

# ARE 213 Problem Set 2B

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## Question 1

We first estimate an event study specification.

- (a) First determine the minimum and maximum event time values that you can estimate in this data set. Code up a separate event time indicator for each possible value of event time in the data set. Estimate an event study regression using all the event time indicators. What happens?

## Question 2

We now apply the synthetic control methods from Abadie et al (2010).

- (a)
  - i. Compare the average pre-period log traffic fatalities per capita of the TU site to that of the average of all the “control” states. Next, graph the pre-period log traffic fatalities by year for the pre-period for both the TU and the average of the control group. Interpret.

```
#Note the following state codes and corresponding state IDs:
View(traffic[state_name == "CT" | state_name == "IA" | state_name == "NM" | state_name == "TX", .(state, stat

#Create a treatment status variable that = 1 if state is CT, IA, NM, or TX and =0 otherwise.
traffic[,treat := ifelse(state_name == "CT" | state_name == "IA"|state_name == "NM" | state_name == "TX", 1,

#Change treatment variable to a factor variable
traffic$treat <- as.factor(traffic$treat)

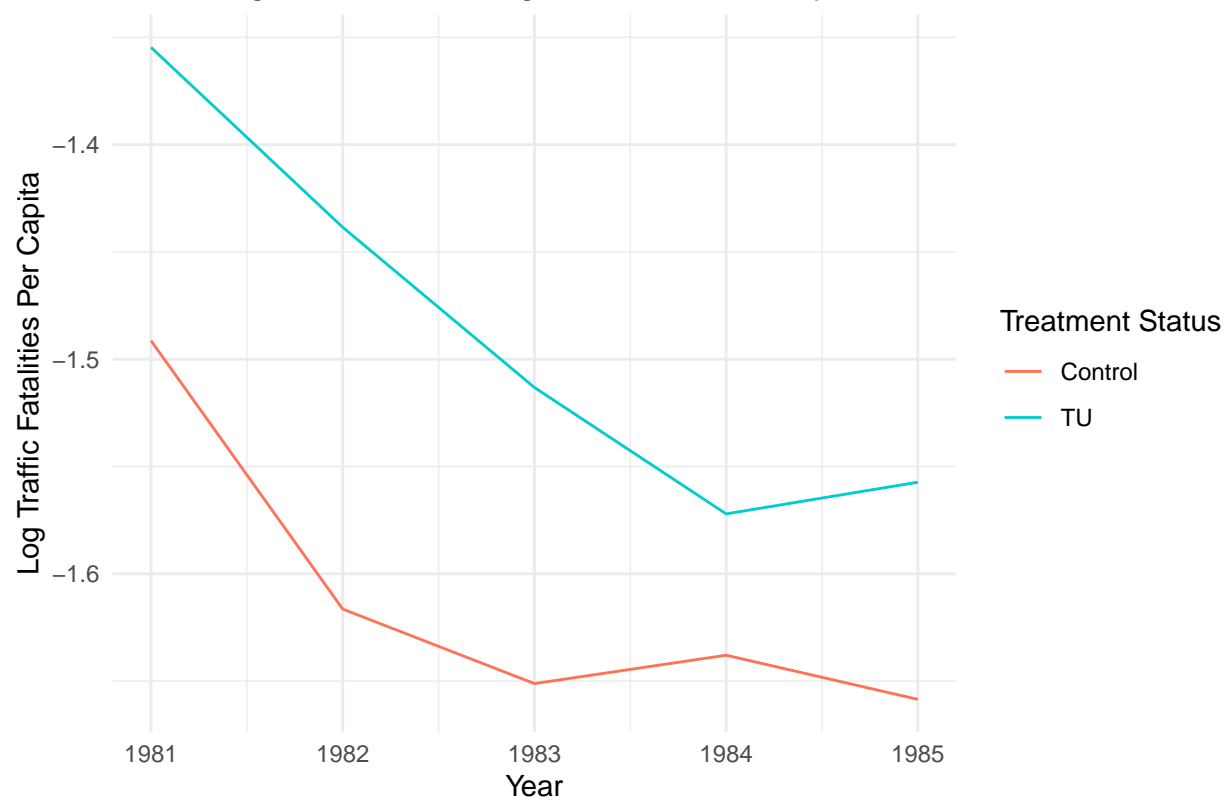
#Create log(fatalities) variable
traffic[, ln_fat_pc := log((fatalities/population))]

#Compare the average pre-period log traffic fatalities per capita between treatment and control
premeanT <- mean(traffic[treat == 1 & year<1986, ln_fat_pc]) #mean pre-period log traffic fatalities in treat
premeanC <- mean(traffic[treat == 0 & year<1986, ln_fat_pc]) #mean pre-period log traffic fatalities in contr

#Create variable of mean log traffic fatalities by treatment status by year
traffic[, mean_lnfat_treat := lapply(.SD, mean), .SDcols = c("ln_fat_pc"), by = c("treat","year")]

#Graph the mean pre-period log traffic fatalities by year for Treatment vs Control
traffic[year < 1986,] %>%
  ggplot(aes(x=year, y = mean_lnfat_treat, group = treat, color = treat)) +
  geom_line() +
  theme_minimal() +
  labs(title = "Average Pre-Period Log Traffic Fatalities by Year", x = "Year", y = "Log Traffic Fatalities P
  theme(plot.title = element_text(hjust = 0.5)) +
  scale_color_manual(labels = c("Control", "TU"), values = c("coral1", "cyan3"))
```

Average Pre-Period Log Traffic Fatalities by Year



The average pre-period log traffic fatalities per capita in our aggregate treatment unit is -1.49 compared with -1.61 in our control states. Graphically, we can see that while log traffic fatalities per capita are declining over time in both groups, treatment units have on average higher traffic fatalities per capita than control units in all pre-period years. This makes sense as states with higher traffic fatalities are more likely to choose to implement seatbelt laws to try to decrease traffic fatalities.