Appendix: Bowing down to TWFE

Appendix B: Robustness Under TWFE

In this section, I analyze a model that differs from the main specifications shown in Table **??**. In particular, specification (2) uses a two-way fixed-effects (TWFE) design where the group fixed effects are university fixed effects and the time fixed effects are the academic year. While this model is intuitive, recent literature has shown that the OLS estimator $\hat{\beta}$ may not be producing the average treatment effect on the treated when treatment effects are heterogeneous between groups and over time [@de_chaisemartin_two-way_2020; @sun_estimating_2021; @goodman-bacon_difference--differences_2021; @athey_design-based_2022]. In particular, @de_chaisemartin_two-way_2020 show that the parameter $\hat{\beta}$ on an indicator variable for treatment in a TWFE design is a weighted sum of the average treatment effects on the treated where some of the weights may be negative. While there are a variety of new methods that can mitigate these issues, none of them can accommodate the model used in this paper where universities go in and out of treatment (non-staggered design) and universities are treated multiple times. To circumvent this issue, I estimate a model that contains no negative weights. These weights are calculated using the TwoWayFEWeights package which allows for models in which units go in and out of treatment. The estimated model is the following TWFE specification:

$$Y_{ut} = \beta Moratorium_{ut} + \gamma_u + \alpha_t + \epsilon_{ut}$$

where Y_{ut} is the outcome for university u at time t measured by per-25000 enrolled students per academic-calendar day, $Moratorium_{ut}$ is an indicator equal to one if university u is in a moratorium at time t, γ_u are university fixed effects, α_t are day by month by year fixed effects, and ϵ_{ut} is the error term. Hence, this model compares academic calendar days within a moratorium to the same calendar days without a moratorium while controlling for systematic differences between universities. As mentioned above, there are no negative weights in this specification, and therefore sign reversal is impossible. With this advantage, I re-estimate the results in Table **??**.

Table **??**

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
```

```
## v ggplot2 3.3.5      v purrr   0.3.4
## v tibble  3.1.6      v dplyr   1.0.7
## v tidyr   1.1.4      v stringr 1.4.0
## v readr   2.1.1      v forcats 0.5.1
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(modelsummary)
library(fixest)
library(kableExtra)
```

```
##
## Attaching package: 'kableExtra'

## The following object is masked from 'package:dplyr':
##
##     group_rows
```

```
if (!exists("daily_crime")){
  daily_crime <- read_csv(paste0(here::here("created_data/xmaster_data/daily_panel.csv")))
}
```

```
## Rows: 56894 Columns: 136

## -- Column specification ---------------------------------------------------
## Delimiter: ","
## chr    (9): university, day_of_week, reason1, reason2, reason3, control_of_i...
## dbl  (120): lead_2, lead_1, treatment, lag_1, lag_2, semester_number, sexual...
## dttm   (6): closure_1, closure_1_end, closure_2, closure_2_end, closure_3, c...
## date   (1): date

##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

```
if (!exists("daily_crime_weekends")){
  daily_crime_weekends <- read_csv(paste0(here::here("created_data/xmaster_data/daily_panel_weekends.csv
}
```

```
## Rows: 24408 Columns: 136

## -- Column specification ---------------------------------------------------
## Delimiter: ","
## chr    (9): university, day_of_week, reason1, reason2, reason3, control_of_i...
## dbl  (120): lead_2, lead_1, treatment, lag_1, lag_2, semester_number, sexual...
## dttm   (6): closure_1, closure_1_end, closure_2, closure_2_end, closure_3, c...
## date   (1): date

##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

```
if (!exists("daily_crime_weekdays")){
  daily_crime_weekdays <- read_csv(paste0(here::here("created_data/xmaster_data/daily_panel_weekdays.csv
}
```

```
## Rows: 32486 Columns: 136
```

```
## -- Column specification ------------------------------------------------
## Delimiter: ","
## chr    (9): university, day_of_week, reason1, reason2, reason3, control_of_i...
## dbl  (120): lead_2, lead_1, treatment, lag_1, lag_2, semester_number, sexual...
## dttm   (6): closure_1, closure_1_end, closure_2, closure_2_end, closure_3, c...
## date   (1): date


##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```r
explanatory_vars <- c("treatment")


# table 2: weekends vs. full sample ---------------------------------------

fixed_effects_preferred <- c("university", "date")
# fixed_effects_preferred_l <-  c("day_of_week", "university_by_academic_year_by_semester", "holiday")
data_subsets <- list(daily_crime, daily_crime_weekends, daily_crime_weekdays)

alc_weeksplit <- map(data_subsets, ~ifc::reghdfe(., c("alcohol_offense_per25"),explanatory_vars, fixed_
)
```

```
## NOTE: 380 observations removed because of NA values (LHS: 380).

## NOTE: 164 observations removed because of NA values (LHS: 164).

## NOTE: 216 observations removed because of NA values (LHS: 216).
```

```r
drug_weeksplit <- map(data_subsets, ~ifc::reghdfe(., c("drug_offense_per25"),explanatory_vars, fixed_ef
)
```

```
## NOTE: 380 observations removed because of NA values (LHS: 380).

## NOTE: 164 observations removed because of NA values (LHS: 164).

## NOTE: 216 observations removed because of NA values (LHS: 216).
```

```r
sex_weeksplit <- map(data_subsets, ~ifc::reghdfe(., c("sexual_assault_per25"),explanatory_vars, fixed_e
)
```

```
## NOTE: 380 observations removed because of NA values (LHS: 380).

## NOTE: 164 observations removed because of NA values (LHS: 164).

## NOTE: 216 observations removed because of NA values (LHS: 216).
```

```
twfe_table <- ifc::main_table(alc_weeksplit, drug_weeksplit, last_panel = sex_weeksplit) %>%
  add_row(term = "Mean of Dependent Variable",
          `Model 1` = sprintf("%.3f ",mean(daily_crime$alcohol_offense_per25, na.rm = T)),
          `Model 2` = sprintf("%.3f",mean(daily_crime_weekends$alcohol_offense_per25, na.rm = T)),
          `Model 3` = sprintf("%.3f",mean(daily_crime_weekdays$alcohol_offense_per25, na.rm = T)),
          .before = 4) %>%
  add_row(term = "Mean of Dependent Variable",
          `Model 1` = sprintf("%.3f",mean(daily_crime$drug_offense_per25, na.rm = T)),
          `Model 2` = sprintf("%.3f",mean(daily_crime_weekends$drug_offense_per25, na.rm = T)),
          `Model 3` = sprintf("%.3f",mean(daily_crime_weekdays$drug_offense_per25, na.rm = T)),
          .before = 8) %>%
  add_row(term = "Mean of Dependent Variable",
          `Model 1` = sprintf("%.3f",mean(daily_crime$sexual_assault_per25, na.rm = T)),
          `Model 2` = sprintf("%.3f",mean(daily_crime_weekends$sexual_assault_per25, na.rm = T)),
          `Model 3` = sprintf("%.3f",mean(daily_crime_weekdays$sexual_assault_per25, na.rm = T)),
          .before = 12) %>%
  kbl(booktabs = T, col.names = c(" ", "All Days", "Weekends", "Weekdays"),
      caption = "\\label{twfe_table}Effect of Moratoriums on Alcohol Offenses, Drug Offenses, and Sexua
  pack_rows("Panel A: Alcohol Offenses", 1, 4, bold = T, italic = F) %>%
  pack_rows("Panel B: Drug Offenses", 5, 8, bold = T, italic = F) %>%
  pack_rows("Panel C: Sexual Assaults", 9, 12, bold = T, italic = F) %>%
  pack_rows("Controls for Panels A-C:", 13, 14, bold = T, italic = F) %>%
  add_header_above(c(" " = 1, "Days of the Week" = 3)) %>%
  footnote(list("Standard errors are clustered by university and each offense is defined as per-25000 e
                "+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001"),
           threeparttable = T)
```

```
## Warning: In version 0.8.0 of the 'modelsummary' package, the default significance markers produced by
## This warning is displayed once per session.
```

Table 1: Effect of Moratoriums on Alcohol Offenses, Drug Offenses, and Sexual Assault by Weekend/Weekdays (No Negative Weights-OLS).

	Days of the Week		
	All Days	Weekends	Weekdays
Panel A: Alcohol Offenses			
In Moratorium	-0.106*	-0.234*	-0.012
	(0.045)	(0.095)	(0.017)
Observations	56514	24244	32270
Mean of Dependent Variable	0.497	0.892	0.201
Panel B: Drug Offenses			
In Moratorium	-0.063+	-0.088*	-0.045
	(0.033)	(0.037)	(0.034)
Observations	56514	24244	32270
Mean of Dependent Variable	0.432	0.495	0.385
Panel C: Sexual Assaults			
In Moratorium	-0.005	-0.006	-0.005
	(0.004)	(0.006)	(0.007)
Observations	56514	24244	32270
Mean of Dependent Variable	0.055	0.064	0.047
Controls for Panels A-C:			
FE: University	X	X	X
FE: Day by Month by Year	X	X	X

Note:
Standard errors are clustered by university and each offense is defined as per-25000 enrolled students. The column 'All Days' represents specification (3) from the main results table. Weekends consist of Fridays, Saturdays, and Sundays. Weekdays consist of Monday through Thursday. A moratorium is a temporary halt on fraternity-related activities with alcohol. The specification used in this table has no negative weights and thus, sign reversal is impossible.
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$