

[13] From 2008 to 2016, overtime information is not reported for approximately half of the observations.

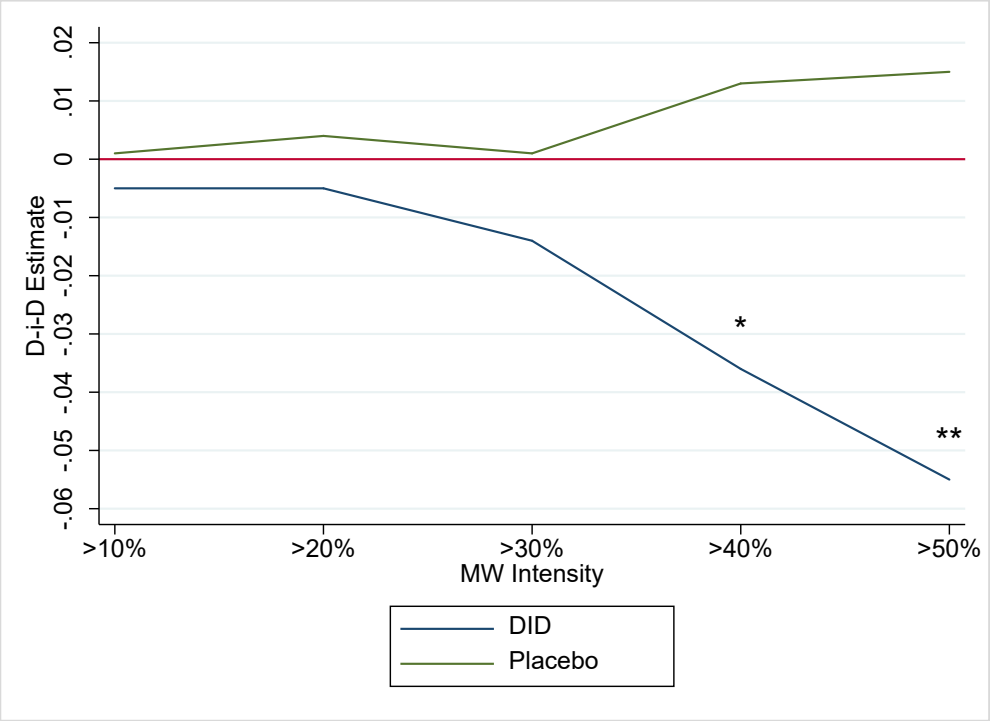
statistically significant. The results for the probability of offering part-time overtime hours (Figure 4.4) are more compelling. The estimated impacts for the treatment period decrease steadily with minimum wage intensity. Firms with over 50 per cent of employees on the minimum wage were almost six percentage points less likely to offer any overtime hours following the 2016 minimum wage increase, relative to firms with no minimum wage employees. The placebo analysis reveals no statistically significant effects. Taken together, Figures 4.3 and 4.4 are suggestive of a decrease in part-time overtime hours among high intensity minimum wage firms, following the 2016 minimum wage increase.

FIGURE 4.3 D-I-D COEFFICIENTS FOR PART-TIME OVERTIME HOURS



Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

FIGURE 4.4 D-I-D COEFFICIENTS FOR PROBABILITY OF PART-TIME OVERTIME HOURS



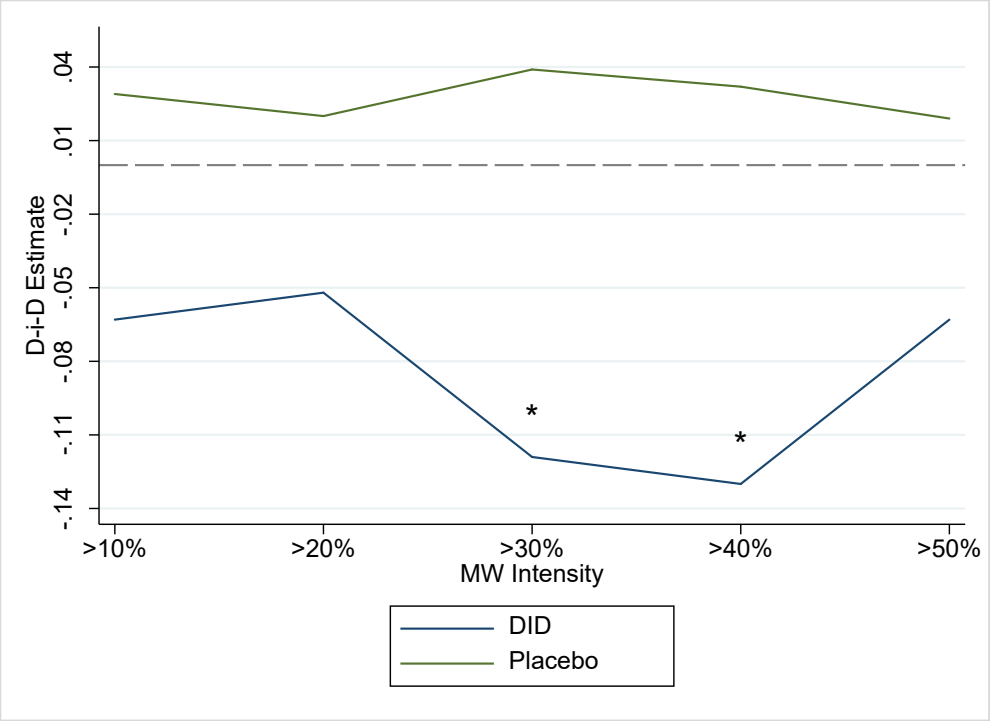
Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: *** p<0.01, ** p<0.05, * p<0.1.

Figures 4.5 and 4.6 show the results for full-time overtime hours. In Figure 4.5, there is evidence to suggest that some high intensity minimum wage firms reduced the number of full-time overtime hours. Firms with over 30 and 40 per cent of minimum wage workers saw a 12 per cent reduction in full-time overtime hours relative to firms with no minimum wage workers. However, the coefficient for the 50 per cent plus group is not statistically significant, nor of a similar magnitude to the 30 and 40 per cent groups. The placebo analysis shows no statistically significant effect and the sign of all the placebo coefficients are marginally positive. Regarding the probability of full-time overtime hours, no clear evidence emerges regarding any impact associated with the 2016 minimum wage increase (Figure 4.6).

Taken together, the results on overtime suggest there may have been a decrease in overtime hours among high intensity minimum wage firms following the 2016 minimum wage increase. However, some of the results provide only weak evidence of negative hours effects. The strongest, and most compelling results relate to the probability a firm offers overtime to part-time workers. Following the 2016 minimum wage increase, firms with over 50 per cent of employees on the minimum wage reduced the probability of offering overtime to part-time workers by approximately six percentage points, relative to firms with no minimum wage workers. It is important to

note that these effects are emerging among a very small minority of firms, as just 3 per cent of firms fall into this category (i.e. have more than 50 per cent of employees on the minimum wage).[14]

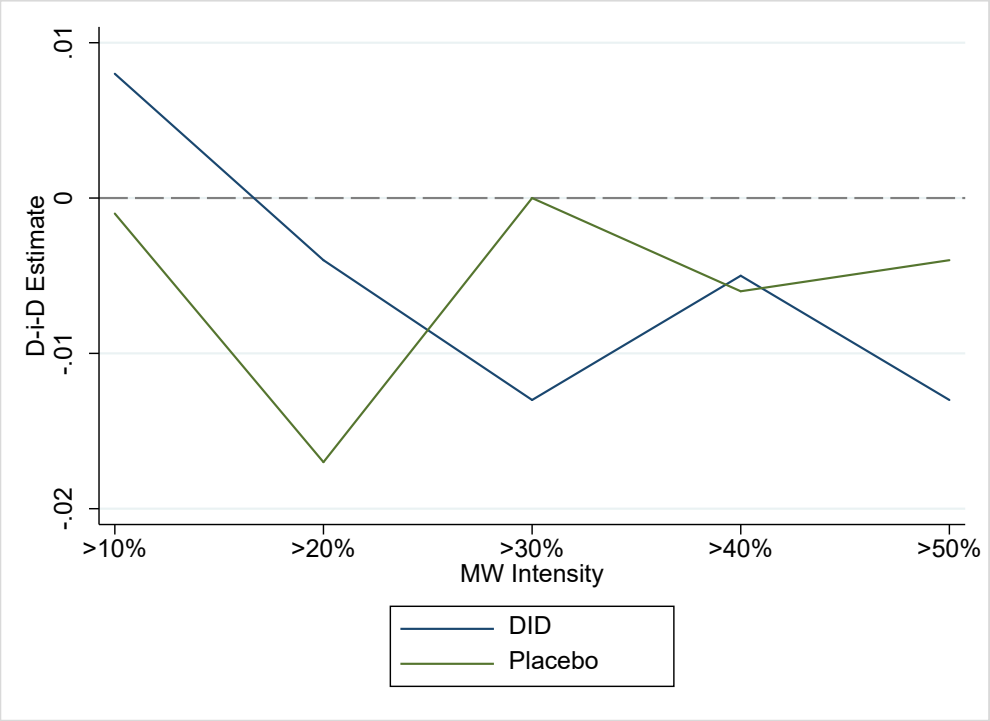
FIGURE 4.5 D-I-D COEFFICIENTS FOR FULL-TIME OVERTIME HOURS



Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: *** p<0.01, ** p<0.05, * p<0.1.

[14] We re-estimate our full-time and part-time hours models (Figures 4.1 and 4.2) using the restricted sample of firms that report some overtime hours and find similar results.

FIGURE 4.6 D-I-D COEFFICIENTS FOR PROBABILITY OF FULL-TIME OVERTIME HOURS



Source: Authors' analyses based on Earnings, Hours and Employment Costs data.

4.3 ROBUSTNESS TEST: LOW WAGE RESTRICTION

In the pooled difference-in-differences analysis, we have used firms with no minimum wage workers as a control group, which forms the basis for comparing our treated firms of varying minimum wage intensity. As such, the control group, by construction, will be different from the treated firms as they will consist of higher paid employees. Some control firms are likely to consist of very high paid employees, in which case they may not be a valid comparison to the lower paid treated firms. As a robustness test, we restrict our sample to low paid firms only, thereby ensuring that we do not include the very high paid firms in the control group, which should improve comparability. Defining who is and who is not a low paid firm is arbitrary. As a robustness test, we omit firms with average hourly wages above the 75th percentile of the hourly wage distribution (or €24.50) and re-estimate our models. The results are shown in Table 4.8 and are broadly consistent with our baseline estimates. Hourly and weekly earnings increased by approximately 3 per cent and 4 per cent respectively among high intensity minimum wage firms, relative to firms with no minimum wage employees. There is also evidence of a decrease in part-time hours, of approximately 5 per cent, and a corresponding increase in full-time hours, of approximately 2 per cent, among high intensity firms. Finally, firms with more than 50 per cent of employees on the minimum wage were five percentage points less likely to have any part-time overtime hours relative to low paying firms with no minimum wage workers.

TABLE 4.8 ROBUSTNESS TESTS, LOW WAGE FIRMS

	Minimum Wage Intensity		
	50+	60+	70+
Hourly Earnings	0.038***	0.034***	0.033**
	(0.010)	(0.013)	(0.016)
	n=41,761	n=40,881	n=40,265
Weekly Earnings	0.046***	0.047***	0.044**
	(0.011)	(0.014)	(0.018)
	n=41,761	n=40,881	n=40,265
Total Hours	-0.008	-0.003	0.016
	(0.015)	(0.019)	(0.023)
	n=43,289	n=42,396	n=41,757
Part-time Hours	-0.011	-0.053**	-0.053
	(0.021)	(0.026)	(0.034)
	n=35,953	n=35,123	n=34,547
Full-time Hours	0.018**	0.017*	0.014
	(0.007)	(0.009)	(0.013)
	n=41,755	n=40,875	n=40,260
	Overtime Hours		
		50+	
Part-time Overtime		-0.035	
		(0.103)	
		n=9,040	
Full-time Overtime		-0.069	
		(0.099)	
		n=16,336	
Pr(Part-time Overtime)		-0.051**	
		(0.025)	
		n=10,042	
Pr(Full-time Overtime)		-0.019	
		(0.019)	
		n=17,327	

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

CHAPTER 5

Conclusion

In 2016, the minimum wage in Ireland increased by almost 6 per cent. Increases to the minimum wage may have differential impacts on firms, depending on the percentage of employees they have on the minimum wage. Using unique data that accurately capture the percentage of employees earning the minimum wage within firms, we estimate the impact of a minimum wage increase on average labour costs and hours worked. We examine whether these effects varied depending on the intensity of firm-level minimum wage employment.

We show that, in Ireland, approximately three-quarters of firms do not employ any minimum wage employees. Approximately 13 per cent have more than 10 per cent of their employees on the minimum wage, while just over 3 per cent of firms have more than 50 per cent of employees on the minimum wage.

Our analysis indicates that, following the 2016 minimum wage increase, average weekly labour costs increased by 5.4 per cent more in firms with 100 per cent of employees on the minimum wage relative to firms with no minimum wage workers. Further analysis based on varying minimum wage intensities within firms indicates that the increased labour costs appear to be confined to the very high intensity firms, i.e. those with more than half of their employees on the minimum wage. It is important to note that these high intensity (50 per cent plus) minimum wage firms account for just three per cent of all firms. For firms with between 10 and 50 per cent of employees on the minimum wage, we detect no statistically significant impact on average labour costs. Therefore, the increase in labour costs among most firms employing minimum wage workers was similar to the increase in labour costs for firms with no minimum wage workers.

It is important to interpret these results in light of the strong economic performance during this time. This was a period of strong GDP growth, declining unemployment and increasing earnings. Therefore, the wages of employees were increasing generally throughout the labour market, even in firms with no minimum wage workers. Had the same minimum wage increase been applied during a period of recession, where wages were flat or even declining, it is possible that affected firms would have seen a sharper rise in their relative labour costs. An additional factor to consider when interpreting these results relates to possible wage spillovers. Existing evidence suggests that wage

spillovers occur to higher paid employees following a minimum wage increase, as individuals value their relative standing in the wage distribution. If these spillovers occur across firms, as well as within firms, then the minimum wage increase could also have increased the average labour costs in firms with no minimum wage workers.

The fact that average labour costs among the lower intensity minimum wage firms did not increase substantially may be explained, to some extent, by minimum wage employees generally working fewer hours than higher paid employees. To illustrate this, consider a firm with 20 per cent of their workforce on the minimum wage and the remaining 80 per cent earning the 2016 median wage. If the minimum wage employees work 20 hours per week, and the higher paid employees work full-time at 40 hours per week, then the 2016 minimum wage increase of six per cent would increase average labour costs by just 0.3 per cent, assuming constant wages for the higher paid workers.

A unique contribution of our paper has been the detailed study of overtime hours. We have shown that, in response to the 2016 minimum wage increase, firms with more than 50 per cent of employees on the minimum wage reduced the probability of offering any overtime hours to part-time workers by almost six percentage points. There is some evidence of an increase in the number of full-time hours which coincided with a decrease in part-time hours. This is consistent with theoretical predictions of labour-labour substitution whereby employers substitute from lower productivity to higher productivity workers following an increase in the wages of low productivity workers. Finally, we do not find any evidence of a reduction in the number of employees among high intensity minimum wage firms following the 2016 minimum wage increase.

REFERENCES

Breza, E., S. Kaur and Y. Shamdasani (2018). 'The morale effects of pay inequality', *The Quarterly Journal of Economics*, Vol. 133, pp. 611-663.

Card, D., A. Mas, E. Moretti and E. Saez (2012). 'Inequality at work: The effect of peer salaries on job satisfaction', *American Economic Review*, Vol. 170, pp. 2981-3003.

Clemens, J. and M. Wither (2019). 'The minimum wage and the Great Recession: Evidence of effects on the employment and income trajectories of low-skilled workers', *Journal of Public Economics*, Vol. 170, pp. 53-67.

Dolton, P., C.R. Bondibene and M. Stops (2015). 'Identifying the employment effect of invoking and changing the minimum wage: A spatial analysis of the UK', *Labour Economics*, Vol. 37, pp. 54-76.

Draca, M., S. Machin and J. Van Reenen (2011). 'Minimum wages and firm profitability', *American Economic Journal: Applied Economics*, Vol. 3, No. 1, pp. 129-151.

Dube, A., L. Giuliano and J. Leonard (2019). 'Fairness and frictions: The impact of unequal raises on quit behavior', *American Economic Review*, Vol. 109 No. 2, pp. 620-63.

Economic and Social Research Institute (2013). *Quarterly Economic Commentary, Autumn 2013*, Dublin: The Economic and Social Research Institute.

Economic and Social Research Institute (2019). *Quarterly Economic Commentary, Autumn 2019*. Dublin: The Economic and Social Research Institute.

Fairris, D. and L.F. Bujanda (2008). 'The dissipation of minimum wage gains for workers through labor-labor substitution: Evidence from the Los Angeles living wage ordinance', *Southern Economic Journal*, Vol. 75, No. 2, pp. 473-496.

Falk, A., E. Fehr and C. Zehnder (2006). 'Fairness perceptions and reservation wages—the behavioral effects of minimum wage laws', *The Quarterly Journal of Economics*, Vol. 121, No. 4, pp. 1347-1381.

Harasztosi, P. and A. Lindner (2019). 'Who pays for the minimum wage?', *American Economic Review*, Vol. 109, No. 8, pp. 2693-2727.

Hirsch, B., B. Kaufman and T. Zelenska (2015). 'Minimum wage channels of adjustment', *Industrial Relations: A Journal of Economy and Society*, Vol. 54, No. 2, pp. 199-239.

Holton, N. and D. O'Neill (2017). 'The changing nature of Irish wage inequality from boom to bust', *The Economic and Social Review*, Vol. 48, No. 1, pp. 1-26.

Lordan, G. and D. Neumark (2018). 'People versus machines: The impact of minimum wages on automatable jobs', *Labour Economics*, Vol. 52, pp. 40-53.

Maître, B., S. McGuinness and P. Redmond (2017). *A study of minimum wage employment in Ireland: The role of worker, household and job characteristics*, Dublin: The Economic and Social Research Institute.

McGuinness, S. and P. Redmond (2019). 'The impact of a minimum-wage increase on temporary-contract workers', *Fiscal Studies*, Vol. 40, No. 2, pp. 149-173.

Okudaira, H., M. Takizawa and K. Yamanouchi (2019). 'Minimum wage effects across heterogeneous markets', *Labour Economics*, Vol. 59, pp. 110-122.

Redmond, P., K. Doorley and S. McGuinness (2019). *The impact of a change in the national minimum wage on the distribution of hourly wages and household income in Ireland,* Dublin: The Economic and Social Research Institute.

Riley, R. and C.R. Bondibene (2017). 'Raising the standard: Minimum wages and firm productivity', *Labour Economics*, Vol. 44, pp. 27-50.

Stewart, M.B. and J.K. Swaffield (2008). 'The other margin: Do minimum wages cause working hours adjustments for low-wage workers?', *Economica*, Vol. 75, pp. 148-67.

APPENDIX SUPPLEMENTARY TABLES

TABLE A1 EFFECT OF 2016 MINIMUM WAGE INCREASE ON AVERAGE LABOUR COSTS – TREATED: >20% TO >40% ON MW

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All	Acc & Food	Retail	Manuf	Household	Other
Average Weekly Earnings						
D-i-D: >20%	0.010	0.010	0.005	0.021	0.013	0.006
	(0.010)	(0.012)	(0.013)	(0.036)	(0.034)	(0.019)
D-i-D: >30%	0.017	0.013	0.010	0.010	0.019	-0.001
	(0.012)	(0.013)	(0.015)	(0.041)	(0.039)	(0.025)
D-i-D: >40%	0.018	0.018	0.021	-0.019	-0.022	0.009
	(0.014)	(0.015)	(0.018)	(0.046)	(0.045)	(0.031)
Average Hourly Earnings						
D-i-D: >20%	0.004	-0.004	-0.001	0.022	0.005	-0.001
	(0.010)	(0.010)	(0.013)	(0.035)	(0.033)	(0.019)
D-i-D: >30%	0.008	-0.007	0.003	0.012	0.011	-0.006
	(0.012)	(0.011)	(0.015)	(0.040)	(0.038)	(0.024)
D-i-D: >40%	0.007	-0.006	0.013	-0.018	-0.033	0.006
	(0.014)	(0.013)	(0.017)	(0.046)	(0.044)	(0.031)

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

TABLE A2 PLACEBO ANALYSIS FOR AVERAGE WEEKLY AND HOURLY EARNINGS

	Minimum Wage Intensity						
	10+	20+	30+	40+	50+	60+	70+
Weekly Earnings	0.007	0.015	0.029**	0.038**	0.035*	0.017	0.014
	(0.009)	(0.011)	(0.013)	(0.016)	(0.020)	(0.025)	(0.032)
Hourly Earnings	0.004	0.011	0.022*	0.032**	0.028	0.013	0.013
	(0.009)	(0.011)	(0.013)	(0.016)	(0.019)	(0.024)	(0.031)

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

TABLE A3 EFFECT OF 2016 MW INCREASE ON AVERAGE WEEKLY HOURS – TREATED: >20% TO >40% ON MW

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All	Acc & Food	Retail	Manuf	Household	Other
Average Weekly Hours						
D-i-D: >20%	0.002	-0.007	-0.002	-0.003	0.017	0.018
	(0.009)	(0.020)	(0.015)	(0.019)	(0.035)	(0.017)
D-i-D: >30%	-0.006	-0.013	0.013	-0.014	0.019	-0.006
	(0.011)	(0.022)	(0.017)	(0.021)	(0.040)	(0.021)
D-i-D: >40%	-0.010	-0.024	0.017	-0.014	0.012	-0.023
	(0.012)	(0.025)	(0.020)	(0.023)	(0.046)	(0.026)
D-i-D: >50%	-0.007	-	-	-	-	-
	(0.014)	-	-	-	-	-
D-i-D: >60%	-0.003	-	-	-	-	-
	(0.018)	-	-	-	-	-
D-i-D: >70%	0.016	-	-	-	-	-
	(0.022)	-	-	-	-	-

Source: Authors' analyses based on Earnings, Hours and Employment Costs data.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Whitaker Square,
Sir John Rogerson's Quay,
Dublin 2
Telephone **+353 1 863 2000**
Email **admin@esri.ie**
Web **www.esri.ie**
Twitter **@ESRIDublin**

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE