

# Econometrics Assignment 4a

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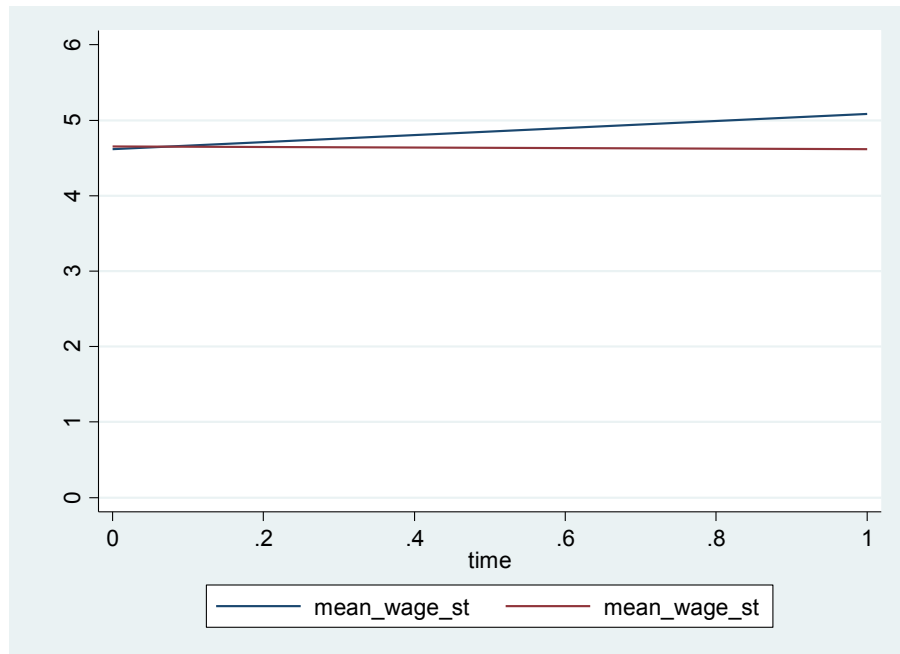
II.

- a. The number of restaurants within the relevant sample is 702. The number of restaurants in New Jersey is 662 out of all 820 restaurants. The number of restaurants in New Jersey within the relevant sample is 570.
- b. The minimum number of full time equivalents within the relevant sample is 3, the maximum number is 80.
- c. The minimum starting wage in restaurants within the relevant sample is 4.25, the maximum is 6.25.

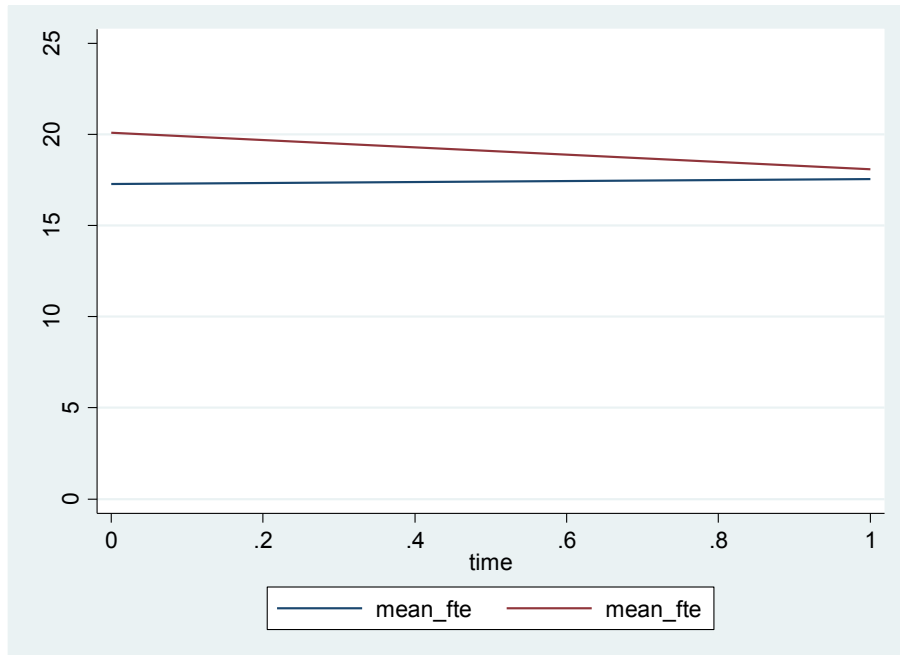
III.

a.

1. Wage changes in New Jersey (blue) and Pennsylvania (red)



2. Employment changes in New Jersey (blue) and Pennsylvania (red)



b.

1. Average starting wages

New Jersey	First wave	4.6130
	Second wave	5.0821
Pennsylvania	First wave	4.6536
	Second wave	4.6188

2. Differences between first and second wave

	<i>First wave</i>	<i>Second wave</i>	<i>Difference (<math>\Delta</math>)</i>
New Jersey	4.6130	5.0821	<b>+ 0.4692</b>
Pennsylvania	4.6536	4.6188	<b>- 0.0349</b>

3. Differences in differences

<i>New Jersey</i>	<i>Pennsylvania</i>	<i><math>\Delta\Delta</math> (NJ-PA)</i>
+ 0.4692	- 0.0349	<b>+ 0.5041</b>

4. The difference in difference estimate gives an indication that the policy change (min. wage increase) leads to an increase in the starting wage in New Jersey. Here Pennsylvania is used as a counterfactual to the starting wage in New Jersey, the assumption thereby is that the states are similar to the extent that without the policy change, the change in starting wages would have been equal to the change that was measured in Pennsylvania. This difference-in-difference would provide a valid estimate in the case that the common trend assumption holds, thus when New Jersey would have faced the same trend that Pennsylvania followed if it had not seen an increase in the minimum wage.
5. We find that the difference-in-difference estimation suggests that an increase in the minimum wage from \$4.25 to \$5.05 per hour leads to a wage increase of approximately 50 cents in average starting wages in the fast food sector, assuming that the common trend assumption holds.

c.

1. Average starting employment (FTE)

New Jersey	First wave	<b>17.2754</b>
	Second wave	<b>17.5623</b>
Pennsylvania	First wave	<b>20.1136</b>
	Second wave	<b>18.0985</b>

2. Differences between first and second wave

	<i>First wave</i>	<i>Second wave</i>	<i>Difference (<math>\Delta</math>)</i>
New Jersey	17.2754	17.5623	<b>+ 0.2869</b>
Pennsylvania	20.1136	18.0985	<b>- 2.0151</b>

3. Differences in differences

<i>New Jersey</i>	<i>Pennsylvania</i>	<i><math>\Delta\Delta</math> (NJ-PA)</i>
+ 0.2869	- 2.0151	<b>+ 2.302</b>

By this estimate, the minimum wage increase is suggested to increase employment in New Jersey fast food restaurants by an average of approximately 2.3 units of full time equivalent employment. Here it is assumed by the common trend assumption that if New Jersey had not seen a minimum wage increase, it would have followed the relative employment-path that can be seen in Pennsylvania, which is the state that is used as counterfactual.

d.

```
. regress wage_st state_time state time
```

Source	SS	df	MS	Number of obs	=	779
				F(3, 775)	=	177.50
Model	40.6981269	3	13.5660423	Prob > F	=	0.0000
Residual	59.2333808	775	.076430169	R-squared	=	0.4073
				Adj R-squared	=	0.4050
Total	99.9315077	778	.128446668	Root MSE	=	.27646

wage_st	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state_time	.4813823	.0506547	9.50	0.000	.3819456	.5808189
state	-.0179978	.0353422	-0.51	0.611	-.0873755	.0513799
time	-.0126668	.0456305	-0.28	0.781	-.1022408	.0769072
_cons	4.630132	.0317121	146.00	0.000	4.56788	4.692383

```
. regress fte state_time state time
```

Source	SS	df	MS	Number of obs	=	801
				F(3, 797)	=	2.15
Model	524.003099	3	174.6677	Prob > F	=	0.0919
Residual	64600.6458	797	81.0547626	R-squared	=	0.0080
				Adj R-squared	=	0.0043
Total	65124.6489	800	81.4058111	Root MSE	=	9.003

fte	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state_time	2.913982	1.610513	1.81	0.071	-.2473667	6.075331
state	-2.883534	1.134812	-2.54	0.011	-5.111107	-.6559608
time	-2.40651	1.446314	-1.66	0.097	-5.245544	.4325237
_cons	19.94872	1.019394	19.57	0.000	17.9477	21.94973

1. The regression estimates the difference-in-difference effect of the treatment (minimum wage increase) on wages to be +0.4814\*\*\* and on employment to be +2.9140\*. These results are different from the results in (b) and (c). The effect on wages is almost similar (.5041 compared to .4814\*\*\*) while the effect on employment differs with a greater margin (2.302 compared to 2.9140\*). Overall, the signs and sizes of the different difference-in-difference estimation methods are quite comparable.

2. The new estimates are as follows:

Covariates	Variable	$\Delta\Delta$
Ownership dummy	Starting wage	<b>+0.4819***</b>
	Employment (fte)	<b>+2.9571*</b>
Ownership dummy & Chain dummies	Starting wage	<b>+0.4764***</b>
	Employment (fte)	<b>+2.9590**</b>

3. After including restaurant-specific covariates, the regression results are still very similar. The only noticeable change is that the effect on employment is now significant at the 5% level compared to before including covariates, when it was only significant at the 10% level. We would not have expected results to change as Pennsylvania and New Jersey are not dramatically different from each other in terms of chain store distribution percentages and ownership percentages.

A full documentation of STATA commands and output can be found below, as a print of the log file.

---

```

name: <unnamed>
log: C:\Users\u1265889\Desktop\Logfile4a.smcl
log type: smcl
opened on: 21 Sep 2017, 14:57:29

```

```

1 . do "C:\Users\u1265889\Desktop\CA4a.do"

2 . * Computer Assignment 4 Econometrics, Sep 2017
3 .
4 . use "C:\Users\u1265889\Downloads\minwage_280915.dta", clear

5 .
6 . * II
7 . *a)
8 . tab sample

```

sample	Freq.	Percent	Cum.
0	<b>118</b>	<b>14.39</b>	<b>14.39</b>
1	<b>702</b>	<b>85.61</b>	<b>100.00</b>
Total	<b>820</b>	<b>100.00</b>	

```

9 . tab state

```

state	Freq.	Percent	Cum.
0	<b>158</b>	<b>19.27</b>	<b>19.27</b>
1	<b>662</b>	<b>80.73</b>	<b>100.00</b>
Total	<b>820</b>	<b>100.00</b>	

```

10 . tab sample if sample==1 & state==1

```

sample	Freq.	Percent	Cum.
1	<b>570</b>	<b>100.00</b>	<b>100.00</b>
Total	<b>570</b>	<b>100.00</b>	

```

11 .
12 . *b)
13 . sum fte if sample==1

```

Variable	Obs	Mean	Std. Dev.	Min	Max
fte	<b>702</b>	<b>17.73611</b>	<b>8.982443</b>	<b>3</b>	<b>80</b>

```

14 .
15 . *c)
16 . sum wage_st if sample==1

```

Variable	Obs	Mean	Std. Dev.	Min	Max
wage_st	<b>702</b>	<b>4.807821</b>	<b>.3580375</b>	<b>4.25</b>	<b>6.25</b>

```

17 .
18 . *III
19 . *a)

```

```

20 . *1)
21 . bys state time: egen mean_wage_st=mean(wage_st) if sample==1
    (118 missing values generated)

22 . graph twoway (line mean_wage_st time if state==1) (line mean_wage_st time if s
    > tate==0), yscale(range(0)) ylabel(0(1)6)

23 . *2)
24 . bys state time: egen mean_fte=mean(fte) if sample==1
    (118 missing values generated)

25 . graph twoway (line mean_fte time if state==1) (line mean_fte time if state==0)
    > , yscale(range(0)) ylabel(0(5)25)

26 . *b)
27 . *1)
28 . table state time if sample==1, contents(mean wage_st)

```

state	time	
	0	1
0	<b>4.65364</b>	<b>4.61879</b>
1	<b>4.61298</b>	<b>5.08214</b>

```

29 . *2)
30 . display 5.08214 - 4.61298
.46916

```

```

31 . display 4.61879 - 4.65364
-.03485

```

```

32 . *3)
33 . display .4692--.0349
.5041

```

```

34 . *c)
35 . *1)
36 . table state time if sample==1, contents(mean fte)

```

state	time	
	0	1
0	<b>20.1136</b>	<b>18.0985</b>
1	<b>17.2754</b>	<b>17.5623</b>

```

37 . *2)
38 . display 17.5623 - 17.2754
.2869

```

```

39 . display 18.0985 - 20.1136
-2.0151

```

```

40 . *3)
41 . display .2869 -- 2.0151
2.302

```

```

42 . *d)
43 . *1)
44 . regress wage_st state_time state time

```

Source	SS	df	MS	Number of obs	=	779
Model	40.6981269	3	13.5660423	F(3, 775)	=	177.50
Residual	59.2333808	775	.076430169	Prob > F	=	0.0000
				R-squared	=	0.4073
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```

45 . regress fte state_time state time

```

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Model	524.003099	3	174.6677	F(3, 797)	=	2.15
Residual	64600.6458	797	81.0547626	Prob > F	=	0.0919
				R-squared	=	0.0080
				Adj R-squared	=	0.0043
Total	65124.6489	800	81.4058111	Root MSE	=	9.003

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state_time	2.913982	1.610513	1.81	0.071	-.2473667	6.075331
state	-2.883534	1.134812	-2.54	0.011	-5.111107	-.6559608
time	-2.40651	1.446314	-1.66	0.097	-5.245544	.4325237
_cons	19.94872	1.019394	19.57	0.000	17.9477	21.94973

```

46 . *2)
47 . *Ownership dummy
48 . regress wage_st state_time state time co_owned

```

Source	SS	df	MS	Number of obs	=	779
Model	41.5851676	4	10.3962919	F(4, 774)	=	137.91
Residual	58.34634	774	.075382868	Prob > F	=	0.0000
				R-squared	=	0.4161
				Adj R-squared	=	0.4131
Total	99.9315077	778	.128446668	Root MSE	=	.27456

wage_st	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state_time	.4819154	.0503067	9.58	0.000	.3831618	.5806691
state	-.0174203	.0350996	-0.50	0.620	-.086322	.0514814
time	-.012443	.0453168	-0.27	0.784	-.1014014	.0765155
co_owned	.0710406	.0207096	3.43	0.001	.030387	.1116941
_cons	4.604893	.0323421	142.38	0.000	4.541405	4.668382

```

49 . regress fte state_time state time co_owned

```

Source	SS	df	MS	Number of obs	=	801
Model	1513.96091	4	378.490228	F(4, 796)	=	4.74
Residual	63610.688	796	79.9129246	Prob > F	=	0.0009
				R-squared	=	0.0232
				Adj R-squared	=	0.0183
Total	65124.6489	800	81.4058111	Root MSE	=	8.9394



fte	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state_time	2.957076	1.599176	1.85	0.065	-.1820244	6.096177
state	-2.912398	1.12682	-2.58	0.010	-5.124288	-.7005081
time	-2.456326	1.43616	-1.71	0.088	-5.275434	.3627821
co_owned	-2.337455	.6641153	-3.52	0.000	-3.641079	-1.033831
_cons	20.7878	1.039884	19.99	0.000	18.74656	22.82904

50 . \*Chain dummies

51 . regres wage\_st state\_time state time co\_owned i.chain

Source	SS	df	MS	Number of obs	=	779
Model	43.1576073	7	6.16537248	F(7, 771)	=	83.73
Residual	56.7739003	771	.073636706	Prob > F	=	0.0000
				R-squared	=	0.4319
				Adj R-squared	=	0.4267
Total	99.9315077	778	.128446668	Root MSE	=	.27136

wage_st	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state_time	.4764773	.0497428	9.58	0.000	.3788299	.5741247
state	-.0114332	.034806	-0.33	0.743	-.079759	.0568926
time	-.0068627	.0448116	-0.15	0.878	-.0948298	.0811045
co_owned	.0635358	.0231942	2.74	0.006	.0180045	.109067
chain						
2	.0210079	.0274848	0.76	0.445	-.032946	.0749617
3	.0482915	.0278068	1.74	0.083	-.0062944	.1028774
4	.1364499	.0300724	4.54	0.000	.0774163	.1954834
_cons	4.567063	.033316	137.08	0.000	4.501662	4.632463

52 . regres fte state\_time state time co\_owned i.chain

Source	SS	df	MS	Number of obs	=	801
Model	12393.6934	7	1770.52763	F(7, 793)	=	26.63
Residual	52730.9555	793	66.4955302	Prob > F	=	0.0000
				R-squared	=	0.1903
				Adj R-squared	=	0.1832
Total	65124.6489	800	81.4058111	Root MSE	=	8.1545

fte	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state_time	2.959047	1.458933	2.03	0.043	.0952206	5.822873
state	-2.371071	1.030224	-2.30	0.022	-4.39336	-.3487828
time	-2.426545	1.310237	-1.85	0.064	-4.998488	.1453966
co_owned	-1.064741	.6855265	-1.55	0.121	-2.410402	.2809202
chain						
2	-9.800042	.8119755	-12.07	0.000	-11.39392	-8.206166
3	-1.2423	.8233232	-1.51	0.132	-2.85845	.3738509
4	-.870672	.8885503	-0.98	0.327	-2.614861	.8735167
_cons	22.27683	.9900716	22.50	0.000	20.33335	24.2203

```
53 . *3)
54 . tab chain if state==0
```

chain	Freq.	Percent	Cum.
1	<b>70</b>	<b>44.30</b>	<b>44.30</b>
2	<b>24</b>	<b>15.19</b>	<b>59.49</b>
3	<b>34</b>	<b>21.52</b>	<b>81.01</b>
4	<b>30</b>	<b>18.99</b>	<b>100.00</b>
Total	<b>158</b>	<b>100.00</b>	

```
55 . tab chain if state==1
```

chain	Freq.	Percent	Cum.
1	<b>272</b>	<b>41.09</b>	<b>41.09</b>
2	<b>136</b>	<b>20.54</b>	<b>61.63</b>
3	<b>164</b>	<b>24.77</b>	<b>86.40</b>
4	<b>90</b>	<b>13.60</b>	<b>100.00</b>
Total	<b>662</b>	<b>100.00</b>	

```
56 . tab co_owned if state==0
```

co_owned	Freq.	Percent	Cum.
0	<b>102</b>	<b>64.56</b>	<b>64.56</b>
1	<b>56</b>	<b>35.44</b>	<b>100.00</b>
Total	<b>158</b>	<b>100.00</b>	

```
57 . tab co_owned if state==1
```

co_owned	Freq.	Percent	Cum.
0	<b>436</b>	<b>65.86</b>	<b>65.86</b>
1	<b>226</b>	<b>34.14</b>	<b>100.00</b>
Total	<b>662</b>	<b>100.00</b>	

```
58 .
59 .
60 .
61 .
62 .
63 .
end of do-file
```

```
64 . log close
    name: <unnamed>
    log: C:\Users\u1265889\Desktop\Logfile4a.smcl
    log type: smcl
    closed on: 21 Sep 2017, 14:58:20
```

---