Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania, Card and Krueger

On April 1, 1992, New Jersey's minimum wage rose from 4.25 to 5.05 per hour. To evaluate the impact 410 fast-food restaurants in NJ near eastern PA (where the minimum wage was constant) were surveyed before and after the rise.

Treatment: change in min wage from 4.25 to 5.05 on April , 1992 in NJ

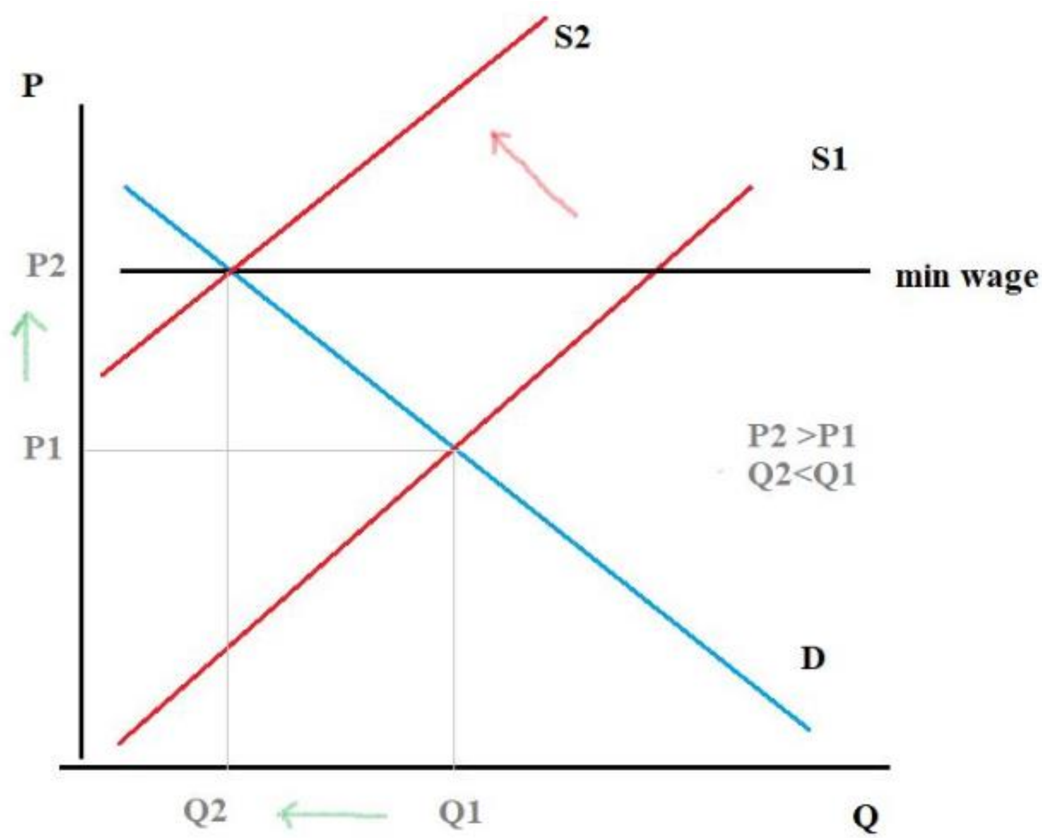
Outcome: change in the level of employment

Method: Difference-in-difference

Research question: Does a rise in minimum wage affect employment?

The results produced by Card and Krueger challenged the idea that a fixed minimum wage results in a reduction of labor demand.

paper available: http://davidcard.berkeley.edu/papers/njmin-aer.pdf



Difference-in-difference combines the comparison of the participant's state before and after treatment (employment in NJ before and after the min wage change) and a comparison between the participant (NJ) and non-participant (PA).

The basic idea is to observe the (self-selected) treatment group and a (self-selected) comparison group before and after the treatment.

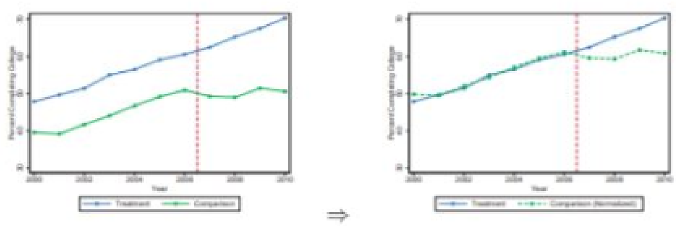
	Treatment	Comparison
Pre-Program	$\bar{Y}^{treatment}_{pre}$	$\bar{Y}^{comparison}_{pre}$
Post-Program	$\bar{Y}^{treatment}_{post}$	$\bar{Y}^{comparison}_{post}$

Common trends assumption -- basic assumptions underlying DID estimation

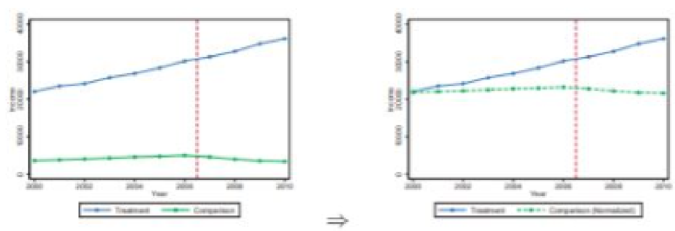
(DID does not identify the treatment effect if treatment and comparison groups were on different trajectories prior to the program.)

- Selection bias relates to fixed characteristics of objects under study
- Time trends are the same for treatment and control groups.

common trends assumtion is upheld:



common trends assumtion is violated:



Treatment effect heterogeneity is the degree to which different treatments have differential causal effects on each unit.

DID with a regression model

result is equivalent to first differences

Y2 - Y1 = a + n + c + t + e

change in the outcome of interest = pre-program in comparison gr. + treatment effect + selection bias + time trend + error

```
library(tidyverse)
library(expss)
```

1. DATA PREP

```
direct <- "did_krueger"
```

```
# download file from a website

URL <- "http://davidcard.berkeley.edu/data_sets/njmin.zip"
destfile <- "C:/Users/aslop/Documents/CLASSES/SPRING 2019/Econometrics/Difference-in-difference/wages.z
download.file(URL, destfile)

# data cleaning code: https://www.brodrigues.co/blog/2019-05-04-diffindiff_part2/
```

The next lines import the codebook:

```
codebook <- read_lines(file = paste0(direct, "/codebook"))
```

```
codebook
```

```
variable_names <- codebook %>%
    `[`(8:59) %>% #I select lines 8 to 59 using the `[`() function
    `[`(-c(5, 6, 13, 14, 32, 33)) %>%  #I remove lines that I do not need
    str_sub(1, 13) %>% # I only keep the first 13 characters
# (which are the variable names, plus some white space characters)
    str_squish() %>%   #  to remove all the unneeded white space characters
    str_to_lower()  # change the column names to lowercase
```

```
glimpse(variable_names)
```

```
 chr [1:46] "sheet" "chain" "co_owned" "state" "southj" "centralj" "northj" ...
```

```
variable_names
```

'sheet' 'chain' 'co_owned' 'state' 'southj' 'centralj' 'northj' 'pa1' 'pa2' 'shore' 'ncalls' 'empft' 'emppt' 'nmgrs' 'wage_st' 'inctime' 'firstinc' 'bonus' 'pctaff' 'meals' 'open' 'hrsopen' 'psoda' 'pfry' 'pentree' 'nregs' 'nregs11' 'type2' 'status2' 'date2' 'ncalls2' 'empft2' 'emppt2' 'nmgrs2' 'wage_st2' 'inctime2' 'firstin2' 'special2' 'meals2' 'open2r' 'hrsopen2' 'psoda2' 'pfry2' 'pentree2' 'nregs2' 'nregs112'

```
# I then load the data, and add the column names that I extracted before:
dataset <- read_table2(paste0(direct, "/public.dat"),  # from readr
                       col_names = FALSE)
```

```
# remove the 47th column, which is empty
# name the columns with `colnames<-`().
dataset <- dataset %>%
    select(-X47) %>%
    `colnames<-`(., variable_names) %>%
    mutate_all(as.numeric) %>%
    mutate(sheet = as.character(sheet))
```

2. DESCRIPTIVE STATISTICS

Calculate Full-time Equivalent Employment variable (FTE)

Full-time Equivalent Employment (FTE) was calculated as the number of full-time workers including managers plus 0.5 of part-time workers.

```
data1 <- dataset %>%
select(co_owned,
       southj,
       centralj,
       northj,
       pa1,
       pa2,
       wage_st,
       wage_st2,
       hrsopen,
       hrsopen2,
       empft,
       emppt,
       nmgrs,
       empft2,
       emppt2,
       nmgrs2,
       state,
       chain,
       status2) %>%
# mutate_all(funs(replace_na(.,0))) %>%
mutate(state = as.character(as.numeric(state))) %>%

mutate(fte_before = empft + nmgrs + emppt*0.5,
       fte_after = empft2 + nmgrs2 + emppt2*0.5)
```

:
```
unique(data1$status2)
# '1 = answered 2nd interview (count = 399)'
# '2 = closed for renovations (count = 2)'
# '3 = closed "permanently" (count = 6)'
# '4 = closed for highway construction (count = 1)'
# '5 = closed due to Mall fire (count = 1)'
```

1 3 4 2 0 5

:
```
names(data1)
```

'co_owned' 'southj' 'centralj' 'northj' 'pa1' 'pa2' 'wage_st' 'wage_st2' 'hrsopen' 'hrsopen2' 'empft' 'emppt' 'nmgrs' 'empft2' 'emppt2' 'nmgrs2' 'state' 'chain' 'status2' 'fte_before' 'fte_after'

```r
# format summary tables https://gdemin.github.io/expss/
data1 %>% tab_cells(co_owned,
              southj,
              centralj,
              northj,
              pa1,
              pa2,
              wage_st,
              wage_st2,
              hrsopen,
              hrsopen2,
              empft,
              empft2,
              chain,
              status2,
              fte_before,
              fte_after) %>%
tab_stat_fun("Valid N" = w_n, Mean = w_mean, "Std. dev." = w_sd, "Min" = w_min, "Max" = w_max,
             method = list) %>%
    tab_pivot()
```

	#Total				
	Valid N	Mean	Std. dev.	Min	Max
co_owned	410	0.3	0.5	0.0	1.0
southj	410	0.2	0.4	0.0	1.0
centralj	410	0.2	0.4	0.0	1.0
northj	410	0.4	0.5	0.0	1.0
pa1	410	0.1	0.3	0.0	1.0
pa2	410	0.1	0.3	0.0	1.0
wage_st	390	4.6	0.3	4.2	5.8
wage_st2	389	5.0	0.3	4.2	6.2
hrsopen	410	14.4	2.8	7.0	24.0
hrsopen2	399	14.5	2.8	8.0	24.0
empft	404	8.2	8.6	0.0	60.0
empft2	398	8.3	8.0	0.0	40.0
chain	410	2.1	1.1	1.0	4.0
status2	410	1.0	0.4	0.0	5.0
fte_before	398	21.0	9.7	5.0	85.0
fte_after	396	21.1	9.1	0.0	60.5

3. VISUALIZE DATA

a) minium wages in NJ and PA before the law

b) minimum wages inn NJ and PA after passing the law

```
# a) minium wages in NJ and PA before the law
# define bins, construct a table and then plot it

table2 <- data1 %>%
select(wage_st, state) %>%
mutate(store = 1) %>%

mutate_all(funs(replace_na(.,0)))  %>%

# maybe just filter what we need?

mutate(category=cut(wage_st, breaks = seq(4.19, 5.60, by = 0.1),
                   labels=c("4.25",
                            "4.35",
                            "4.45",
                            "4.55",
                            "4.65",
                            "4.75",
                            "4.85",
                            "4.95",
                            "5.05",
                            "5.15",
                            "5.25",
                            "5.35",
                            "5.45",
                            "5.55"))) %>%

group_by(state, category) %>%
summarise(sum = sum(store, is.na = TRUE)) %>%
mutate(category = as.character(category)) %>%
filter(!is.na(category)) %>%
spread( key = "state", value = "sum")
```

```
table2
```

A tibble: 14 × 3

category	0	1
<chr>	<dbl>	<dbl>
4.25	27	102
4.35	2	13
4.45	NA	4
4.55	14	53
4.65	2	21
4.75	11	39
4.85	2	14
4.95	NA	3
5.05	21	51
5.15	NA	6
5.25	3	7
5.35	NA	3
5.45	NA	2
5.55	3	8

```
# calculate total number of stores
tot <- data1 %>% select(wage_st, state) %>%
mutate(store = 1) %>%
group_by(state) %>%
summarise(sum_tot = sum(store)) %>%
spread( key = "state", value = "sum_tot") %>%
mutate(category = "total_stores") %>%
select(category, everything())
tot
```

A tibble: 1 × 3

category	0	1
<chr>	<dbl>	<dbl>
total_stores	79	331

```
# full table
full_table <- table2 %>%
mutate(pa_percent = (`0`/79)*100,
       nj_percent = (`1`/331)*100)

full_table
```

A tibble: 14 × 5

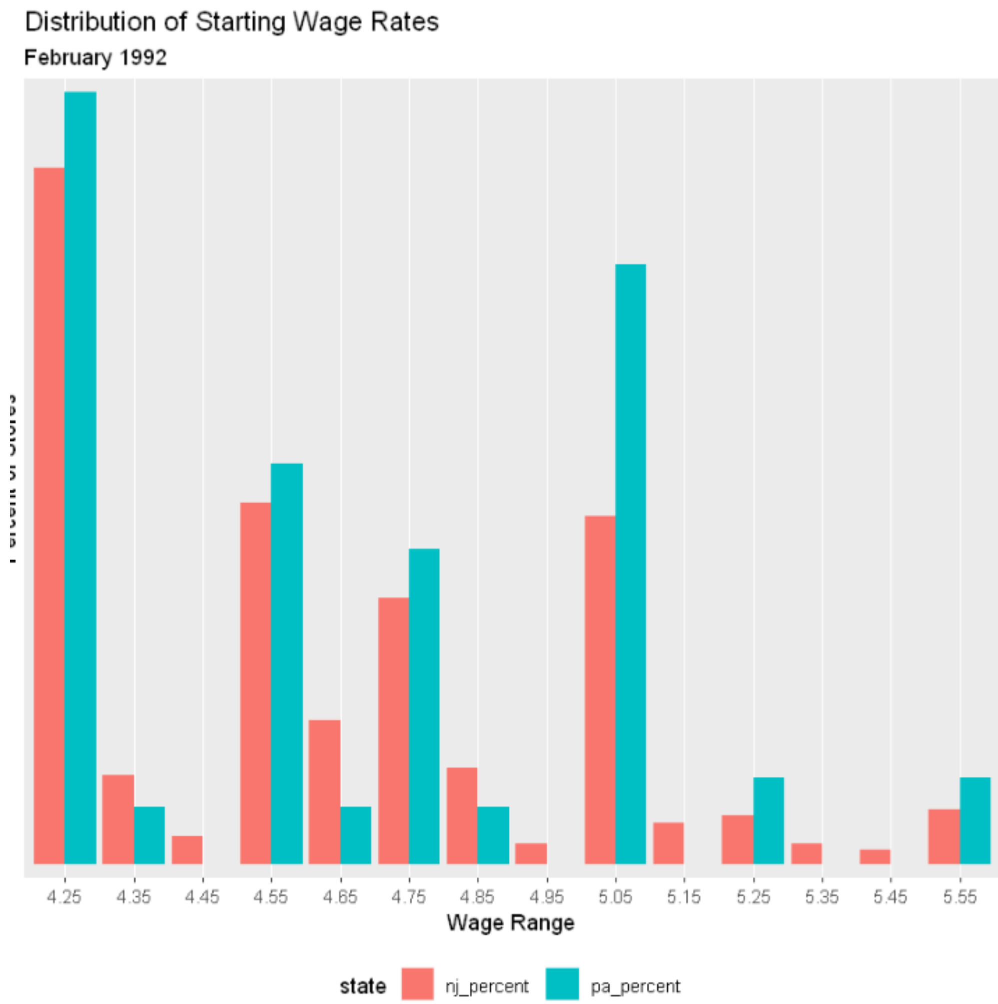
category	0	1	pa_percent	nj_percent
<chr>	<dbl>	<dbl>	<dbl>	<dbl>
4.25	27	102	34.177215	30.8157100
4.35	2	13	2.531646	3.9274924
4.45	NA	4	NA	1.2084592
4.55	14	53	17.721519	16.0120846
4.65	2	21	2.531646	6.3444109
4.75	11	39	13.924051	11.7824773
4.85	2	14	2.531646	4.2296073
4.95	NA	3	NA	0.9063444
5.05	21	51	26.582278	15.4078550
5.15	NA	6	NA	1.8126888
5.25	3	7	3.797468	2.1148036
5.35	NA	3	NA	0.9063444
5.45	NA	2	NA	0.6042296
5.55	3	8	3.797468	2.4169184

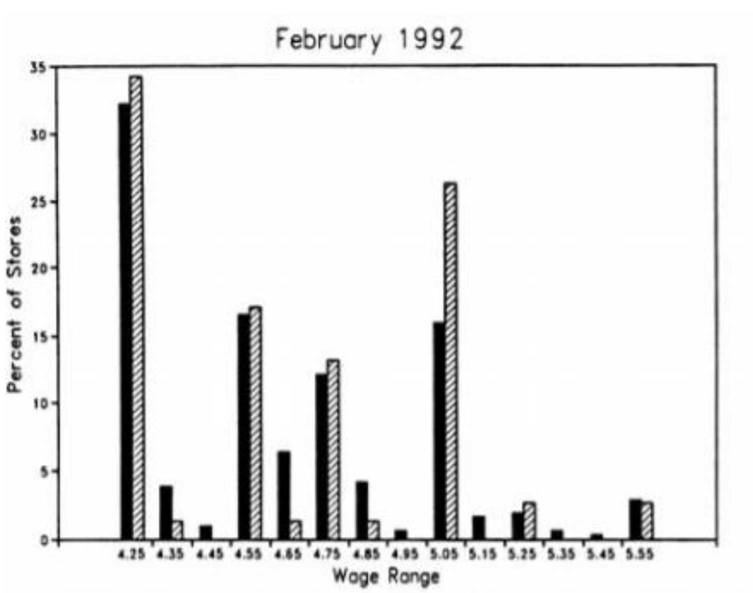
```r
full_n <- full_table %>%
gather("pa_percent", "nj_percent", key = "state", value = "percent")
full_n
```

A tibble: 28 × 5

category	0	1	state	percent
<chr>	<dbl>	<dbl>	<chr>	<dbl>
4.25	27	102	pa_percent	34.1772152
4.35	2	13	pa_percent	2.5316456
4.45	NA	4	pa_percent	NA
4.55	14	53	pa_percent	17.7215190
4.65	2	21	pa_percent	2.5316456
4.75	11	39	pa_percent	13.9240506
4.85	2	14	pa_percent	2.5316456
4.95	NA	3	pa_percent	NA
5.05	21	51	pa_percent	26.5822785
5.15	NA	6	pa_percent	NA
5.25	3	7	pa_percent	3.7974684
5.35	NA	3	pa_percent	NA
5.45	NA	2	pa_percent	NA
5.55	3	8	pa_percent	3.7974684
4.25	27	102	nj_percent	30.8157100
4.35	2	13	nj_percent	3.9274924
4.45	NA	4	nj_percent	1.2084592
4.55	14	53	nj_percent	16.0120846
4.65	2	21	nj_percent	6.3444109
4.75	11	39	nj_percent	11.7824773
4.85	2	14	nj_percent	4.2296073
4.95	NA	3	nj_percent	0.9063444
5.05	21	51	nj_percent	15.4078550
5.15	NA	6	nj_percent	1.8126888
5.25	3	7	nj_percent	2.1148036
5.35	NA	3	nj_percent	0.9063444
5.45	NA	2	nj_percent	0.6042296
5.55	3	8	nj_percent	2.4169184

```
# standard wages before the min wage change in NJ
ggplot(data=full_n, aes(x = category, y = percent, fill = state)) +
geom_bar(stat = "identity", position = position_dodge()) +
ggtitle("Distribution of Starting Wage Rates", subtitle = "February 1992") +
scale_x_discrete("Wage Range") +
scale_y_discrete("Percent of Stores") +
theme(legend.position = "bottom")
```





```
# b) minimum wages inn NJ and PA after passing the law
# after November 1992 in NJ min wage became 5.05
```

```
table3 <- data1 %>%
select(wage_st2, state) %>%
mutate(store = 1) %>%

mutate_all(funs(replace_na(.,0)))  %>%

# maybe just filter what we need?

mutate(category=cut(wage_st2, breaks = seq(4.19, 5.60, by = 0.1),
                    labels=c("4.25",
                             "4.35",
                             "4.45",
                             "4.55",
                             "4.65",
                             "4.75",
                             "4.85",
                             "4.95",
                             "5.05",
                             "5.15",
                             "5.25",
                             "5.35",
                             "5.45",
                             "5.55"))) %>%

group_by(state, category) %>%
summarise(sum = sum(store, is.na = TRUE)) %>%
mutate(category = as.character(category)) %>%
filter(!is.na(category)) %>%
spread( key = "state", value = "sum")
table3
```

category	0	1
<chr>	<dbl>	<dbl>
4.25	21	NA
4.35	6	NA
4.45	3	NA
4.55	12	NA
4.75	15	NA
4.95	4	NA
5.05	15	285
5.15	NA	4
5.25	2	19
5.35	NA	2
5.45	NA	2
5.55	NA	9

```r
# calculate total number of stores
tot2 <- data1 %>% select(wage_st2, state) %>%
mutate(store = 1) %>%
group_by(state) %>%
summarise(sum_tot = sum(store)) %>%
spread( key = "state", value = "sum_tot") %>%
mutate(category = "total_stores") %>%
select(category, everything())
tot2
```

A tibble: 1 × 3

category	0	1
<chr>	<dbl>	<dbl>
total_stores	79	331

```r
# full table -- needs to be reformatted

full_table2 <- table3 %>%
mutate(pa_percent = (`0`/79)*100,
       nj_percent = (`1`/331)*100)

full_table2
```

category	0	1	pa_percent	nj_percent
<chr>	<dbl>	<dbl>	<dbl>	<dbl>
4.25	21	NA	26.582278	NA
4.35	6	NA	7.594937	NA
4.45	3	NA	3.797468	NA
4.55	12	NA	15.189873	NA
4.75	15	NA	18.987342	NA
4.95	4	NA	5.063291	NA
5.05	15	285	18.987342	86.1027190
5.15	NA	4	NA	1.2084592
5.25	2	19	2.531646	5.7401813
5.35	NA	2	NA	0.6042296
5.45	NA	2	NA	0.6042296
5.55	NA	9	NA	2.7190332

:
```
full_n2 <- full_table2 %>%
gather("pa_percent", "nj_percent", key = "state", value = "percent")
full_n2
```

A tibble: 24 × 5

category	0	1	state	percent
<chr>	<dbl>	<dbl>	<chr>	<dbl>
4.25	21	NA	pa_percent	26.5822785
4.35	6	NA	pa_percent	7.5949367
4.45	3	NA	pa_percent	3.7974684
4.55	12	NA	pa_percent	15.1898734
4.75	15	NA	pa_percent	18.9873418
4.95	4	NA	pa_percent	5.0632911
5.05	15	285	pa_percent	18.9873418
5.15	NA	4	pa_percent	NA
5.25	2	19	pa_percent	2.5316456
5.35	NA	2	pa_percent	NA
5.45	NA	2	pa_percent	NA
5.55	NA	9	pa_percent	NA
4.25	21	NA	nj_percent	NA
4.35	6	NA	nj_percent	NA
4.45	3	NA	nj_percent	NA
4.55	12	NA	nj_percent	NA
4.75	15	NA	nj_percent	NA
4.95	4	NA	nj_percent	NA
5.05	15	285	nj_percent	86.1027190
5.15	NA	4	nj_percent	1.2084592
5.25	2	19	nj_percent	5.7401813
5.35	NA	2	nj_percent	0.6042296
5.45	NA	2	nj_percent	0.6042296
5.55	NA	9	nj_percent	2.7190332

```
# standard wages after the min wage change in NJ (November 1992)

ggplot(data=full_n2, aes(x = category, y = percent, fill = state)) +
geom_bar(stat = "identity", position = position_dodge()) +
ggtitle("Distribution of Starting Wage Rates", subtitle = "November 1992") +
scale_x_discrete("Wage Range") +
scale_y_discrete("Percent of Stores") +
theme(legend.position = "bottom")
```

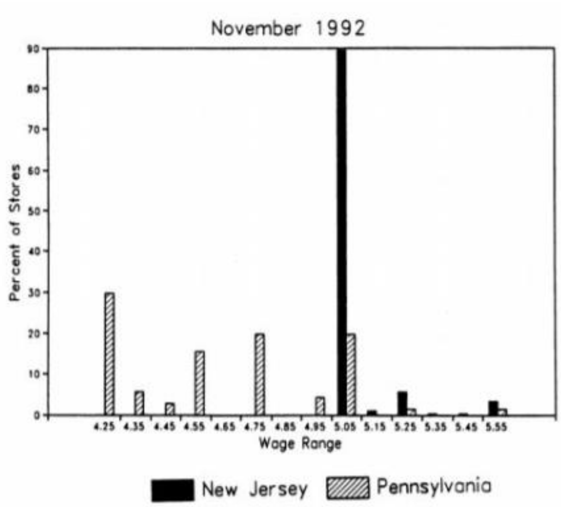


FIGURE 1. DISTRIBUTION OF STARTING WAGE RATES

4. AVERAGE EMPLOYMENT PER STORE BEFORE AND AFTER THE RISE IN NJ AND MINIMUM WAGE

TABLE 3—AVERAGE EMPLOYMENT PER STORE BEFORE AND AFTER THE RISE IN NEW JERSEY MINIMUM WAGE

	Stores by state			Stores in New Jersey[a]			Differences within NJ[b]	
Variable	PA (i)	NJ (ii)	Difference, NJ – PA (iii)	Wage = $4.25 (iv)	Wage = $4.26–$4.99 (v)	Wage ≥ $5.00 (vi)	Low–high (vii)	Midrange–high (viii)
1. FTE employment before, all available observations	23.33 (1.35)	20.44 (0.51)	–2.89 (1.44)	19.56 (0.77)	20.08 (0.84)	22.25 (1.14)	–2.69 (1.37)	–2.17 (1.41)
2. FTE employment after, all available observations	21.17 (0.94)	21.03 (0.52)	–0.14 (1.07)	20.88 (1.01)	20.96 (0.76)	20.21 (1.03)	0.67 (1.44)	0.75 (1.27)
3. Change in mean FTE employment	–2.16 (1.25)	0.59 (0.54)	2.76 (1.36)	1.32 (0.95)	0.87 (0.84)	–2.04 (1.14)	3.36 (1.48)	2.91 (1.41)
4. Change in mean FTE employment, balanced sample of stores[c]	–2.28 (1.25)	0.47 (0.48)	2.75 (1.34)	1.21 (0.82)	0.71 (0.69)	–2.16 (1.01)	3.36 (1.30)	2.87 (1.22)
5. Change in mean FTE employment, setting FTE at temporarily closed stores to 0[d]	–2.28 (1.25)	0.23 (0.49)	2.51 (1.35)	0.90 (0.87)	0.49 (0.69)	–2.39 (1.02)	3.29 (1.34)	2.88 (1.23)

Notes: Standard errors are shown in parentheses. The sample consists of all stores with available data on employment. FTE (full-time-equivalent) employment counts each part-time worker as half a full-time worker. Employment at six closed stores is set to zero. Employment at four temporarily closed stores is treated as missing.

[a]Stores in New Jersey were classified by whether starting wage in wave 1 equals $4.25 per hour ($N = 101$), is between $4.26 and $4.99 per hour ($N = 140$), or is $5.00 per hour or higher ($N = 73$).

[b]Difference in employment between low-wage ($4.25 per hour) and high-wage (≥ $5.00 per hour) stores; and difference in employment between midrange ($4.26–$4.99 per hour) and high-wage stores.

[c]Subset of stores with available employment data in wave 1 and wave 2.

[d]In this row only, wave-2 employment at four temporarily closed stores is set to 0. Employment changes are based on the subset of stores with available employment data in wave 1 and wave 2.

```
# 1st row: MEANs and SEs across subgroups
  results <- data1 %>% group_by(state) %>% # group_by the treatment variable
            dplyr::select(state, fte_before) %>%
            group_by(N = n(), add = TRUE) %>%
            summarize_all(funs(mean, var, na_sum = sum(is.na(.))), na.rm = TRUE) %>%
            mutate(n = N - na_sum) %>%
            mutate(se = sqrt(var/n))
```

```
results
```

A grouped_df: 2 × 7

state	N	mean	var	na_sum	n	se
<chr>	<int>	<dbl>	<dbl>	<int>	<int>	<dbl>
0	79	23.33117	140.57145	2	77	1.3511489
1	331	20.43941	82.92359	10	321	0.5082607

A. Stores by state

```r
tot_sample <- data1 %>% group_by(state) %>%
  summarise(mean_before = mean(fte_before, na.rm=TRUE),
            mean_after = mean(fte_after, na.rm=TRUE),

            var_before = var(fte_before, na.rm=TRUE),
            var_after = var(fte_after, na.rm=TRUE),
            n_before = sum(!is.na(fte_before)),
            n_after = sum(!is.na(fte_after))) %>%
                mutate(se_mean_before = sqrt(var_before/n_before)) %>%
                mutate(se_mean_after = sqrt(var_after/n_after)) %>%

mutate(state = dplyr::recode(state, '0' = "PA", '1' = "NJ"),
      change_mean_fte = mean_after - mean_before) %>%

select(state,
      mean_before,
      mean_after,
      change_mean_fte,
      se_mean_before,
      se_mean_after)
```

```r
tot_sample
```

A tibble: 2 × 6

state	mean_before	mean_after	change_mean_fte	se_mean_before	se_mean_after
<chr>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
PA	23.33117	21.16558	-2.1655844	1.3511489	0.9432212
NJ	20.43941	21.02743	0.5880214	0.5082607	0.5203094

```r
# line 4 with note c: Subset of stores with available employment data in wave 1 and wave 2
balanced_sample <- data1 %>%
filter(complete.cases(fte_before, fte_after)) %>%
group_by(state) %>%
summarise(mean_before_balanced = mean(fte_before), # subset of stores that has data in wave1 and wave2
          mean_after_balanced = mean(fte_after))  %>%

mutate(change_mean_fte_balanced = mean_after_balanced - mean_before_balanced,
      state = dplyr::recode(state, '0' = "PA", '1' = "NJ")) %>%
select(state, change_mean_fte_balanced)


balanced_sample
```

A tibble: 2 × 2

state	change_mean_fte_balanced
<chr>	<dbl>
PA	-2.2833333
NJ	0.4666667

```r
full_table <- left_join(tot_sample, balanced_sample, by = c("state" = "state")) %>%
select(state,
      mean_before,
      mean_after,
      se_mean_before,
      se_mean_after,
      change_mean_fte,
      change_mean_fte_balanced)
full_table
```

A data.frame: 2 × 7

state	mean_before	mean_after	se_mean_before	se_mean_after	change_mean_fte	change_mean_fte_balanced
<chr>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
PA	23.33117	21.16558	1.3511489	0.9432212	-2.1655844	-2.2833333
NJ	20.43941	21.02743	0.5082607	0.5203094	0.5880214	0.4666667

```r
transposed <- as.data.frame(t(as.matrix(full_table))) %>%
rename("PA" = "V1", "NJ" = "V2") %>%
mutate(variable = c("state",
                    "mean_before",
                    "mean_after",
                    "se_mean_before",
                    "se_mean_after",
                    "change_mean_fte",
                    "change_mean_fte_balanced")) %>%
filter(variable != "state") %>%

select(variable, everything()) %>%
mutate(PA = as.numeric(as.character(PA)),
       NJ = as.numeric(as.character(NJ)),
       Diff_NJ_NA = NJ - PA)

transposed
```

A data.frame: 6 × 4

variable	PA	NJ	Diff_NJ_NA
<chr>	<dbl>	<dbl>	<dbl>
mean_before	23.3311700	20.4394100	-2.8917600
mean_after	21.1655800	21.0274300	-0.1381500
se_mean_before	1.3511489	0.5082607	-0.8428882
se_mean_after	0.9432212	0.5203094	-0.4229118
change_mean_fte	-2.1655844	0.5880214	2.7536058
change_mean_fte_balanced	-2.2833333	0.4666667	2.7500000

The relative gain (the difference in difference of the changes in employment) is 2.76 FTE employees.

5. REGRESSION - ADJUSTED MODELS

change in employment = set of characteristics of stores i + NJ dummy (=1)

```
data2 <- dataset %>%
select(co_owned,
       empft,
       chain,
       emppt,
       nmgrs,
       empft2,
       emppt2,
       nmgrs2,
       state,
       chain,
       status2,
       wage_st,
       wage_st2) %>%
mutate(state = as.character(as.numeric(state))) %>%

mutate(fte_before = empft + nmgrs + emppt*0.5,
       fte_after = empft2 + nmgrs2 + emppt2*0.5,

       contr_bk = case_when(chain == "1" ~ 1, chain != "1" ~ 0),
       contr_kfc = case_when(chain == "2" ~ 1, chain != "2" ~ 0),
       contr_roys = case_when(chain == "3" ~ 1, chain != "3" ~ 0),
       contr_wend = case_when(chain == "4" ~ 1, chain != "4" ~ 0)) %>%

filter(complete.cases(fte_before, fte_after)) %>%
filter(complete.cases(wage_st, wage_st2) | status2 == 3)
# filter to keep stores with available data on employment and starting wages
# including permanently closed stores
```

CHAIN 1=bk; 2=kfc; 3=roys; 4=wendys'

STATUS2 'Second Interview Status'

'0 = refused second interview (count = 1)'

'1 = answered 2nd interview (count = 399)'

'2 = closed for renovations (count = 2)'

'3 = closed "permanently" (count = 6)'

'4 = closed for highway construction (count = 1)'

'5 = closed due to Mall fire (count = 1)'

```
fit <- lm((fte_after - fte_before) ~
          state + contr_bk + contr_kfc + contr_roys + co_owned, data = data2)
```

```
summary(fit)
```

```
Call:
lm(formula = (fte_after - fte_before) ~ state + contr_bk + contr_kfc +
    contr_roys + co_owned, data = data2)

Residuals:
    Min      1Q  Median      3Q     Max
-39.803  -3.903   0.606   4.106  27.393

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   -2.209      1.613  -1.369   0.1717
state1         2.304      1.196   1.927   0.0548 .
contr_bk       0.512      1.498   0.342   0.7328
contr_kfc      1.004      1.686   0.595   0.5519
contr_roys    -1.705      1.682  -1.014   0.3114
co_owned       0.308      1.094   0.282   0.7785
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 8.785 on 351 degrees of freedom
Multiple R-squared:  0.02315,	Adjusted R-squared:  0.009231
F-statistic: 1.663 on 5 and 351 DF,  p-value: 0.1427
```

TABLE 4—REDUCED-FORM MODELS FOR CHANGE IN EMPLOYMENT

	Model				
Independent variable	(i)	(ii)	(iii)	(iv)	(v)
1. New Jersey dummy	2.33 (1.19)	2.30 (1.20)	—	—	—
2. Initial wage gap[a]	—	—	15.65 (6.08)	14.92 (6.21)	11.91 (7.39)
3. Controls for chain and ownership[b]	no	yes	no	yes	yes
4. Controls for region[c]	no	no	no	no	yes
5. Standard error of regression	8.79	8.78	8.76	8.76	8.75
6. Probability value for controls[d]	—	0.34	—	0.44	0.40

Notes: Standard errors are given in parentheses. The sample consists of 357 stores with available data on employment and starting wages in waves 1 and 2. The dependent variable in all models is change in FTE employment. The mean and standard deviation of the dependent variable are −0.237 and 8.825, respectively. All models include an unrestricted constant (not reported).

[a]Proportional increase in starting wage necessary to raise starting wage to new minimum rate. For stores in Pennsylvania the wage gap is 0.

[b]Three dummy variables for chain type and whether or not the store is company-owned are included.

[c]Dummy variables for two regions of New Jersey and two regions of eastern Pennsylvania are included.

[d]Probability value of joint F test for exclusion of all control variables.