Chapter 5 of MHE: Fixed Effects, Diff-in-Diff and Panel Data

05 April, 2018

(MHE) Section 5.2.1 - Regression Differnce in Difference

We want to reproduce Figure 5.2.4 from MHE. This figure was originally produced by Autor (2003) (Figure 3 in the original) to show the estimated impact of a law (implied-contract exceptions to the employment-at-will doctrine) over an outcome (the use of temporary workers).

Download and load the data

First download the data from the author's website (will migrate to external data repo in the future!), and load it in to R.

```
# Download the data and unzip it
download.file('http://economics.mit.edu/~dautor/outsourcingatwill_table7.zip',
              'outsourcingatwill_table7.zip')
unzip('outsourcingatwill_table7.zip')
```

```
# Load the data
autor <- read.dta('table7/autor-jole-2003.dta')
```

The data downloaded data set contains 24 years (from 74 to 97) and 50 states, for a total of 1200 observations.

"Clean" the data

Restrict sample to years between 1979 and 1995 (inclusive), and deleting Guam from the sample (state = 98).

```
# Restrict sample
autor <- autor[which(autor$year >= 79 & autor$year <= 95), ]
autor <- autor[which(autor$state != 98), ]
```

The clean data now contains 17 years (from 79 to 95) and 50 states, for a total of 850 observations.

"Build" analytic file

In addition to the variables already defined in the data, we need to construct the following variables:
- Log of total employment
- Normalize the year variable to 1978

```
# Log total employment: from BLS employment & earnings
autor$lnemp <- log(autor$annemp)

# Normalize year to 1978
autor$t  <- autor$year - 78
```

```
# Create state and year factors (required format for fe reg package)
autor$state <- factor(autor$state)
autor$year  <- factor(autor$year)
```

Define model to estimate

We want to estimate a fixed effect model with lead and lag treatment variables:

$$y_{st} = \gamma_{0s} + \gamma_{1s}t + \lambda_t + \sum_{\tau=0}^{m} \delta_{-\tau} D_{s,t-\tau} + \sum_{\tau=1}^{q} \delta_{+\tau} D_{s,t+\tau} + X'_{st}\beta + \varepsilon_{st} \tag{1}$$

Where:
- y_{st} is the (log) number of jobs under the catergory of Temporary Help Services for each state.
- γ_{0s} are the state fixed effect, λ_t are the time fixed effec, and $\gamma_{1s}t$ are state specific time trends.
- X'_{st} contains: log state nonfarm employment, and leads and lags of adoption of the public policy and good faith exceptions.
- Treatment variables in contemporary ($\delta D_{s,t}$) leads $\delta_{+\tau} D_{s,t+\tau}$ and lags $\delta_{+\tau} D_{s,t+\tau}$

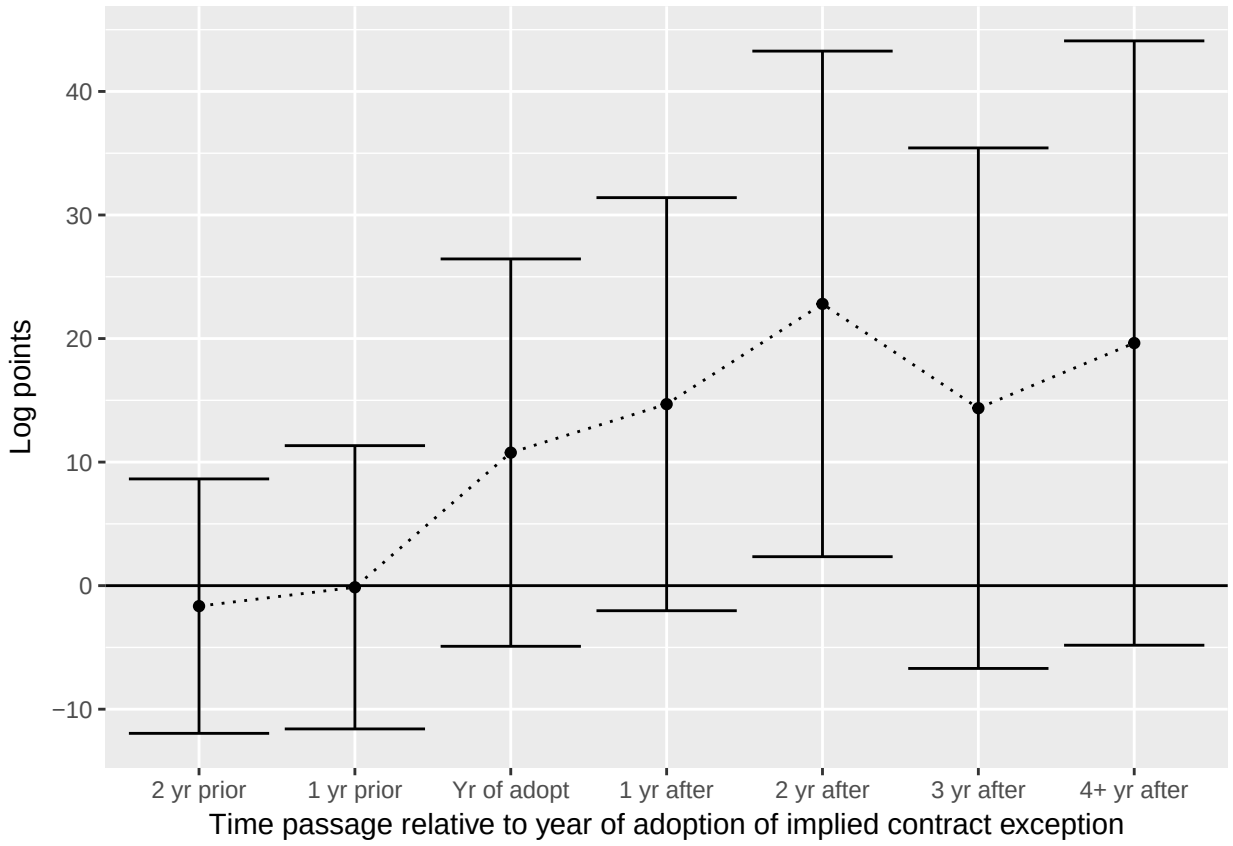
The estimation of this model is presented in column 2 of table 7 of the original paper.

```
# Diff-in-diff regression
did <- felm(lnths ~ lnemp   + admico_2 + admico_1 + admico0  + admico1  + admico2 +
                    admico3 + mico4    + admppa_2 + admppa_1 + admppa0  + admppa1 +
                    admppa2 + admppa3  + mppa4    + admgfa_2 + admgfa_1 + admgfa0 +
                    admgfa1 + admgfa2  + admgfa3  + mgfa4
                    | state + year + state:t | 0 | state, data = autor)
```

Vizualize the results

And this estimates are then used to create figure 3 of the original paper, which is figure 5.2.4 in MHE.

```
# Plot results
lags_leads  <- c("admico_2", "admico_1", "admico0",
                 "admico1" , "admico2" , "admico3",
                 "mico4")
labels      <- c("2 yr prior", "1 yr prior", "Yr of adopt",
                 "1 yr after", "2 yr after", "3 yr after",
                 "4+ yr after")
results.did <- data.frame(label = factor(labels, levels = labels),
                          coef  = summary(did)$coef[lags_leads, "Estimate"] * 100,
                          se    = summary(did)$coef[lags_leads, "Cluster s.e."] * 100)
g           <- ggplot(results.did, aes(label, coef, group = 1))
p           <- g + geom_point()                                  +
                   geom_line(linetype = "dotted")                +
                   geom_errorbar(aes(ymax = coef + 1.96 * se,
                                     ymin = coef - 1.96 * se)) +
                   geom_hline(yintercept = 0)                    +
                   ylab("Log points")                            +
                   xlab(paste("Time passage relative to year of",
                              "adoption of implied contract exception"))
print(p)
```




```
ggsave(p, file = "Figure 5-2-4-R.png", height = 6, width = 8, dpi = 300)

# End of script
```