

First, some terminology for clarity:

- **Treatment Group:** Establishments in NJ ($nj = 1$).
- **Control Group:** Establishments in Pennsylvania (PA) ($nj = 0$).
- **Pre-Treatment Period:** Before the NJ minimum wage increase ($d = 0$).
- **Post-Treatment Period:** After the NJ minimum wage increase ($d = 1$).

a. Construct a difference in difference estimate of the change in FTEs due to the minimum wage increase with no other explanatory variables.

Using a linear regression model, we can estimate the following DiD specification:

$$fte = \beta_0 + \beta_1 \times nj + \beta_2 \times d + \delta \times (nj \times d) + \epsilon$$

Where:

δ (our coefficient of interest) captures the additional average change in employment in NJ after the minimum wage increase, which is the DiD estimator.

d_nj coefficient(δ) is 2.754, but it's not statistically significant at conventional levels ($p > 0.1$). This suggests that, based on this simple model, the increase in minimum wage in NJ did not have a significant impact on full-time equivalent employment (**fte**), relative to PA.

b. Is there any evidence that different regions or different companies were on different trajectories (i.e., we have violated the parallel trend assumption)?

The parallel trends assumption implies that, in the absence of the treatment (minimum wage increase), the treatment and control groups would have followed the same trends over time.

We can add interaction terms of each company variable (e.g., ``bk``, ``kfc``, ``roys``, ``wendys``, ``southj_d``) with the ``d`` variable to the above regression and check if these interaction terms are significant. If they are, it suggests different companies were on different trajectories.

$$fte = \beta_0 + \beta_1 \times nj + \beta_2 \times d + \beta_3 \times (nj \times d) + \beta_4 \times (d \times bk) + \beta_5 \times (d \times kfc) + \beta_6 \times (d \times roys) + \beta_7 \times (d \times centralj) + \beta_8 \times (d \times southj) + \beta_9 \times (d \times pa1) + \epsilon$$

VARIABLES	(1) fte	(2) fte
nj	-2.892** (1.194)	-2.892** (1.135)
d	-2.166 (1.516)	-0.182 (2.111)
d_nj	2.754 (1.688)	4.134** (1.922)
bk_d		0.908

		(1.398)
kfc_d		-9.098***
		(1.583)
roys_d		-2.552*
		(1.547)
centralj_d		-0.481
		(1.340)
southj_d		-3.831***
		(1.182)
pa1_d		-0.912
		(2.092)
Constant	23.33***	23.33***
	(1.072)	(1.019)
Observations	794	794
R-squared	0.007	0.110

Standard errors in parentheses

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

kfc_d coefficient is -9.098 and highly significant (p<0.01), **southj_d** coefficient is -3.831 and highly significant (p<0.01), suggesting that Kentucky Fried Chicken saw a significant reduction in **fte** compared to other companies after the wage change.

c. Is there any evidence that the effect differs by region of NJ or PA? (hint: you need interaction terms to do this)

To determine if the effect of the minimum wage increase varies by region within NJ or PA, we can include interactions of the 'd' variable with each region-specific dummy variable ('centralj', 'southj', 'pa1', 'pa2'). The regression would look like:

$$fte = \beta_0 + \beta_1 \times d + \beta_2 \times centralj + \beta_3 \times southj + \beta_4 \times pa1 + \beta_5 \times pa2 \\ + \beta_6 \times (d \times centralj) + \beta_7 \times (d \times southj) + \beta_8 \times (d \times pa1) + \beta_9 \times (d \times pa2) \\ + \epsilon$$

- 'd_centralj', 'd_southj', and 'd_pa2' are all not statistically significant, implying that the wage change effect did not vary significantly for Central NJ, Southern NJ, and PA2 regions compared to the reference group.

- 'd_pa1' coefficient is -4.514 and significant at p<0.1, suggesting that the effect of the wage change in PA1 differed significantly from the reference group.

(3)	
VARIABLES	fte
d	0.871

	(1.002)
centralj	0.116
	(1.383)
southj	-5.073***
	(1.192)
pa1	2.843*
	(1.709)
pa2	0.307
	(1.586)
d_centralj	-1.256
	(1.950)
d_southj	-0.234
	(1.693)
d_pa1	-4.514*
	(2.417)
d_pa2	-1.805
	(2.244)
Constant	21.87***
	(0.708)
Observations	794
R-squared	0.057

Standard errors in parentheses

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

Appendix: Stata Code

```
clear
capture log close
import delimited "/Users/yimingzhang/Desktop/Econometric/pset3/njmin3.csv"

reg fte nj d d_nj
outreg2 using results.doc, replace

gen centralj_d = d*centralj
gen southj_d = d*southj
gen pa1_d = d*pa1

gen bk_d = bk*d
gen kfc_d = kfc*d
gen roys_d = roys*d

reg fte nj d d_nj bk_d kfc_d roys_d centralj_d southj_d pa1_d
outreg2 using results.doc, append

gen d_centralj = d*centralj
gen d_southj = d*southj
gen d_pa1 = d*pa1
gen d_pa2 = d*pa2

reg fte d centralj southj pa1 pa2 d_centralj d_southj d_pa1 d_pa2
outreg2 using results1.doc, replace
```