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Minimum wages and firm profitability [1]

1. Background

The authors use the changes induced by the introduction of the National Minimum Wage in the UK in 1999 to explore the impact of minimum wage policies on the profitability of firms. In what ways did firms sustain the higher wage costs induced by the minimum wage policy after the policy was implemented? Firms may have passed on the higher wage costs to consumers by raising prices, but it is found that some of the higher wage costs will not be fully borne by consumers. This means that companies may have to bear a portion of their wage costs, which can have an impact on their profitability. Finally, the authors focus on the possibility that the implementation of minimum wage policies leads to a decrease in the profitability of firms, which in turn leads to an impact on the profitability of firms. Notable among these is the fact that minimum wage policies can significantly raise wages, thereby squeezing the profitability of firms[2].

2. Empirical methodology

They adopt an identification strategy using variations in wages induced by the introduction of the national minimum wage (NMW) in the United Kingdom as a quasi-experiment to examine the impact of wage floors on firm profitability. There is already evidence that national minimum wage policies significantly increase the wages of low-wage earners, but do not have a significant impact on employment. Thus, providing a basis for studying the impact on firm profitability.

From the equation below, we can see the negative relationship between the initial wage of the firm and the change in profit after the policy.

$$\Delta\Pi \cong -WL(\frac{\Delta W}{W} + \frac{\eta}{2}(\frac{\Delta W}{W})^2)$$

The Empirical methodology they consider building is the DID model. This is operationalized by defining an experimental group of firms that are more affected and a control group of firms that are less affected or even unaffected. Where the experimental group of firms is low-income firms ($T = 1$) and the control group is non-low-income firms ($T = 0$). This quasi-experimental setup allows us to compare the profitability of low-wage firms before and after the introduction of NMW with the profitability of a group of firms whose wages were not as much (or not at all) affected by the introduction of NMW over the same period.

The difference-in-difference estimate of the wage impact of the policy is, $(\bar{w}^{T=1}_{MMW=1} - \bar{w}^{T=1}_{NMW=0}) - (\bar{w}^{T=0}_{NMW=1} - \bar{w}^{T=0}_{NMW=0})$, where $w = ln(W)$, NMW is a dummy variable equal to 1 for time periods when the NMW was in place (and 0 for pre-policy periods). This DID estimate is simply the difference in means and is not controlled by other conditions of the business. It can therefore be easily set in the following regression equation,

$$w_{it} = \alpha_1 + \beta_1 X_{\mathrm{it}} + \delta_1 Y_t + \theta_1 I(w_{i,t-1} < mw_t) + \psi_1[I(w_{i,t-1} < mw_t)NMW_t] + \varepsilon_{1it},$$

The authors then went on to consider whether profitability was affected differently between treatment group companies ($T = 1$) and control group companies ($T = 0$).

The unconditional difference-in-difference in profit margins is $[(\bar{\Pi/S})^{T=1}_{NMW=1} - (\bar{\Pi/S})^{T=1}_{NMW=0}] - [(\bar{\Pi/S})^{T=0}_{MMW=1} - (\bar{\Pi/S})^{T=0}_{NMW=0}]$. The conditional DID regression model is,

$$(\frac{\Pi}{S})_{it} = \alpha_2 + \beta_2 Z_{it} + \delta_2 Y_t + \theta_2 I(w_{i,t-1} < mw_t) + \psi_2[I(w_{i,t-1} < mw_t)NMW_t] + \varepsilon_{2it},$$

where Z represents the control variable.

3. Data

They used profit data from the FAME database[4], using the sales-to-profit ratio as a measure of profitability. In order to investigate the impact of the minimum wage, the researchers defined a concept known as a 'treatment group', denoted as T. If the average remuneration of a business was below $£12{,}000$ in the accounting year prior to the introduction of the minimum wage policy, then they were defined as a 'low-wage business' and were included in treatment group T. The following are the results of descriptive statistics based on the raw data with a selection of important variables.

Variable	Obs	Mean	Std. dev.	Min	Max
ln_avwage	20,634	3.016963	.6467169	-2.268376	7.239394
net_pcm	20,860	-.7992608	90.47829	-13014.5	184.6667
ctreat1	20,914	.0889356	.2846576	0	1
treat1_NMW	20,914	.0314144	.174439	0	1
NMW	20,914	.3626279	.4807702	0	1
avwage	20,634	25.48057	31.17957	.10348	1393.25
c_avwage99	15,668	3.046763	.6322449	-1.879315	7.239394
avwage99_NMW	15,668	1.06879	1.503549	-1.879315	7.239394
grad2	20,914	.1869426	.1533295	0	1
unionmem	20,906	.2158367	.168073	0	1
ptwk	20,906	.1643418	.1234923	0	.7126051
female	20,906	.4186636	.1976356	0	.9387755

4. Replication results and tables

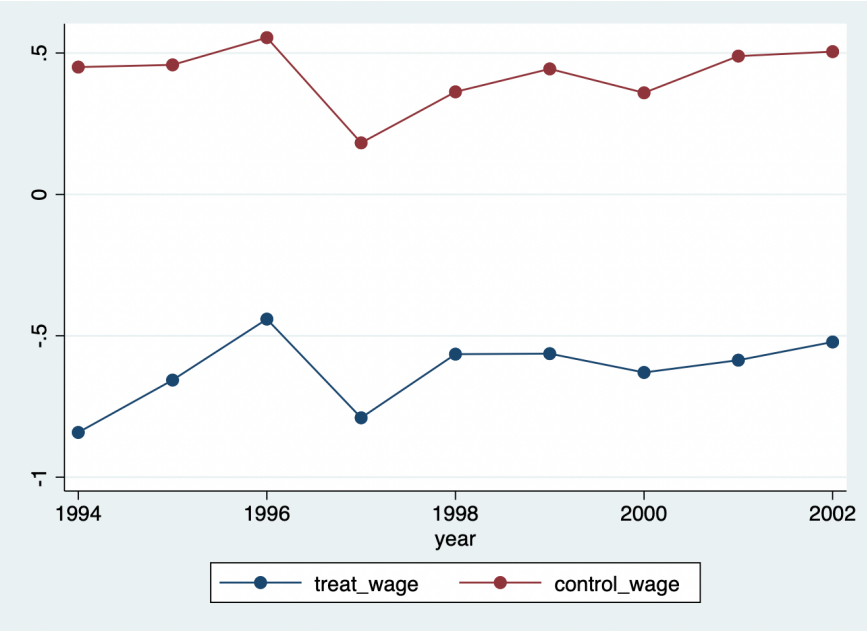
After the introduction of a minimum wage policy, it is important to observe whether there is a significant change or 'distortion' in the average wage distribution of firms. For the purpose of this study, we first calculated the change in the average wage at each percentile of the wage

distribution for each firm before and after the introduction of the policy. The introduction of the minimum wage should have increased the average wages of low-wage firms more.

The above figure shows the lowest decile of the distribution of average wages for firms. In the year prior to the implementation of the policy, wages in the bottom decile are not shown to have grown faster. wage growth in the bottom thirteen deciles averaged 2.6 percent in the $1998-1999$ fiscal year, compared to 9.9 percent in the following year. There were some fluctuations or anomalies in wages at the bottom deciles between the two time periods, but over time these fluctuations tended to revert to the average of the overall wage distribution. The graphs illustrate that the treatment groups defined are effective.

We need to verify the need for a common trend and stable composition between experimental and control groups prior to experimental intervention[3] (Richard Blundell et al., 2004). I use the authors' original data to present the results of the parallel trend test in a simple scatter plot

(unlike the bar chart in the original article). I find from the graph that the treatment combination control group had roughly the same trend prior to the implementation of the 1999 policy.



The authors use pre-policy information on wage distribution to implement the DID method. The minimum wage raises wages, but also significantly reduces profits. The difference-in-difference model they consider in their empirical modeling strategy (described below) will be carried out by defining a treatment group of more affected firms and a comparison group of less affected firms.

	(1)	(2)
VARIABLES	ln_avwage	net_pcm
ctreat1	-0.626***	0.058***
	(-26.226)	(4.249)
treat1_NMW	0.111***	-0.027**
	(3.878)	(-1.996)
NMW	0.118***	-0.012***
	(16.245)	(-2.828)
Constant	2.775***	0.070***
	(416.234)	(14.533)

Observations	4,112	4,112
Adjusted R-squared	0.500	0.019

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The $treat1\_NMW$ variable is a cross-over term between the treatment group and the indicator variable for the minimum wage (NMW), and I find that the unconditional difference in mean wages between the treatment encounter and the comparison group for discrete classification is significant from the cross-over coefficient and significance, and this is partly where I differ from the original operation. The first column shows that the cross-phase coefficient is 0.111 and is significant at the 1% level. This indicates that after the implementation of the minimum wage policy, the treatment group experienced a significantly faster increase in average wages relative to the control group, by 0.111 units. This is consistent with the previous hypothesis made by the authors that the NMW significantly raises wages in low-wage firms. In the second column, on the other hand, we find a cross term coefficient of -0.027, significant at the 5% level, which indicates a significant negative effect on the profitability of low-wage firms after NMW and is also consistent with our previous assumptions.

The authors then additionally control for firm and industry characteristics, where the panel data in the top half presents results for a binary low-wage firm indicator, while the bottom half uses a continuous measure of pre-policy average wages.

	(1)	(2)	(3)	(4)
	ln_avwage	net_pcm	ln_avwage	net_pcm
treat1_NMW	0.090***	-0.029**		
	(0.026)	(0.012)		
avwage99_NMW			-0.188***	0.032**
			(0.033)	(0.015)
N	4112	4112	4112	4112

For the discrete variables in the top half of the regression, the results show a 9.0 percentage point increase in wages and a 0.029 percentage point decrease in profitability, and both are statistically significant (like the results of the unconditional regression). The same correlation is found for the continuous pre-NMW wage reported in the second half (if negative values are taken). There is a significant positive correlation between wage increases and the negative value of pre-policy wages, while there is a significant negative correlation with profitability. Although the results of this part of the regression differ from the authors' sign, this does not affect consistency. This is because here the authors report negative numbers after adjusting the sign to allow for a consistently defined sign on the coefficients.

5. Conclusion

In this paper, by examining the empirical link between national minimum wage policies and firm profitability, the authors construct treatment and comparison groups using pre-policy information on wage distribution and introduce a difference-in-difference approach. A body of evidence suggests that the introduction of the minimum wage significantly raises wages and significantly reduces firm profitability. The authors then conducted more detailed analyses such as robustness-type tests and heterogeneity analyses, namely that the negative impact of the NMW on profitability was more severe in industries with relatively large market power but had insignificant effects on employment or production. However, the authors' subsequent findings are consistent with a simple 'no behavior' result that we have previously conducted.

Reference

[1] Draca, Mirko, Stephen Machin, and John Van Reenen. "Minimum wages and firm profitability." American economic journal: applied economics 3.1 (2011): 129-151.

[2] DiNardo, John, Nicole Fortin, and Thomas Lemieux. "Labor market institutions and the distribution of wages, 1973-1992: A semiparametric approach." (1995).

[3] Blundell, Richard, et al. "Evaluating the employment impact of a mandatory job search program." Journal of the European economic association 2.4 (2004): 569-606.

[4] Bloom, Nicholas, and John Van Reenen. "Measuring and explaining management practices across firms and countries." The quarterly journal of Economics 122.4 (2007): 1351-1408.

Code

Please refer to my code on my GitHub, the link is https://github.com/wqr1017yo/ECON6040.