```
################################################
################Replication Files#################
###########Criminal Violence in Mexico############
##### Jane Esberg#################################

#run on macOS Sonoma 14.6.1
#Rstudio version 2023.09.0+463
#R version 4.3.1 Beagle Scouts

########################################
#########LOADING PACKAGES, FUNCTIONS###
########################################

#install.packages('pacman')
#library(pacman)
#remotes::install_github("shuo-zhang-ucsb/did_multiplegt") # Install (only nee

pacman::p_load(lmtest, plm, ggplot2, tidyr, broom, stargazer,
               fixest, this.path, bacondecomp, did, stringr,
               stringi, plyr, dplyr, DIDmultiplegt, gridExtra,
               extrafont, sf, RColorBrewer)

#sets working directory to current folder
setwd(dirname(this.path()))

#function to get models in one line.
#inputs: dependent variables, independent variables, data, any covariates,
#what to call covariates in the model (covariate_names)
#outputs: list of models
returnModels<-function(dvs, ivs, data, covariates=NULL, covariate_names=NULL){
  model_list=list() #empty list of models
  model_names=list() #empty list of model names

  for (i in 1:length(dvs)){
    for (j in 1:length(ivs)){
      dv<-dvs[i]
      iv<-ivs[j]
      formula<-as.formula(paste(dv, "~",iv, covariates, '|muni_id+year'))

      model <- feols(formula,cluster = ~ muni_id,
                     data = data)

      model_list<-append(model_list, list(model))
    }
  }

  return(model_list)
}
```

```
#code for event study plots - extracts data on years
#inputs: list of models, dependent variables list, comparison year,
#term that distinguishes the interaction terms of interest
#outputs: data formatted for event study plot

event_study_data<-function(models, dvs, base_year, searchvar){
  year_df<-data.frame(tidy(models[[1]], conf.int=T))
  year_df<-subset(year_df, str_detect(year_df$term, searchvar)==TRUE)
  year_df$year<-str_replace(year_df$term, searchvar, "")
  new_row<-data.frame(cbind(as.character(base_year), 0, 0, 0, 0, 0,0, base_yea
  colnames(new_row)<-colnames(year_df)
  year_df<-rbind(year_df, new_row)
  year_df$estimate<-as.numeric(as.character(year_df$estimate))
  year_df$conf.low<-as.numeric(as.character(year_df$conf.low))
  year_df$conf.high<-as.numeric(as.character(year_df$conf.high))
  year_df$dv<-dvs[1]


  if (length(models)==1){
    year_df$year<-as.numeric(as.character(year_df$year))
    year_df<-subset(year_df, is.na(year)==F)
    return(year_df)
  }
  else{
  for (i in 2:length(models)){
    year_df_new<-data.frame(broom::tidy(models[[i]], conf.int=T))
    year_df_new<-subset(year_df_new, str_detect(year_df_new$term, searchvar)==
    year_df_new$year<-str_replace(year_df_new$term, searchvar, "")
    new_row<-data.frame(cbind(as.character(base_year), 0, 0, 0, 0, 0,0, base_y
    colnames(new_row)<-colnames(year_df_new)
    year_df_new<-rbind(year_df_new, new_row)
    year_df_new$estimate<-as.numeric(as.character(year_df_new$estimate))
    year_df_new$conf.low<-as.numeric(as.character(year_df_new$conf.low))
    year_df_new$conf.high<-as.numeric(as.character(year_df_new$conf.high))
    year_df_new$dv<-dvs[i]

    year_df<-rbind(year_df, year_df_new)

  }
  year_df$year<-as.numeric(as.character(year_df$year))
  year_df<-subset(year_df, is.na(year)==F)

  return(year_df)
  }
}

#setting look and style for event study plots
es_base_plot<-ggplot()+  theme(plot.title = element_text(hjust = 0.5))+
  theme_bw()+
```

```
  theme(plot.title = element_text(hjust = 0.5, size=16),
        text = element_text(size=18),
        legend.position='none')+
  theme(panel.grid.major = element_blank(), panel.grid.minor = element_blank()
        panel.background = element_blank(), axis.line = element_line(colour =
  scale_linetype_discrete(name='', guide=guide_legend())+
  geom_hline(yintercept=0, linetype='dashed')

#set style and variable names for etable
setFixest_etable(style.tex = style.tex("aer"),
                 notes={'\\scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, +
                 fitstat = ~ r2 + n + my,
                 digits=2,
                 digits.stats=2,
                 dict=c('muni_id'='municipality',
                        'dominant'='Major',
                        'small_groups'='Minor',
                        'kingpin_tr'='Kingpin Removal',
                        'gasxprice'='Gas Pipeline x Price',
                        'log(mariguana_kghec+1)'='Marijuana Hectares',
                        'log(amapola_kghec+1)'='Poppy Hectares',
                        'pan'='PAN party mayor',
                        'kingpin_tr_on'='Kingpin Removal (On)',
                        'kingpin_tr_ypre'='Kingpin Removal (presence=t-1)',
                        'kingpin_tr_yof'='Kingpin Removal (presence=t)',
                        'gasbinxprice'='Pipeline Presence x Price',
                        'gas_post17'='Gas Pipeline x Post-2017',
                        'distxprice'='Distance (log) x Price',
                        'gasxprice2020'='Gas Pipeline (2020) x Price',
                        'log(POBTOT+1)'='Log Population',
                        'illiteracy'='% Illiterate',
                        'piso_de_tierra'='% Earth Floor',
                        'indigenous_pop'='% Indigenous'))

########################################
#######LOADING/MERGING DATA ############
########################################
mx_panel<-read.csv('mx_panel.csv') #general panel data
crim<-read.csv('criminal_groups.csv') #crime groups data
vars<-c('inegi', 'year', setdiff(colnames(crim), colnames(mx_panel)))

mx_panel<-merge(mx_panel, crim[vars], by=c('year', 'inegi'), all.x=T)

#grouping small orgs
mx_panel$small_groups<-mx_panel$unaffiliated+mx_panel$splinters+mx_panel$cells

#no emergence or expansion in first year of data
mx_panel <- mx_panel %>%
  mutate(across(c(splinters_emergence, cells_emergence, unaffiliated_emergence
```

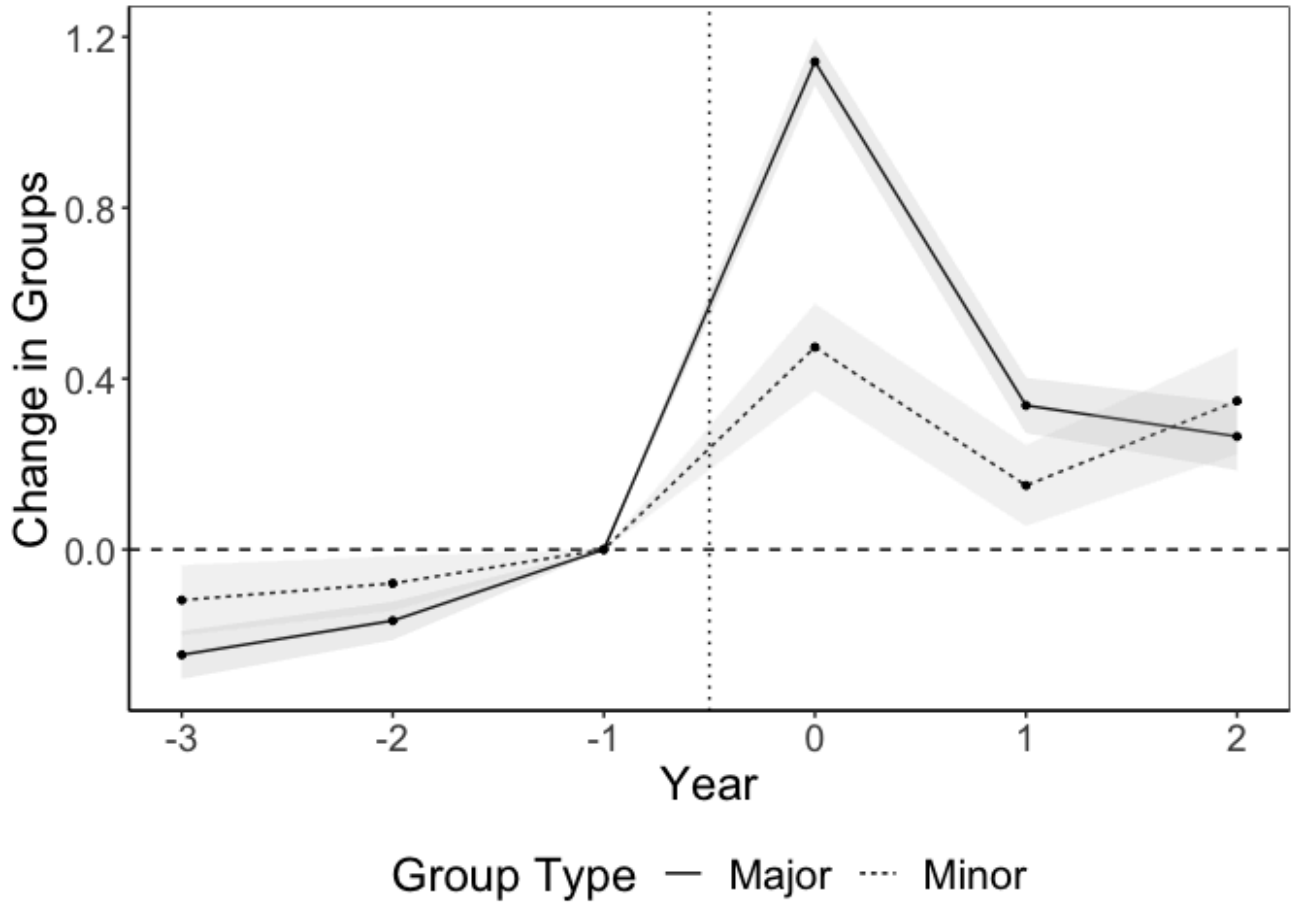
```
                  splinters_expansion, cells_expansion, unaffiliated_expansior
                ~ ifelse(year == 2009, NA, .)))

mx_panel$emergence_small<-mx_panel$unaffiliated_emergence+mx_panel$splinters_e
mx_panel$expansion_small<-mx_panel$unaffiliated_expansion+mx_panel$splinters_e


##################################
###FIGURE 1: TERRITORY MAPS######
##################################
munis <- st_read("muni_2012gw/Muni_2012gw.shp") #shapefile
#> Reading layer `Muni_2012gw' from data source
#>   `/Users/jesberg/Dropbox/Mac/Desktop/PSRM_Replication/muni_2012gw/Muni_201
#>   using driver `ESRI Shapefile'
#> Simple feature collection with 2457 features and 6 fields
#> Geometry type: MULTIPOLYGON
#> Dimension:     XY
#> Bounding box:  xmin: -118.4076 ymin: 14.5321 xmax: -86.71041 ymax: 32.71865
#> Geodetic CRS:  WGS 84
munis$inegi<-paste(munis$CVE_ENT, munis$CVE_MUN, sep='') #ensure inegi codes m
munis$inegi<-as.numeric(as.character(munis$inegi))

mx_panel$groups_factor<-NA #define levels for map
mx_panel$groups_factor[mx_panel$unique_groups==0]<-'0'
mx_panel$groups_factor[mx_panel$unique_groups==1]<-'1'
mx_panel$groups_factor[mx_panel$unique_groups>=2&mx_panel$unique_groups<=4]<-'
mx_panel$groups_factor[mx_panel$unique_groups>=5&mx_panel$unique_groups<=8]<-'
mx_panel$groups_factor[mx_panel$unique_groups>8]<-'>8'

for (i in c(2010, 2019)) {
  sp <- merge(munis, subset(mx_panel, year == i), by='inegi', all.x = TRUE)#me
  sp$groups_factor<-factor(sp$groups_factor, levels=c('0', '1', '2-4', '5-8',

  # Create the plot
  mapplot<-ggplot() +
    geom_sf(data = sp, aes(fill = groups_factor), color = "light grey", size=.
    scale_fill_manual(values = brewer.pal(n = 5, name = "Greys"), name = "Grou
    labs(title = i) +
    theme_minimal() +
    theme(panel.grid = element_blank(),  # Remove gridlines
          axis.title = element_blank(), # Remove axis titles
          axis.text = element_blank(),# Remove axis text (ticks)
          plot.title = element_text(size = 20))

  # Save the plot
  ggsave(paste(#'output/',
               "mexico_map", i, ".png", sep = ""), mapplot, width = 8, height
}
```

```
##########################################
############ Kingpin models##############
##########################################

####Defining treatments

#ever treated municipalities
mx_panel$kingpin_treated<-ifelse(mx_panel$muni_id%in%unique(mx_panel$muni_id[m

#ensuring all non-treated years are 0
mx_panel$kingpin_tr[is.na(mx_panel$kingpin_tr)]<-0

#event study treatment (grouping)
mx_panel$kingpinwp<-as.numeric(as.character(mx_panel$kingpin_tofrom))
mx_panel$kingpinwp[mx_panel$kingpin_tofrom< -3]<-'pre'
mx_panel$kingpinwp[mx_panel$kingpin_tofrom > 2]<-'post'

mx_panel$kingpinwp[is.na(mx_panel$kingpinwp)&mx_panel$kingpin_treated==1]<-'pr
mx_panel$kingpinwp[is.na(mx_panel$kingpinwp)&mx_panel$kingpin_treated==0]<-'ne

mx_panel$kingpinwp<-factor(mx_panel$kingpinwp, levels=c('-1', 'pre', 'never_tr

############## Results

####################################
#####TABLE 1: Kingpin DID
models<-returnModels( c('dominant', 'small_groups', 'emergence_small', 'expans
             data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+log(amapol
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)

table<-etable(models, tex=TRUE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              depvar=FALSE,
              fontsize='small',
              drop=c('NOM_EST', 'PAN party', 'Marijuana', 'Poppy'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/kingpin_criminal.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/kingpin_criminal.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
```

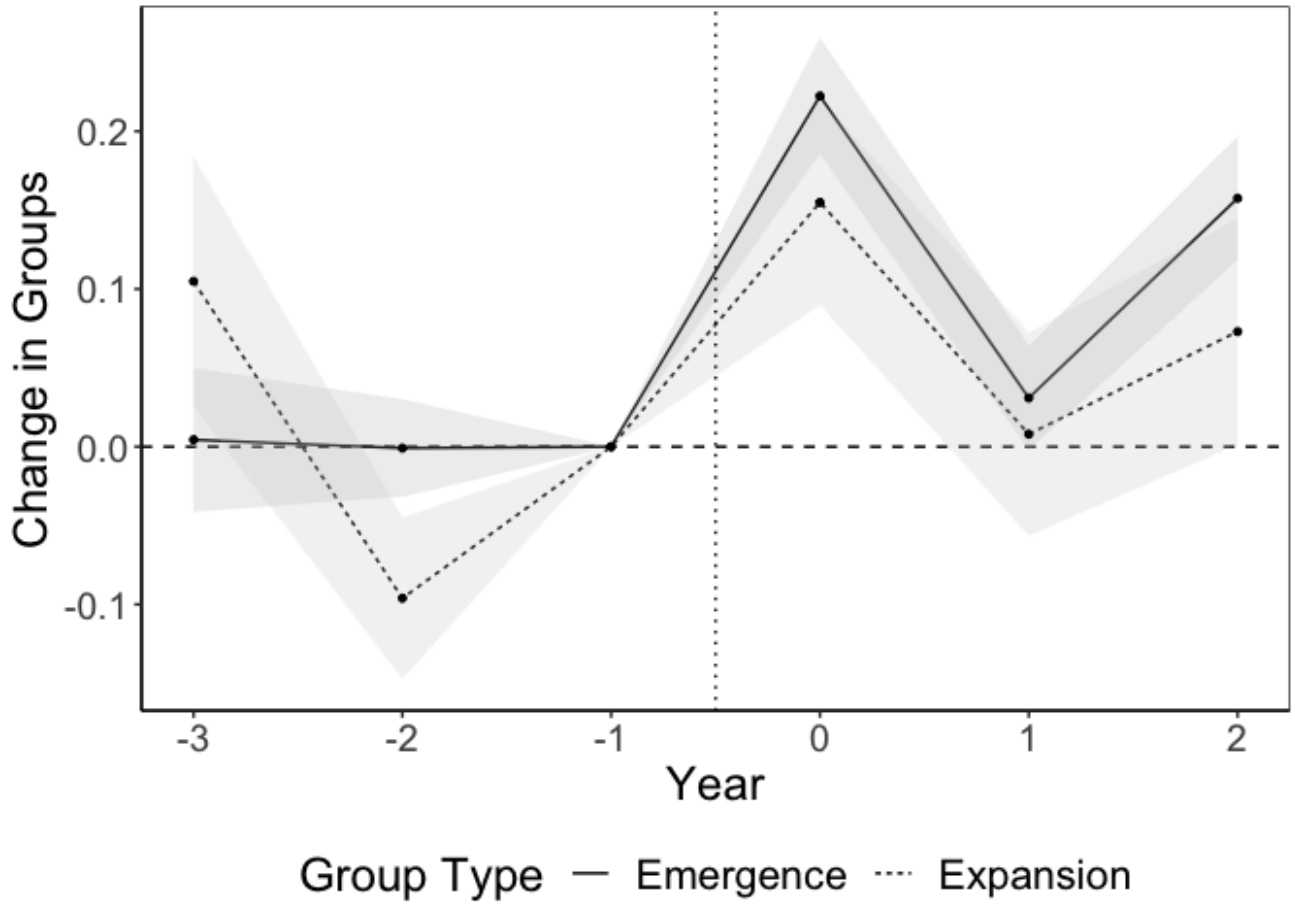
```
#>    \toprule
#>                                & Major         & Minor         & Emergence
#>                                & (1)           & (2)           & (3)
#>    \midrule
#>    Kingpin Removal             & 0.76$^{***}$  & 0.23$^{***}$  & 0.06$^{***}
#>                                & (0.02)        & (0.03)        & (0.01)
#>     \\
#>    R$^2$                       & 0.70          & 0.57          & 0.31
#>    Observations                & 29,480        & 29,480        & 27,024
#>    Dependent variable mean     & 0.25          & 0.24          & 0.06
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects          & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

####################################
#####Figure 2: Kingpin Event Study

es_models<-returnModels( c('dominant', 'small_groups', 'emergence_small', 'exp
                         data=mx_panel, covariates='+log(mariguana_kghec+1)+lc
#> NOTE: 84 observations removed because of NA values (LHS: 84).
#> The variables 'kingpinwpnever_treated' and 'NOM_ESTZacatecas:year' have bee
#> NOTE: 84 observations removed because of NA values (LHS: 84).
#> The variables 'kingpinwpnever_treated' and 'NOM_ESTZacatecas:year' have bee
#> NOTE: 2,541 observations removed because of NA values (LHS: 2,541).
#> The variable 'kingpinwpnever_treated' has been removed because of collinear
#> NOTE: 2,541 observations removed because of NA values (LHS: 2,541).
#> The variable 'kingpinwpnever_treated' has been removed because of collinear
es_models
#> [[1]]
#> OLS estimation, Dep. Var.: dominant
#> Observations: 29,484
#> Fixed-effects: muni_id: 2,457,  year: 12
#> Standard-errors: Clustered (muni_id)
#>                           Estimate Std. Error  t value   Pr(>|t|)
#> kingpinwppre             -0.124519   0.029327 -4.24585 2.2587e-05 ***
#> kingpinwp-3              -0.246443   0.028575 -8.62451  < 2.2e-16 ***
#> kingpinwp-2              -0.166450   0.022777 -7.30774 3.6557e-13 ***
#> kingpinwp0                1.142019   0.028032 40.73942  < 2.2e-16 ***
#> kingpinwp1                0.337329   0.032767 10.29476  < 2.2e-16 ***
#> kingpinwp2                0.264752   0.040132  6.59702 5.1200e-11 ***
#> kingpinwppost             0.125571   0.030844  4.07114 4.8263e-05 ***
#> log(mariguana_kghec + 1) -0.028796   0.009849 -2.92388 3.4886e-03 **
#> ... 32 coefficients remaining (display them with summary() or use argument
```

```
#> ... 2 variables were removed because of collinearity (kingpinwpnever_treate
#> ---
#> Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
#> RMSE: 0.351417     Adj. R2: 0.722184
#>                  Within R2: 0.335867
#>
#> [[2]]
#> OLS estimation, Dep. Var.: small_groups
#> Observations: 29,484
#> Fixed-effects: muni_id: 2,457,  year: 12
#> Standard-errors: Clustered (muni_id)
#>                           Estimate Std. Error  t value   Pr(>|t|)
#> kingpinwppre              0.134437   0.047865  2.80869 5.0136e-03 **
#> kingpinwp-3              -0.118447   0.041773 -2.83547 4.6132e-03 **
#> kingpinwp-2              -0.079207   0.032534 -2.43461 1.4979e-02 *
#> kingpinwp0                0.473793   0.051760  9.15367  < 2.2e-16 ***
#> kingpinwp1                0.149877   0.048254  3.10600 1.9180e-03 **
#> kingpinwp2                0.347895   0.063075  5.51561 3.8394e-08 ***
#> kingpinwppost             0.337039   0.061387  5.49040 4.4222e-08 ***
#> log(mariguana_kghec + 1) -0.148502   0.029355 -5.05883 4.5302e-07 ***
#> ... 32 coefficients remaining (display them with summary() or use argument
#> ... 2 variables were removed because of collinearity (kingpinwpnever_treate
#> ---
#> Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
#> RMSE: 0.680216     Adj. R2: 0.53587
#>                  Within R2: 0.135458
#>
#> [[3]]
#> OLS estimation, Dep. Var.: emergence_small
#> Observations: 27,027
#> Fixed-effects: muni_id: 2,457,  year: 11
#> Standard-errors: Clustered (muni_id)
#>                           Estimate Std. Error   t value   Pr(>|t|)
#> kingpinwppre              0.027787   0.017203  1.615302 1.0637e-01
#> kingpinwp-3               0.004412   0.023263  0.189663 8.4959e-01
#> kingpinwp-2              -0.000883   0.015710 -0.056181 9.5520e-01
#> kingpinwp0                0.222307   0.018715 11.878707  < 2.2e-16 ***
#> kingpinwp1                0.030919   0.016913  1.828113 6.7654e-02 .
#> kingpinwp2                0.157544   0.019937  7.902173 4.1002e-15 ***
#> kingpinwppost             0.205930   0.023916  8.610462  < 2.2e-16 ***
#> log(mariguana_kghec + 1)  0.001930   0.009494  0.203291 8.3892e-01
#> ... 33 coefficients remaining (display them with summary() or use argument
#> ... 1 variable was removed because of collinearity (kingpinwpnever_treated)
#> ---
#> Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
#> RMSE: 0.305079     Adj. R2: 0.248289
#>                  Within R2: 0.056634
#>
#> [[4]]
```

```
#> OLS estimation, Dep. Var.: expansion_small
#> Observations: 27,027
#> Fixed-effects: muni_id: 2,457,  year: 11
#> Standard-errors: Clustered (muni_id)
#>                            Estimate Std. Error   t value   Pr(>|t|)
#> kingpinwppre               0.015014   0.029892  0.502265 6.1553e-01
#> kingpinwp-3                0.104863   0.040231  2.606508 9.2024e-03 **
#> kingpinwp-2               -0.096060   0.026033 -3.689923 2.2920e-04 ***
#> kingpinwp0                 0.154910   0.033145  4.673703 3.1180e-06 ***
#> kingpinwp1                 0.007955   0.032795  0.242574 8.0836e-01
#> kingpinwp2                 0.072992   0.036487  2.000482 4.5558e-02 *
#> kingpinwppost              0.112543   0.033818  3.327900 8.8794e-04 ***
#> log(mariguana_kghec + 1) -0.036565   0.012529 -2.918463 3.5496e-03 **
#> ... 33 coefficients remaining (display them with summary() or use argument
#> ... 1 variable was removed because of collinearity (kingpinwpnever_treated)
#> ---
#> Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
#> RMSE: 0.37153     Adj. R2: 0.211027
#>                 Within R2: 0.044892

es_data1<-event_study_data(es_models[1:2], c('Major', 'Minor'), -1, 'kingpinwp
#> Warning in event_study_data(es_models[1:2], c("Major", "Minor"), -1,
#> "kingpinwp"): NAs introduced by coercion

sub_plot_kingpin<-es_base_plot+geom_line(data=es_data1, aes(x=as.numeric(year)
  geom_ribbon(data=es_data1, aes(x=as.numeric(year), y=estimate, group=dv,ymir
  geom_point(data=es_data1, aes(x=as.numeric(year), y=estimate, group=dv), siz
  scale_fill_manual(values=c("dark grey", 'light grey'))+
  xlab("Year")+ylab("Change in Groups")+
  theme(legend.position='bottom', legend.text = element_text(size=16))+
  guides(linetype=guide_legend(title="Group Type"), fill='none')+
  geom_vline(xintercept=c(-1+.5), linetype='dotted')
sub_plot_kingpin
```



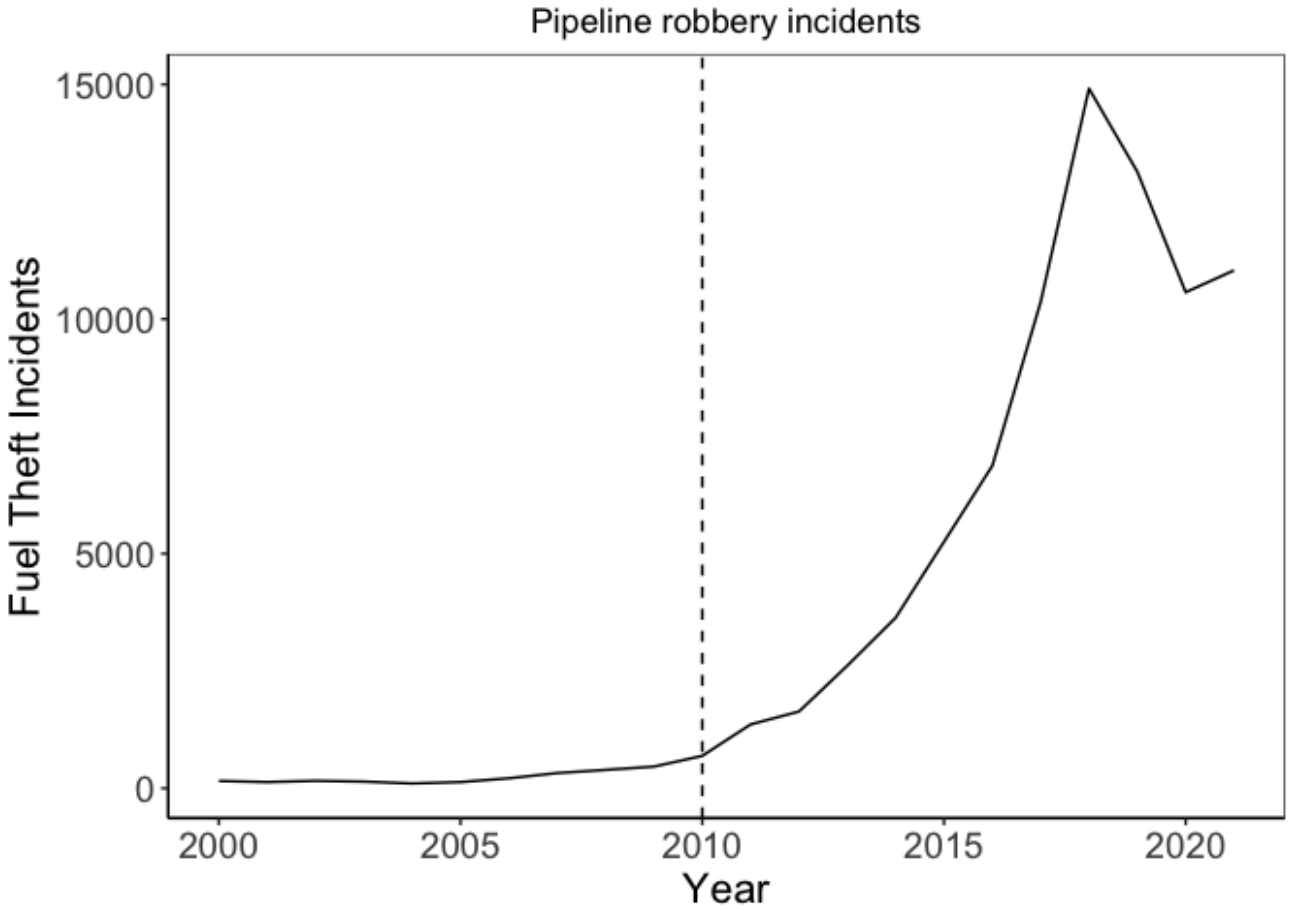

```
es_data2<-event_study_data(es_models[3:4], c('Emergence', 'Expansion'), -1, 'k
#> Warning in event_study_data(es_models[3:4], c("Emergence", "Expansion"), :
#> introduced by coercion

sub_small_plot_kingpin<-es_base_plot+geom_line(data=es_data2, aes(x=as.numeric
  geom_ribbon(data=es_data2, aes(x=as.numeric(year), y=estimate, group=dv,ymir
  geom_point(data=es_data2, aes(x=as.numeric(year), y=estimate, group=dv), siz
  scale_fill_manual(values=c("dark grey", 'light grey'))+
  xlab("Year")+ylab("Change in Groups")+
  theme(legend.position='bottom', legend.text = element_text(size=16))+
  guides(linetype=guide_legend(title="Group Type"), fill='none')+
  geom_vline(xintercept=c(-1+.5), linetype='dotted')
sub_small_plot_kingpin
```




```
#ggsave('output/sub_plot_kingpin.pdf', plot= sub_plot_kingpin, height=4, width
#ggsave('output/sub_small_plot_kingpin.pdf', plot= sub_small_plot_kingpin, hei

##############################################
#########Gas pipelines#########################
##############################################

############ defining treatments
mx_panel$gasxprice<-log(mx_panel$length_pre+1)*(mx_panel$inflation_adjusted_pr
mx_panel$gasbinxprice<-I(mx_panel$length_pre>0)*(mx_panel$inflation_adjusted_p
mx_panel$gasbin<-as.numeric(I(mx_panel$length_pre>0)) #binary pipeline presenc
mx_panel$distxprice<-log(mx_panel$dist_vector_pre+1)*(mx_panel$inflation_adjus
mx_panel$gas_post17<-log(mx_panel$length_pre+1)*I(mx_panel$year>=2017) #length
mx_panel$gasxprice2020<-log(mx_panel$length_all+1)*(mx_panel$inflation_adjuste


########### Results

##############################
########Table 2: Gas Pipelines

models<-returnModels( c('dominant', 'small_groups', 'emergence_small', 'expans
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
```

```
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)

table<-etable(models, tex=TRUE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              depvar=FALSE,
              fontsize='small',
              drop=c('NOM_EST', 'PAN party', 'Marijuana', 'Poppy'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/gas_criminal.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/gas_criminal.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                               & Major         & Minor         & Emergence
#>                               & (1)           & (2)           & (3)
#>    \midrule
#>    Gas Pipeline x Price       & 0.06$^{**}$   & 0.11$^{***}$  & 0.009
#>                               & (0.02)        & (0.03)        & (0.009)
#>     \\
#>    R$^2$                      & 0.63          & 0.57          & 0.30
#>    Observations               & 29,480        & 29,480        & 27,024
#>    Dependent variable mean    & 0.25          & 0.24          & 0.06
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup


#########################################################
#####Appendix A: Additional Information##############
#########################################################

tomas_by_year<-read.csv('tomas_by_year_pemex.csv', stringsAsFactors=F)

tomas_by_year_plot<-ggplot(tomas_by_year, aes(x=year, y=tomas))+geom_line()+th
  xlab("Year")+ylab("Fuel Theft Incidents")+
```

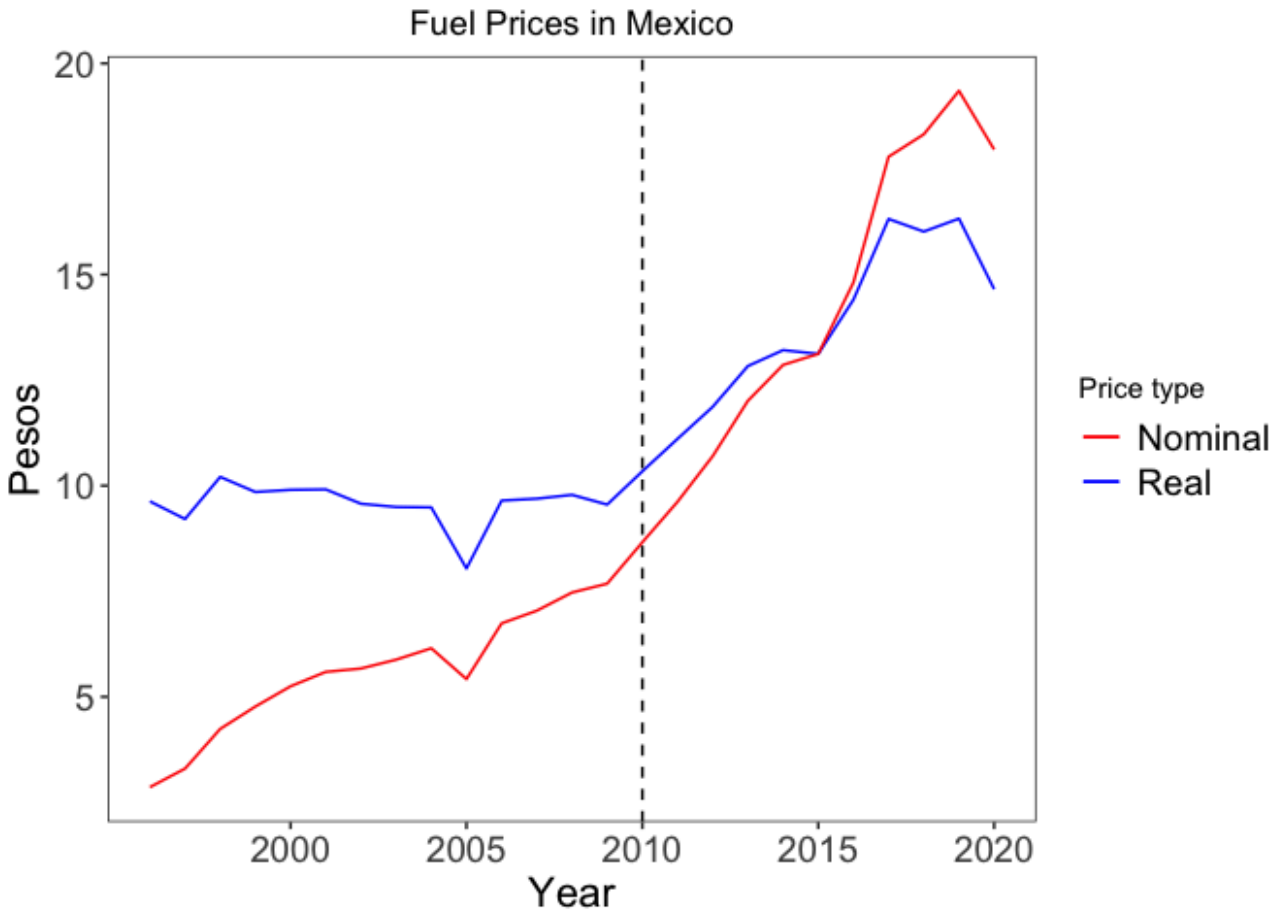
```
  theme(plot.title = element_text(hjust = 0.5))+
  theme(axis.text=element_text(size=14),
        legend.text=element_text(size=14),
        axis.title=element_text(size=16))+
  theme(panel.grid.major = element_blank(), panel.grid.minor = element_blank()
        panel.background = element_blank(), axis.line = element_line(colour =
  geom_vline(xintercept=2010, linetype='dashed')
tomas_by_year_plot
```




```
#ggsave('output/tomas_by_year_plot.pdf', plot= tomas_by_year_plot, height=5, w
```

```
gas_prices<-read.csv('gas_prices_annual_mexico.csv')
gas_prices_plot<-ggplot(gas_prices, aes(x=year, y=inflation_adjusted_price_pes
  geom_line(data=gas_prices, aes(x=year, y=gas_price_mexico_regular,color='blu
  theme_bw()+ ggtitle("Fuel Prices in Mexico")+
  xlab("Year")+ylab("Pesos")+
  theme(plot.title = element_text(hjust = 0.5))+
  theme(axis.text=element_text(size=14),
        legend.text=element_text(size=14),
        axis.title=element_text(size=16))+
  scale_x_continuous(breaks= c(2000, 2005, 2010, 2015, 2020))+
  theme(panel.grid.major = element_blank(), panel.grid.minor = element_blank()
        panel.background = element_blank())+
```

```
  geom_vline(xintercept=2010, linetype='dashed')+
  guides(color=guide_legend(title="Price type"), fill=FALSE)  +
  scale_colour_manual(values = c("red","blue"),
                      labels=c('Nominal', 'Real'))
#> Warning: The `<scale>` argument of `guides()` cannot be `FALSE`. Use "none"
#> of ggplot2 3.3.4.
#> This warning is displayed once every 8 hours.
#> Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
#> generated.
gas_prices_plot
```




```
#ggsave('output/gas_prices_plot.pdf', plot= gas_prices_plot, height=5, width=7


##########################################
############A.7: Full tables

models<-returnModels( c('dominant', 'small_groups', 'emergence', 'expansion'),
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
```

```
table<-etable(models, tex=TRUE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              depvar=FALSE,
              fontsize='small',
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/full_tables_kp.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/full_tables_kp.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                               & Major         & Minor         & Emergence
#>                               & (1)           & (2)           & (3)
#>    \midrule
#>    Kingpin Removal            & 0.76$^{***}$  & 0.23$^{***}$  & 0.09$^{***}
#>                               & (0.02)        & (0.03)        & (0.01)
#>    PAN party mayor            & -0.01         & -0.01         & -0.02$^{*}$
#>                               & (0.01)        & (0.03)        & (0.007)
#>    Marijuana Hectares         & -0.03$^{**}$  & -0.15$^{***}$ & 0.007
#>                               & (0.01)        & (0.03)        & (0.010)
#>    Poppy Hectares             & 0.04$^{**}$   & 0.01          & -0.02
#>                               & (0.01)        & (0.03)        & (0.01)
#>     \\
#>    R$^2$                      & 0.70          & 0.57          & 0.30
#>    Observations               & 29,480        & 29,480        & 29,480
#>    Dependent variable mean    & 0.25          & 0.24          & 0.06
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

models<-returnModels( c('dominant', 'small_groups', 'emergence', 'expansion'),
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
```

```
table<-etable(models, tex=TRUE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              depvar=FALSE,
              fontsize='small',
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/full_tables_gas.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/full_tables_gas.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                               & Major         & Minor         & Emergence
#>                               & (1)           & (2)           & (3)
#>    \midrule
#>    Gas Pipeline x Price       & 0.06$^{**}$   & 0.11$^{***}$  & -0.009
#>                               & (0.02)        & (0.03)        & (0.01)
#>    PAN party mayor            & -0.04$^{*}$   & -0.02         & -0.02$^{*}$
#>                               & (0.02)        & (0.03)        & (0.008)
#>    Marijuana Hectares         & -0.04$^{***}$ & -0.16$^{***}$ & 0.005
#>                               & (0.01)        & (0.03)        & (0.010)
#>    Poppy Hectares             & 0.04$^{**}$   & 0.02          & -0.02
#>                               & (0.01)        & (0.03)        & (0.01)
#>     \\
#>    R$^2$                      & 0.63          & 0.57          & 0.30
#>    Observations               & 29,480        & 29,480        & 29,480
#>    Dependent variable mean    & 0.25          & 0.24          & 0.06
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

########################################
##############A.8 Broken down by group type

models<-returnModels( c('splinters', 'cells', 'unaffiliated'), c('kingpin_tr',
                     data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
```

```
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).

table<-etable(models, tex=TRUE,
              headers=c('Splinters', 'Splinters', 'Cells', 'Cells', 'Unaffilia
              depvar=FALSE,
              fontsize='small',
              order=c('Kingpin Removal', 'Gas Pipeline x Price'),
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/results_bytype.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/results_bytype.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccccc}
#>    \toprule
#>     & \multicolumn{2}{c}{Splinters} & \multicolumn{2}{c}{Cells} & \multicol
#>                               & (1)           & (2)           & (3)
#>    \midrule
#>    Kingpin Removal            & 0.11$^{***}$  &               & 0.12$^{***}
#>                               & (0.02)        &               & (0.02)
#>    Gas Pipeline x Price       &               & 0.05$^{**}$   &
#>                               &               & (0.01)        &
#>    PAN party mayor            & -0.007        & -0.01         & -0.008
#>                               & (0.01)        & (0.01)        & (0.02)
#>    Marijuana Hectares         & -0.10$^{***}$ & -0.10$^{***}$ & -0.04$^{**}
#>                               & (0.02)        & (0.02)        & (0.01)
#>    Poppy Hectares             & 0.02          & 0.03$^{+}$    & 0.01
#>                               & (0.01)        & (0.01)        & (0.01)
#>     \\
#>    R$^2$                      & 0.55          & 0.55          & 0.49
#>    Observations               & 29,480        & 29,480        & 29,480
#>    Dependent variable mean    & 0.11          & 0.11          & 0.10
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup
```

```
#emergence
models<-returnModels( c('splinters_emergence', 'cells_emergence', 'unaffiliate
                     data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)

table<-etable(models, tex=TRUE,
              headers=c('Splinters', 'Splinters', 'Cells', 'Cells', 'Unaffilia
              depvar=FALSE,
              fontsize='small',
              order=c('Kingpin Removal', 'Gas Pipeline x Price'),
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/results_bytype_emergence.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/results_bytype_emergence.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccccc}
#>    \toprule
#>     & \multicolumn{2}{c}{Splinters} & \multicolumn{2}{c}{Cells} & \multicol
#>                               & (1)           & (2)                  & (3)
#>    \midrule
#>    Kingpin Removal            & 0.03$^{***}$  &                      & 0.07
#>                               & (0.004)       &                      & (0.0
#>    Gas Pipeline x Price       &               & 0.002                &
#>                               &               & (0.004)              &
#>    PAN party mayor            & -0.0010       & -0.002               & -0.0
#>                               & (0.003)       & (0.003)              & (0.0
#>    Marijuana Hectares         & 0.004         & 0.003                & 0.00
#>                               & (0.003)       & (0.003)              & (0.0
#>    Poppy Hectares             & -0.0003       & $4.1\times 10^{-5}$  & 0.01
#>                               & (0.005)       & (0.005)              & (0.0
#>     \\
#>    R$^2$                      & 0.19          & 0.19                 & 0.24
#>    Observations               & 27,024        & 27,024               & 27,0
#>    Dependent variable mean    & 0.02          & 0.02                 & 0.02
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$         & $\ch
#>    year fixed effects         & $\checkmark$  & $\checkmark$         & $\ch
```

```
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

#expansion
models<-returnModels( c('splinters_expansion', 'cells_expansion', 'unaffiliate
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)

table<-etable(models, tex=TRUE,
              headers=c('Splinters', 'Splinters', 'Cells', 'Cells', 'Unaffilia
              depvar=FALSE,
              fontsize='small',
              order=c('Kingpin Removal', 'Gas Pipeline x Price'),
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/results_bytype_expansion.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/results_bytype_expansion.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccccc}
#>    \toprule
#>     & \multicolumn{2}{c}{Splinters} & \multicolumn{2}{c}{Cells} & \multicol
#>                               & (1)           & (2)           & (3)
#>    \midrule
#>    Kingpin Removal            & 0.005         &               & 0.03$^{**}$
#>                               & (0.009)       &               & (0.01)
#>    Gas Pipeline x Price       &               & 0.03$^{***}$  &
#>                               &               & (0.009)       &
#>    PAN party mayor            & -0.002        & -0.003        & -0.002
#>                               & (0.008)       & (0.008)       & (0.006)
#>    Marijuana Hectares         & -0.04$^{***}$ & -0.04$^{***}$ & -0.0010
#>                               & (0.007)       & (0.007)       & (0.008)
#>    Poppy Hectares             & 0.004         & 0.005         & -0.004
#>                               & (0.009)       & (0.009)       & (0.01)
#>     \\
```

```
#>    R$^2$                     & 0.22          & 0.22          & 0.23
#>    Observations              & 27,024        & 27,024        & 27,024
#>    Dependent variable mean   & 0.04          & 0.04          & 0.04
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects        & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

###################################
##### A.8.1 Alternative coding

#For splinters/cells
models<-returnModels( c('splinter_alt', 'cell_alt'), c('kingpin_tr', 'gasxpric
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).

table<-etable(models, tex=TRUE,
              headers=c('Splinters', 'Splinters', 'Cells', 'Cells'),
              depvar=FALSE,
              fontsize='small',
              order=c('Kingpin Removal', 'Gas Pipeline x Price'),
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/alternate_coding.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/alternate_coding.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>     & \multicolumn{2}{c}{Splinters} & \multicolumn{2}{c}{Cells} \\
#>                               & (1)           & (2)           & (3)
#>    \midrule
#>    Kingpin Removal           & 0.09$^{***}$  &               & 0.14$^{***}
#>                              & (0.02)        &               & (0.02)
#>    Gas Pipeline x Price      &               & 0.04$^{*}$    &
#>                              &               & (0.01)        &
```

```
#>    PAN party mayor            & -0.007        & -0.01         & -0.008
#>                               & (0.01)        & (0.01)        & (0.02)
#>    Marijuana Hectares         & -0.11$^{***}$ & -0.11$^{***}$ & -0.03$^{*}$
#>                               & (0.02)        & (0.02)        & (0.01)
#>    Poppy Hectares             & 0.03$^{+}$    & 0.03$^{+}$    & 0.009
#>                               & (0.02)        & (0.02)        & (0.01)
#>     \\
#>    R$^2$                      & 0.54          & 0.54          & 0.50
#>    Observations               & 29,480        & 29,480        & 29,480
#>    Dependent variable mean    & 0.09          & 0.09          & 0.11
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

# for affiliated v unaffiliated
models<-returnModels( c('affiliated', 'unaffiliated'), c('kingpin_tr', 'gasxpr
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).

table<-etable(models, tex=TRUE,
              headers=c('Affiliated', 'Affiliated', 'Unaffiliated', 'Unaffilia
              depvar=FALSE,
              fontsize='small',
              drop=c('NOM_EST'),
              order=c('Kingpin Removal', 'Gas Pipeline x Price'),

              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/affiliated.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/affiliated.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>     & \multicolumn{2}{c}{Affiliated} & \multicolumn{2}{c}{Unaffiliated} \\
#>                               & (1)           & (2)           & (3)
```

```
#>    \midrule
#>    Kingpin Removal            & 0.99$^{***}$  &               & -0.001
#>                               & (0.04)        &               & (0.01)
#>    Gas Pipeline x Price       &               & 0.12$^{***}$  &
#>                               &               & (0.04)        &
#>    PAN party mayor            & -0.03         & -0.06$^{+}$   & 0.0004
#>                               & (0.03)        & (0.03)        & (0.005)
#>    Marijuana Hectares         & -0.17$^{***}$ & -0.19$^{***}$ & -0.01$^{*}$
#>                               & (0.03)        & (0.03)        & (0.007)
#>    Poppy Hectares             & 0.07$^{*}$    & 0.08$^{*}$    & -0.02$^{*}$
#>                               & (0.03)        & (0.03)        & (0.01)
#>     \\
#>    R$^2$                      & 0.70          & 0.67          & 0.30
#>    Observations               & 29,480        & 29,480        & 29,480
#>    Dependent variable mean    & 0.46          & 0.46          & 0.04
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup


############################################################
#############Appendix B: Robustness#######################
############################################################

####################################
######### B.1.1 Corroborated Groups

mx_panel$small_corroborated<-mx_panel$splinters_corroborated+mx_panel$cells_cc

models<-returnModels( c('small_corroborated'), c('kingpin_tr', 'gasxprice'),
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
table<-etable(models, tex=TRUE,
              depvar=FALSE,
              fontsize='small',
              drop=c('NOM_EST'),
              order=c('Kingpin Removal', 'Gas Pipeline x Price'),

              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/corroborated.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
```

```
#> 'output/corroborated.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcc}
#>    \toprule
#>                                & (1)           & (2)\\
#>    \midrule
#>    Kingpin Removal             & 0.23$^{***}$  &   \\
#>                                & (0.03)        &   \\
#>    Gas Pipeline x Price        &               & 0.11$^{***}$\\
#>                                &               & (0.03)\\
#>    PAN party mayor             & -0.01         & -0.02\\
#>                                & (0.03)        & (0.03)\\
#>    Marijuana Hectares          & -0.15$^{***}$ & -0.16$^{***}$\\
#>                                & (0.03)        & (0.03)\\
#>    Poppy Hectares              & 0.01          & 0.02\\
#>                                & (0.03)        & (0.03)\\
#>     \\
#>    R$^2$                       & 0.57          & 0.57\\
#>    Observations                & 29,480        & 29,480\\
#>    Dependent variable mean     & 0.24          & 0.24\\
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$\\
#>    year fixed effects          & $\checkmark$  & $\checkmark$\\
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

##################################
######### B.1.2 Dropping Small Groups
mx_panel$small_m10<-mx_panel$splinters_m10+mx_panel$cells_m10+mx_panel$unaffil

models<-returnModels( c('small_m10'), c('kingpin_tr', 'gasxprice'),
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).

table<-etable(models, tex=TRUE,
              depvar=FALSE,
              fontsize='small',
              drop=c('NOM_EST'),
              order=c('Kingpin Removal', 'Gas Pipeline x Price'),
```

```
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/m10.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/m10.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection

mx_panel$small_m10<-mx_panel$splinters_m10+mx_panel$cells_m10+mx_panel$unaffil

models<-returnModels( c('small_m10'), c('kingpin_tr', 'gasxprice'),
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).

table<-etable(models, tex=TRUE,
              depvar=FALSE,
              fontsize='small',
              drop=c('NOM_EST'),
              order=c('Kingpin Removal', 'Gas Pipeline x Price'),

              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/m10.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/m10.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcc}
#>    \toprule
#>                               & (1)           & (2)\\
#>    \midrule
#>    Kingpin Removal            & 0.22$^{***}$  &   \\
#>                               & (0.03)        &   \\
#>    Gas Pipeline x Price       &               & 0.10$^{***}$\\
#>                               &               & (0.03)\\
#>    PAN party mayor            & -0.02         & -0.03\\
#>                               & (0.02)        & (0.02)\\
#>    Marijuana Hectares         & -0.14$^{***}$ & -0.14$^{***}$\\
#>                               & (0.03)        & (0.03)\\
#>    Poppy Hectares             & 0.008         & 0.01\\
#>                               & (0.03)        & (0.03)\\
#>     \\
#>    R$^2$                      & 0.56          & 0.56\\
#>    Observations               & 29,480        & 29,480\\
#>    Dependent variable mean    & 0.22          & 0.22\\
#>     \\
```

```
#>    municipality fixed effects & $\checkmark$  & $\checkmark$\\
#>    year fixed effects         & $\checkmark$  & $\checkmark$\\
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

####################################
#### B.1.3 Removing umbrella groups

mx_panel$small_noum<-mx_panel$small_groups-mx_panel$umbrella

models<-returnModels( c('small_noum'), c('kingpin_tr', 'gasxprice'),
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).

table<-etable(models, tex=TRUE,
              depvar=FALSE,
              fontsize='small',
              order=c('Kingpin Removal', 'Gas Pipeline x Price'),
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/noumbrella.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/noumbrella.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcc}
#>    \toprule
#>                               & (1)           & (2)\\
#>    \midrule
#>    Kingpin Removal            & 0.24$^{***}$  &   \\
#>                               & (0.03)        &   \\
#>    Gas Pipeline x Price       &               & 0.11$^{***}$\\
#>                               &               & (0.03)\\
#>    PAN party mayor            & -0.02         & -0.03\\
#>                               & (0.03)        & (0.03)\\
#>    Marijuana Hectares         & -0.14$^{***}$ & -0.15$^{***}$\\
#>                               & (0.03)        & (0.03)\\
#>    Poppy Hectares             & 0.01          & 0.01\\
#>                               & (0.03)        & (0.03)\\
#>     \\
```

```
#>    R$^2$                      & 0.57          & 0.57\\
#>    Observations               & 29,480        & 29,480\\
#>    Dependent variable mean    & 0.23          & 0.23\\
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$\\
#>    year fixed effects         & $\checkmark$  & $\checkmark$\\
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

##################################
######B.1.4: Binary DV (presence)

mx_panel$dominant_bin<-as.numeric(I(mx_panel$dominant>0))
mx_panel$small_bin<-as.numeric(I(mx_panel$small_groups>0))
mx_panel$emergence_bin<-as.numeric(I(mx_panel$emergence_small>0))
mx_panel$expansion_bin<-as.numeric(I(mx_panel$expansion_small>0))

models<-returnModels( c('dominant_bin', 'small_bin', 'emergence_bin', 'expansi
                      c('kingpin_tr'),
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)

table<-etable(models, tex=TRUE,
              depvar=FALSE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              fontsize='small',
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/binary_kp.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/binary_kp.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                               & Major         & Minor         & Emergence
#>                               & (1)           & (2)           & (3)
#>    \midrule
```

```
#>    Kingpin Removal            & 0.46$^{***}$  & 0.14$^{***}$  & 0.05$^{***}
#>                               & (0.01)         & (0.01)         & (0.007)
#>    PAN party mayor            & -0.005         & -0.008         & -0.01$^{*}$
#>                               & (0.008)        & (0.007)        & (0.005)
#>    Marijuana Hectares         & -0.004         & -0.02$^{***}$ & 0.009$^{*}$
#>                               & (0.005)        & (0.005)        & (0.004)
#>    Poppy Hectares             & 0.01$^{*}$     & 0.005          & -0.01$^{*}$
#>                               & (0.006)        & (0.005)        & (0.005)
#>     \\
#>    R$^2$                      & 0.63           & 0.51           & 0.29
#>    Observations               & 29,480         & 29,480         & 27,024
#>    Dependent variable mean    & 0.15           & 0.10           & 0.04
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

models<-returnModels( c('dominant_bin', 'small_bin', 'emergence_bin', 'expansi
                      c('gasxprice'),
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)

table<-etable(models, tex=TRUE,
              depvar=FALSE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              fontsize='small',
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/binary_gas.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/binary_gas.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                               & Major          & Minor          & Emergence
#>                               & (1)            & (2)            & (3)
```

```
#>    \midrule
#>    Gas Pipeline x Price       & 0.03$^{**}$   & 0.03$^{***}$  & 0.009
#>                               & (0.01)        & (0.009)       & (0.006)
#>    PAN party mayor            & -0.02$^{*}$   & -0.01$^{+}$   & -0.01$^{*}$
#>                               & (0.009)       & (0.007)       & (0.005)
#>    Marijuana Hectares         & -0.01$^{*}$   & -0.02$^{***}$ & 0.008$^{+}$
#>                               & (0.006)       & (0.005)       & (0.004)
#>    Poppy Hectares             & 0.02$^{*}$    & 0.007         & -0.01$^{*}$
#>                               & (0.007)       & (0.005)       & (0.005)
#>     \\
#>    R$^2$                      & 0.54          & 0.50          & 0.28
#>    Observations               & 29,480        & 29,480        & 27,024
#>    Dependent variable mean    & 0.15          & 0.10          & 0.04
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup


################################
#### B.1.5. without backfilling the data
mx_panel$small_nobf<-mx_panel$splinters_nobf+mx_panel$cells_nobf+mx_panel$unaf

models<-returnModels( c('dominant_nobf', 'small_nobf'), c('kingpin_tr', 'gasxp
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).

table<-etable(models, tex=TRUE,
              depvar=FALSE,
              headers=c('Major', 'Major', 'Minor', 'Minor'),
              fontsize='small',
              order=c('Kingpin Removal', 'Gas Pipeline x Price'),
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/nobf.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/nobf.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
```

```
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>     & \multicolumn{2}{c}{Major} & \multicolumn{2}{c}{Minor} \\
#>                               & (1)           & (2)           & (3)
#>    \midrule
#>    Kingpin Removal            & 0.64$^{***}$  &               & 0.20$^{***}
#>                               & (0.02)        &               & (0.03)
#>    Gas Pipeline x Price       &               & 0.04$^{*}$    &
#>                               &               & (0.01)        &
#>    PAN party mayor            & -0.010        & -0.03$^{*}$   & -0.02
#>                               & (0.01)        & (0.01)        & (0.02)
#>    Marijuana Hectares         & -0.03$^{**}$  & -0.04$^{***}$ & -0.12$^{***
#>                               & (0.01)        & (0.01)        & (0.03)
#>    Poppy Hectares             & 0.03$^{*}$    & 0.04$^{**}$   & -0.01
#>                               & (0.01)        & (0.01)        & (0.03)
#>     \\
#>    R$^2$                      & 0.61          & 0.56          & 0.52
#>    Observations               & 29,480        & 29,480        & 29,480
#>    Dependent variable mean    & 0.22          & 0.22          & 0.22
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup


########################################
######### Alternate Kingpin Treatments

############treatment always 'on'
models<-returnModels( c('dominant', 'small_groups', 'emergence_small', 'expans
                     data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
table<-etable(models, tex=TRUE,
              depvar=FALSE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              fontsize='small',
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
```

```
write(table[3:length(table)-1], 'output/tr_on.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/tr_on.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                               & Major         & Minor         & Emergence
#>                               & (1)           & (2)           & (3)
#>    \midrule
#>    Kingpin Removal (On)       & 0.82$^{***}$  & 0.30$^{***}$  & 0.12$^{***}
#>                               & (0.03)        & (0.04)        & (0.01)
#>    PAN party mayor            & -0.03$^{+}$   & -0.02         & -0.01$^{+}$
#>                               & (0.01)        & (0.03)        & (0.008)
#>    Marijuana Hectares         & -0.03$^{**}$  & -0.15$^{***}$ & 0.001
#>                               & (0.01)        & (0.03)        & (0.009)
#>    Poppy Hectares             & 0.03$^{*}$    & 0.01          & -0.02
#>                               & (0.01)        & (0.03)        & (0.01)
#>     \\
#>    R$^2$                      & 0.68          & 0.57          & 0.31
#>    Observations               & 29,480        & 29,480        & 27,024
#>    Dependent variable mean    & 0.25          & 0.24          & 0.06
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

########### Treating affected only as municipalities treated in t

models<-returnModels( c('dominant', 'small_groups','emergence_small', 'expansi
                     data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
table<-etable(models, tex=TRUE,
              depvar=FALSE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              fontsize='small',
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
```

```
              vcov='cluster')
write(table[3:length(table)-1], 'output/kingpin_tr_yof.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/kingpin_tr_yof.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                                & Major         & Minor         & Emergence
#>                                & (1)           & (2)           & (3)
#>    \midrule
#>    Kingpin Removal (presence=t) & 0.78$^{***}$  & 0.23$^{***}$  & 0.08$^{**
#>                                & (0.02)        & (0.03)        & (0.01)
#>    PAN party mayor             & -0.02         & -0.02         & -0.01$^{+
#>                                & (0.01)        & (0.03)        & (0.008)
#>    Marijuana Hectares          & -0.03$^{**}$  & -0.15$^{***}$ & 0.0006
#>                                & (0.01)        & (0.03)        & (0.009)
#>    Poppy Hectares              & 0.04$^{**}$   & 0.01          & -0.02
#>                                & (0.01)        & (0.03)        & (0.01)
#>     \\
#>    R$^2$                       & 0.70          & 0.57          & 0.31
#>    Observations                & 29,480        & 29,480        & 27,024
#>    Dependent variable mean     & 0.25          & 0.24          & 0.06
#>     \\
#>    municipality fixed effects  & $\checkmark$  & $\checkmark$  & $\checkma
#>    year fixed effects          & $\checkmark$  & $\checkmark$  & $\checkma
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

########################################
######### Alternative Gas Treatments
models<-returnModels( c('dominant', 'small_groups', 'emergence_small', 'expans
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
table<-etable(models, tex=TRUE,
              depvar=FALSE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              fontsize='small',
              drop=c('NOM_EST'),
```

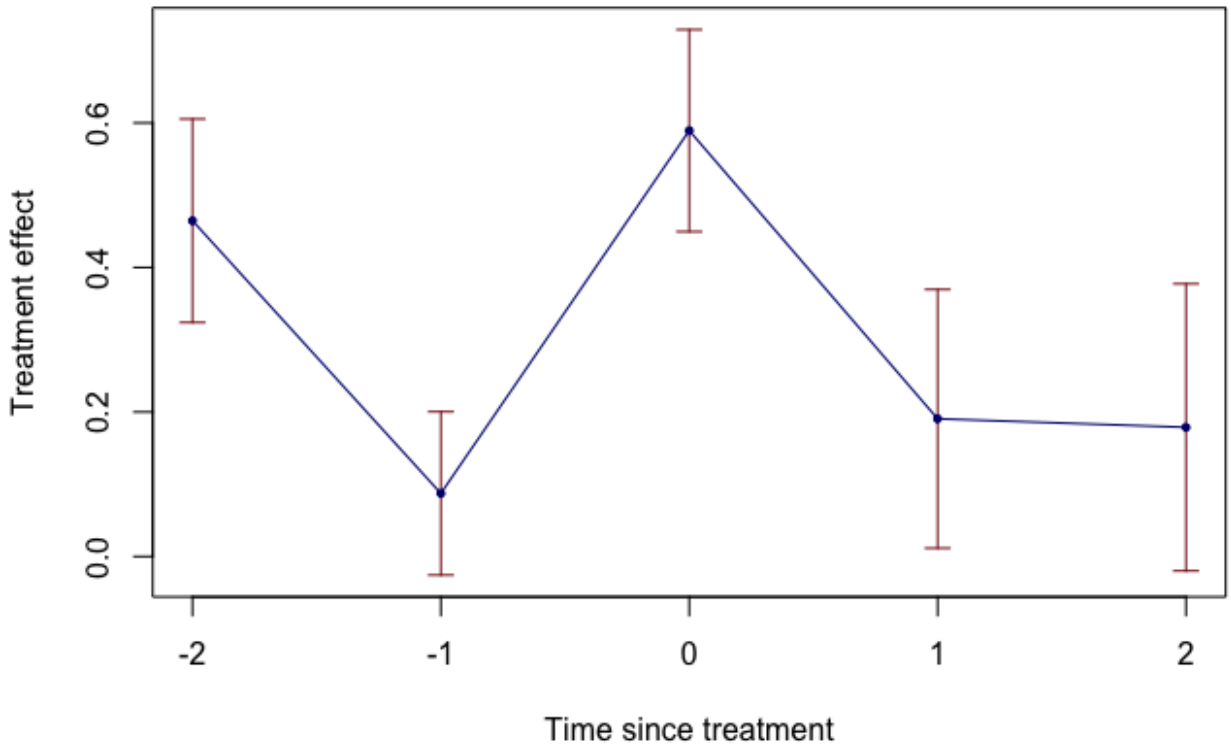
```
             signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
             vcov='cluster')
write(table[3:length(table)-1], 'output/gas_bin.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/gas_bin.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                              & Major         & Minor         & Emergence
#>                              & (1)           & (2)           & (3)
#>    \midrule
#>    Pipeline Presence x Price  & 0.24$^{***}$  & 0.48$^{***}$  & 0.04
#>                              & (0.06)        & (0.12)        & (0.04)
#>    PAN party mayor            & -0.04$^{*}$   & -0.02         & -0.02$^{*}$
#>                              & (0.02)        & (0.03)        & (0.008)
#>    Marijuana Hectares         & -0.04$^{***}$ & -0.16$^{***}$ & -0.001
#>                              & (0.01)        & (0.03)        & (0.009)
#>    Poppy Hectares             & 0.04$^{**}$   & 0.02          & -0.02
#>                              & (0.01)        & (0.03)        & (0.01)
#>     \\
#>    R$^2$                      & 0.63          & 0.57          & 0.30
#>    Observations               & 29,480        & 29,480        & 27,024
#>    Dependent variable mean    & 0.25          & 0.24          & 0.06
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

models<-returnModels( c('dominant', 'small_groups', 'emergence_small', 'expans
                     data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
table<-etable(models, tex=TRUE,
             depvar=FALSE,
             headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
             fontsize='small',
             drop=c('NOM_EST'),
             signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
```

```
              vcov='cluster')
write(table[3:length(table)-1], 'output/gas_post17.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/gas_post17.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                               & Major         & Minor         & Emergence
#>                               & (1)           & (2)           & (3)
#>    \midrule
#>    Gas Pipeline x Post-2017   & 0.03$^{***}$  & 0.04$^{**}$   & 0.0006
#>                               & (0.008)       & (0.01)        & (0.004)
#>    PAN party mayor            & -0.04$^{*}$   & -0.02         & -0.02$^{*}$
#>                               & (0.02)        & (0.03)        & (0.008)
#>    Marijuana Hectares         & -0.04$^{***}$ & -0.16$^{***}$ & -0.001
#>                               & (0.01)        & (0.03)        & (0.009)
#>    Poppy Hectares             & 0.04$^{**}$   & 0.01          & -0.02
#>                               & (0.01)        & (0.03)        & (0.01)
#>     \\
#>    R$^2$                      & 0.63          & 0.57          & 0.30
#>    Observations               & 29,480        & 29,480        & 27,024
#>    Dependent variable mean    & 0.25          & 0.24          & 0.06
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

models<-returnModels( c('dominant', 'small_groups', 'emergence_small', 'expans
                      data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
table<-etable(models, tex=TRUE,
              depvar=FALSE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              fontsize='small',
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
```

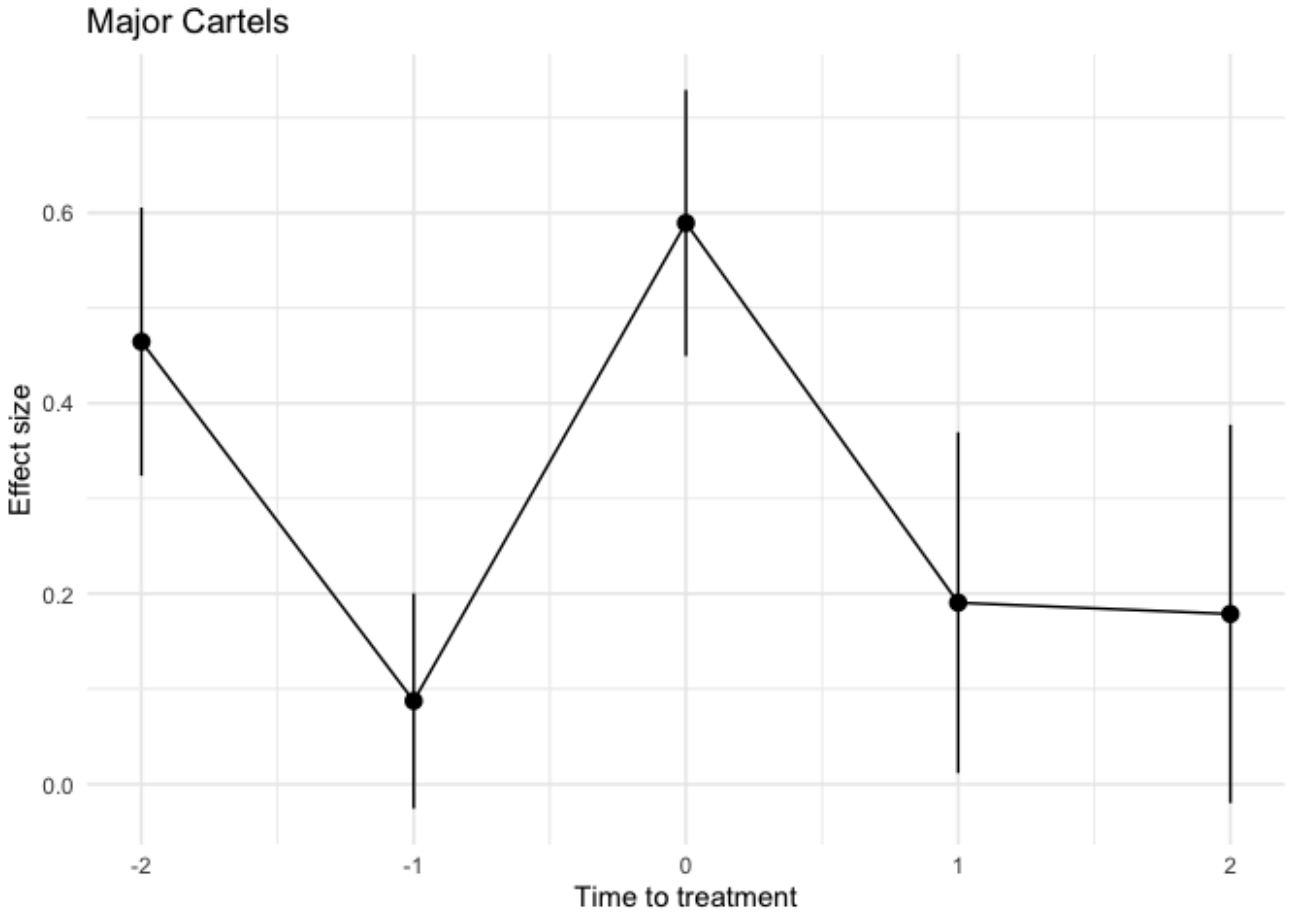
```
write(table[3:length(table)-1], 'output/distxprice.tex')
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/distxprice.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                               & Major         & Minor         & Emergence
#>                               & (1)           & (2)           & (3)
#>    \midrule
#>    Distance (log) x Price     & -0.04$^{**}$  & -0.09$^{**}$  & -0.02$^{*}$
#>                               & (0.01)        & (0.03)        & (0.009)
#>    PAN party mayor            & -0.04$^{*}$   & -0.02         & -0.02$^{*}$
#>                               & (0.02)        & (0.03)        & (0.008)
#>    Marijuana Hectares         & -0.04$^{***}$ & -0.16$^{***}$ & -0.002
#>                               & (0.01)        & (0.03)        & (0.009)
#>    Poppy Hectares             & 0.05$^{**}$   & 0.02          & -0.02
#>                               & (0.01)        & (0.03)        & (0.01)
#>     \\
#>    R$^2$                      & 0.63          & 0.57          & 0.30
#>    Observations               & 29,480        & 29,480        & 27,024
#>    Dependent variable mean    & 0.25          & 0.24          & 0.06
#>     \\
#>    municipality fixed effects & $\checkmark$  & $\checkmark$  & $\checkmark
#>    year fixed effects         & $\checkmark$  & $\checkmark$  & $\checkmark
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup

models<-returnModels( c('dominant', 'small_groups', 'emergence_small', 'expans
                     data=mx_panel, covariates='+pan+log(mariguana_kghec+1)+l
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 88 observations removed because of NA values (LHS: 84, RHS: 88).
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
#> NOTE: 2,544 observations removed because of NA values (LHS: 2,541, RHS: 88)
table<-etable(models, tex=TRUE,
              depvar=FALSE,
              headers=c('Major', 'Minor', 'Emergence', 'Expansion'),
              fontsize='small',
              drop=c('NOM_EST'),
              signif.code = c("***"=0.001, "**"=0.01, "*"=0.05, '+'=.1),
              vcov='cluster')
write(table[3:length(table)-1], 'output/gasxprice2020.tex')
```

```
#> Warning in file(file, ifelse(append, "a", "w")): cannot open file
#> 'output/gasxprice2020.tex': No such file or directory
#> Error in file(file, ifelse(append, "a", "w")): cannot open the connection
table
#> \begingroup
#> \centering
#> \small
#> \begin{tabular}{lcccc}
#>    \toprule
#>                                & Major         & Minor         & Emergence
#>                                & (1)           & (2)           & (3)
#>    \midrule
#>    Gas Pipeline (2020) x Price & 0.05$^{**}$   & 0.09$^{**}$   & 0.008
#>                                & (0.02)        & (0.03)        & (0.009)
#>    PAN party mayor             & -0.04$^{*}$   & -0.02         & -0.02$^{*}
#>                                & (0.02)        & (0.03)        & (0.008)
#>    Marijuana Hectares          & -0.04$^{***}$ & -0.16$^{***}$ & -0.001
#>                                & (0.01)        & (0.03)        & (0.009)
#>    Poppy Hectares              & 0.04$^{**}$   & 0.02          & -0.02
#>                                & (0.01)        & (0.03)        & (0.01)
#>     \\
#>    R$^2$                       & 0.63          & 0.57          & 0.30
#>    Observations                & 29,480        & 29,480        & 27,024
#>    Dependent variable mean     & 0.25          & 0.24          & 0.06
#>     \\
#>    municipality fixed effects  & $\checkmark$  & $\checkmark$  & $\checkmar
#>    year fixed effects          & $\checkmark$  & $\checkmark$  & $\checkmar
#>    \bottomrule
#> \end{tabular}
#>
#> \par \raggedright
#> \scriptsize{$*** p < 0.001, ** p< 0.01, * p< 0.05, + p<.01$. Robust SEs clu
#> \par\endgroup


##############################
#####Other DID estimators###
##############################

########################
### chaisemartin
tidy.did_multiplegt = function(x, level = 0.95) {
  ests = x[grepl("^placebo_|^effect|^dynamic_", names(x))]
  ret = data.frame(
    term      = names(ests),
    estimate  = as.numeric(ests),
    std.error = as.numeric(x[grepl("^se_placebo|^se_effect|^se_dynamic", names
    N         = as.numeric(x[grepl("^N_placebo|^N_effect|^N_dynamic", names(x)
  ) |>
```

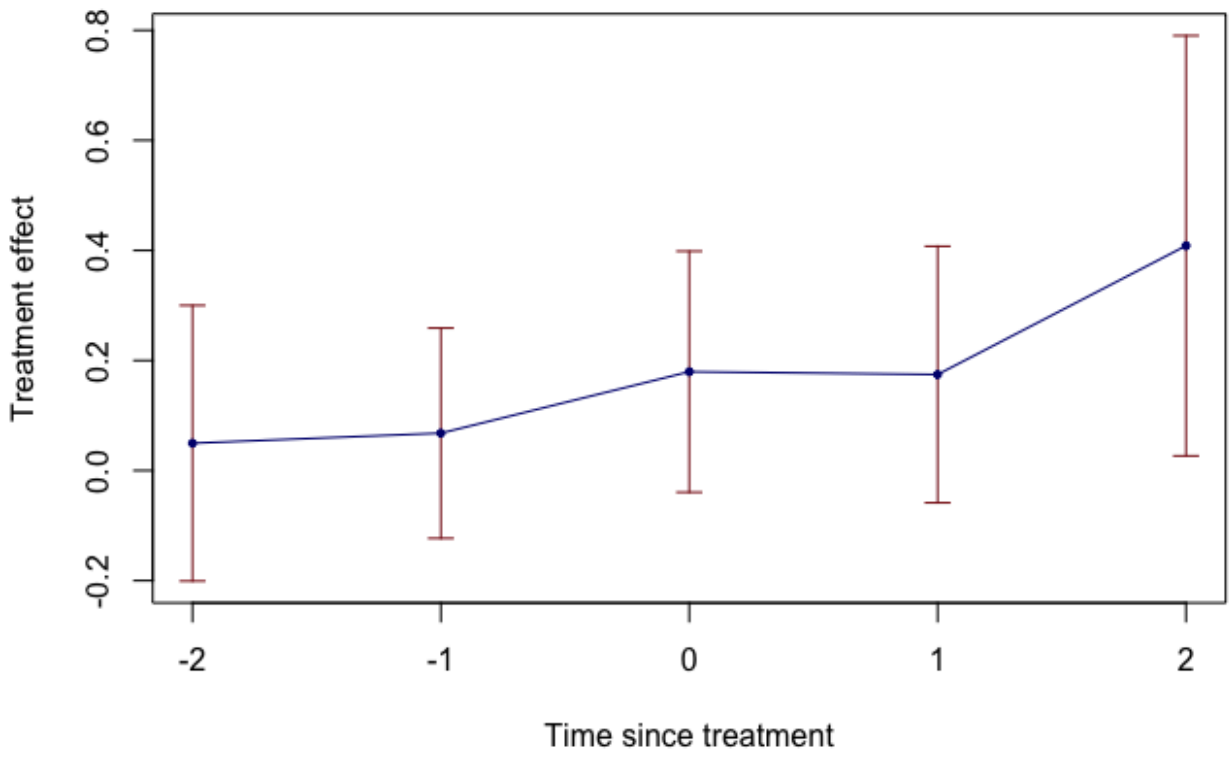
```
    # For CIs we'll assume standard normal distribution
    within({
      conf.low  = estimate - std.error*(qnorm(1-(1-level)/2))
      conf.high = estimate + std.error*(qnorm(1-(1-level)/2))
    })
  return(ret)
}

theme_set(theme_minimal())

mx_panel$log_mj<-log(mx_panel$mariguana_kghec+1)
mx_panel$log_poppy<-log(mx_panel$amapola_kghec+1)

set.seed(1234)
mod_dom=did_multiplegt(
  mx_panel, 'dominant',
  'muni_id', 'year', 'kingpin_tr',
  controls=c('pan', 'log_mj', 'log_poppy'),# original regression params
  dynamic   = 2,                 # no. of post-treatment periods
  placebo   = 2,                 # no. of pre-treatment periods
  brep      = 1000,                 # no. of bootstraps (required for SEs)
  cluster   = 'muni_id',               # variable to cluster SEs on
  parallel  = TRUE                # run the bootstraps in parallel
)
#> Warning: There was 1 warning in `summarize()`.
#> ℹ In argument: `Tgroup = group_indices()`.
#> ℹ In group 1: `T = 2009`.
#> Caused by warning:
#> ! `group_indices()` was deprecated in dplyr 1.0.0.
#> ℹ Please use `cur_group_id()` instead.
#> ℹ The deprecated feature was likely used in the DIDmultiplegt package.
#>   Please report the issue to the authors.
```



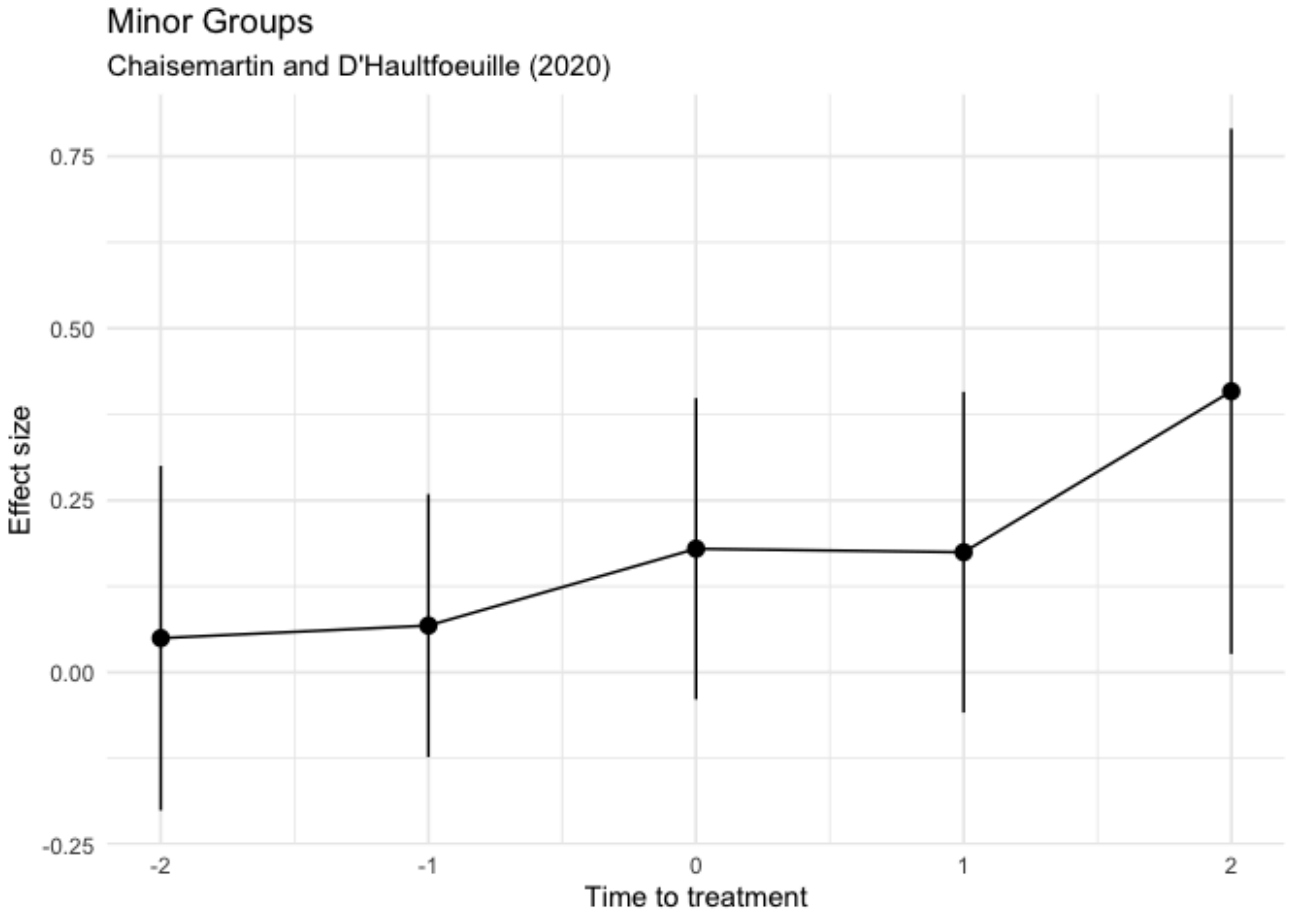

```
theme_set(theme_minimal())

mod_dom_td = tidy.did_multiplegt(mod_dom)

mod_dom_plot<-mod_dom_td |>
  within({
    term = gsub("^placebo_", "-", term)
    term = gsub("^effect", "0", term)
    term = gsub("^dynamic_", "", term)
    term = as.integer(term)
  }) |>
  ggplot(aes(x = term, y = estimate, ymin = conf.low, ymax = conf.high)) +
  geom_pointrange() + geom_line()+
  labs(
    x = "Time to treatment", y = "Effect size", title = "Major Cartels"
  )
mod_dom_plot
```



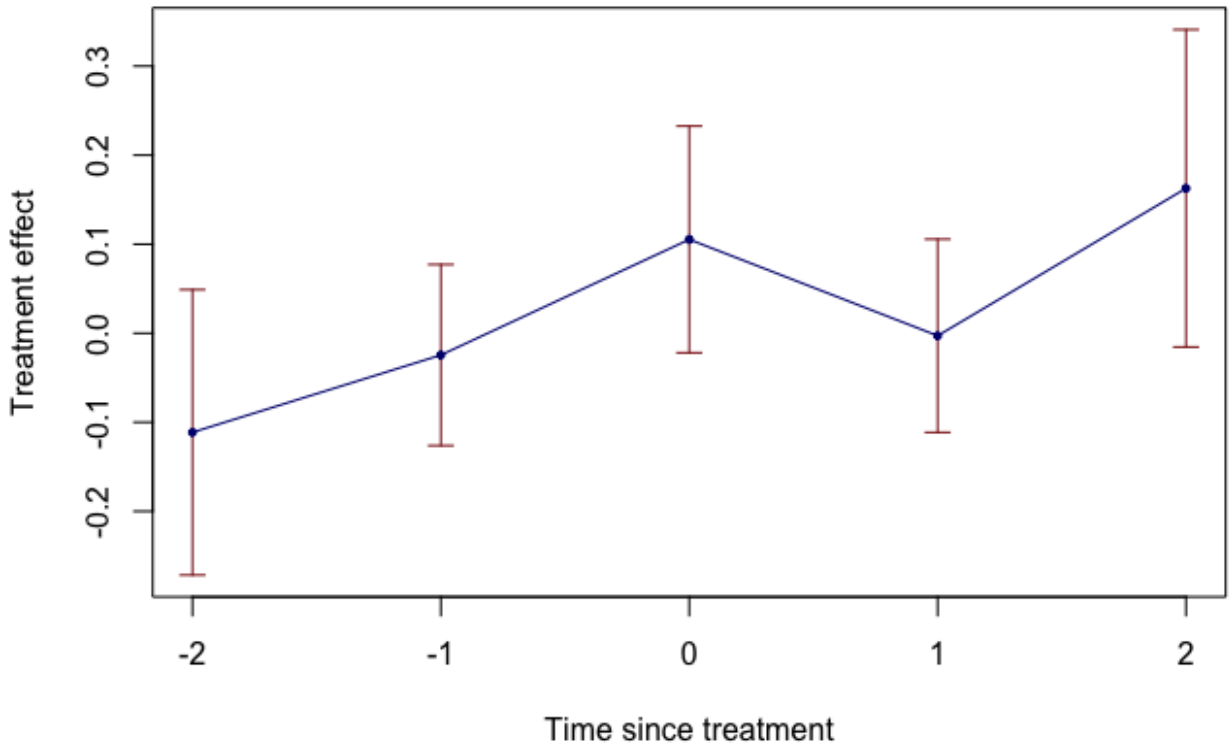

```
#ggsave('output/cdh_major.pdf', plot= mod_dom_plot, height=5, width=6)


mod_small=did_multiplegt(mx_panel, 'small_groups',
                         'muni_id', 'year', 'kingpin_tr',
                         controls=c('pan', 'log_mj', 'log_poppy'),# original r
                         dynamic   = 2,                 # no. of post-treatme
                         placebo   = 2,                 # no. of pre-treatmer
                         brep      = 1000,                 # no. of bootstrap
                         cluster   = 'muni_id',                # variable to c
                         parallel  = TRUE                # run the bootstraps
)
```



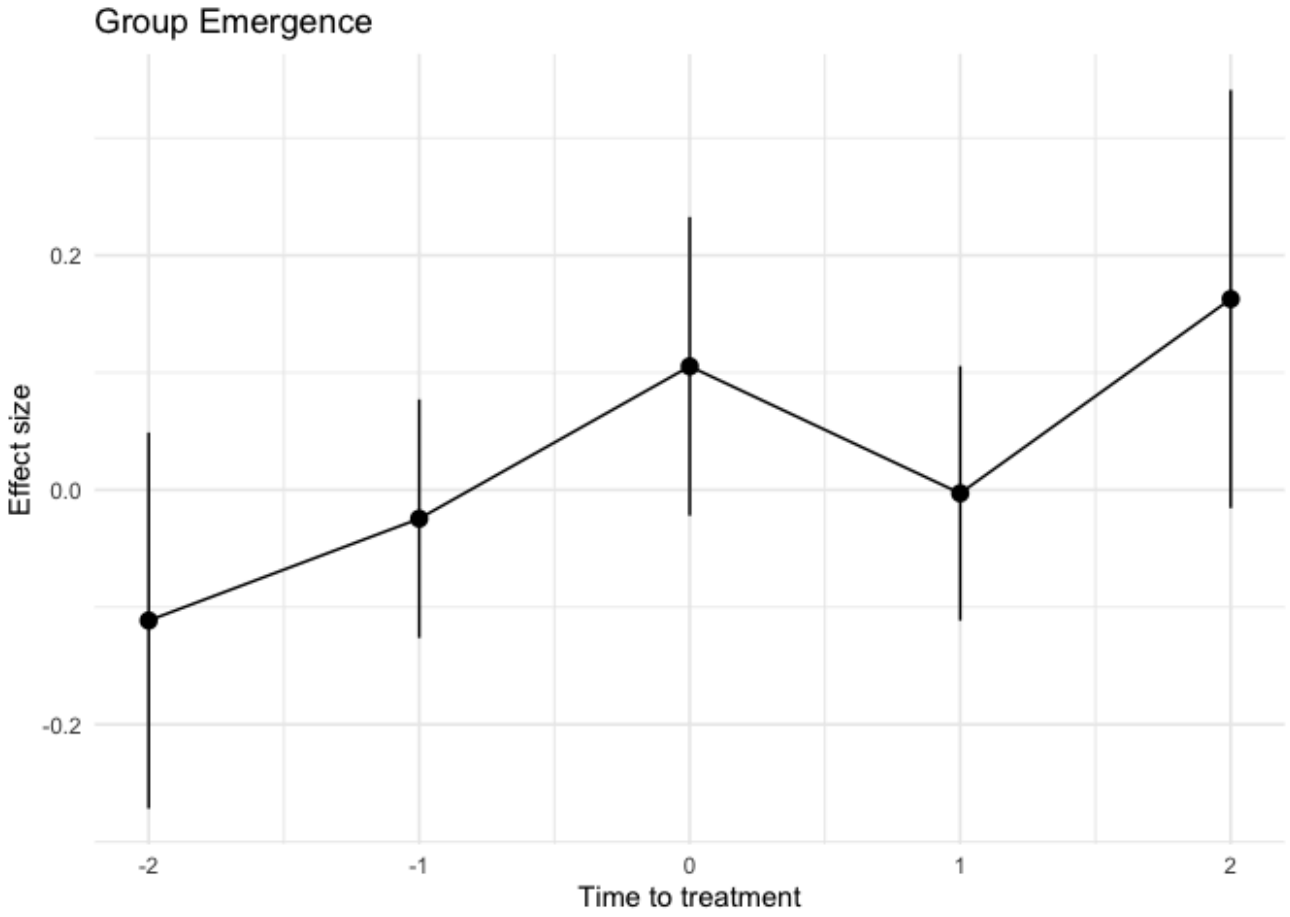

```
mod_small_td = tidy.did_multiplegt(mod_small)

mod_small_plot<-mod_small_td |>
  within({
    term = gsub("^placebo_", "-", term)
    term = gsub("^effect", "0", term)
    term = gsub("^dynamic_", "", term)
    term = as.integer(term)
  }) |>
  ggplot(aes(x = term, y = estimate, ymin = conf.low, ymax = conf.high)) +
  geom_pointrange() + geom_line()+
  labs(
    x = "Time to treatment", y = "Effect size", title = "Minor Groups",
    subtitle = "Chaisemartin and D'Haultfoeuille (2020)"
  )

mod_small_plot
```




```
#ggsave('output/cdh_minor.pdf', plot= mod_small_plot, height=5, width=6)

mod_emergence=did_multiplegt(
  mx_panel, 'emergence_small',
  'muni_id', 'year', 'kingpin_tr',
  controls=c('pan', 'log_mj', 'log_poppy'),# original regression params
  dynamic   = 2,                 # no. of post-treatment periods
  placebo   = 2,                 # no. of pre-treatment periods
  brep      = 1000,                 # no. of bootstraps (required for SEs)
  cluster   = 'muni_id',                # variable to cluster SEs on
  parallel  = TRUE                # run the bootstraps in parallel
)
```

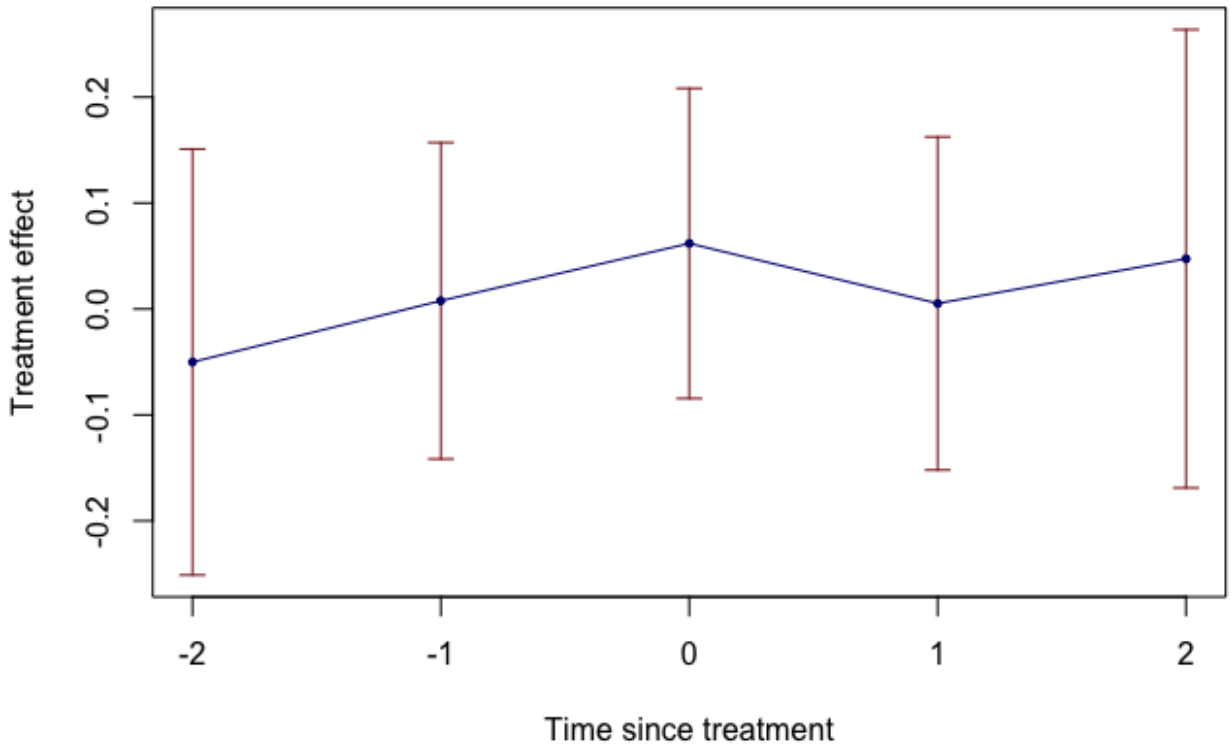



```
mod_emergence_td = tidy.did_multiplegt(mod_emergence)

mod_emergence_plot<-mod_emergence_td |>
  within({
    term = gsub("^placebo_", "-", term)
    term = gsub("^effect", "0", term)
    term = gsub("^dynamic_", "", term)
    term = as.integer(term)
  }) |>
  ggplot(aes(x = term, y = estimate, ymin = conf.low, ymax = conf.high)) +
  geom_pointrange() + geom_line()+
  labs(
    x = "Time to treatment", y = "Effect size", title = "Group Emergence"
  )

mod_emergence_plot
```

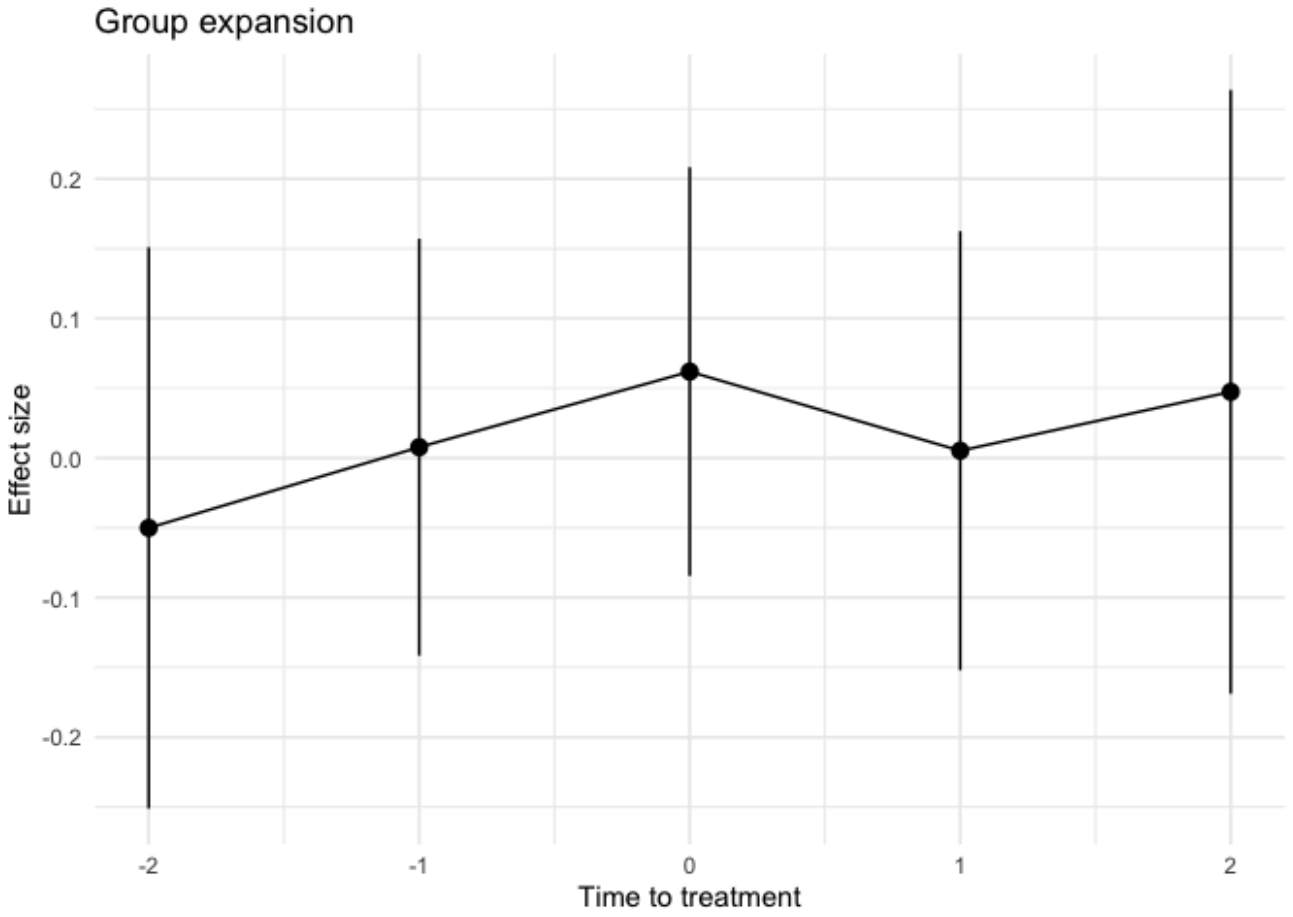



```
#ggsave('output/cdh_emergence.pdf', plot= mod_emergence_plot, height=5, width=
```

```
mod_expansion=did_multiplegt(
  mx_panel, 'expansion_small',
  'muni_id', 'year', 'kingpin_tr',
  controls=c('pan', 'log_mj', 'log_poppy'),# original regression params
  dynamic   = 2,                  # no. of post-treatment periods
  placebo   = 2,                  # no. of pre-treatment periods
  brep      = 1000,                  # no. of bootstraps (required for SEs)
  cluster   = 'muni_id',                 # variable to cluster SEs on
  parallel  = TRUE                 # run the bootstraps in parallel
)
```




```
mod_expansion_td = tidy.did_multiplegt(mod_expansion)

mod_expansion_plot<-mod_expansion_td |>
  within({
    term = gsub("^placebo_", "-", term)
    term = gsub("^effect", "0", term)
    term = gsub("^dynamic_", "", term)
    term = as.integer(term)
  }) |>
  ggplot(aes(x = term, y = estimate, ymin = conf.low, ymax = conf.high)) +
  geom_pointrange() + geom_line()+
  labs(
    x = "Time to treatment", y = "Effect size", title = "Group expansion"
  )

mod_expansion_plot
```




```
#ggsave('output/cdh_expansion.pdf', plot= mod_expansion_plot, height=5, width=


#######################################
####################Callaway Sant'Anna

#defining indicator
mx_panel$first_treat<-NA

for (munid in unique(mx_panel$muni_id[mx_panel$kingpin_tr==1])){
  print(munid)
  first_year<-min(mx_panel$year[mx_panel$kingpin_tr==1&mx_panel$muni_id==munic

  mx_panel$first_treat[mx_panel$muni_id==munid]<-first_year
}
#> [1] "Mexicali-Baja California"
#> [1] "Tecate-Baja California"
#> [1] "Tijuana-Baja California"
#> [1] "Acuna-Coahuila"
#> [1] "Monclova-Coahuila"
#> [1] "Piedras Negras-Coahuila"
#> [1] "Ramos Arizpe-Coahuila"
#> [1] "Saltillo-Coahuila"
#> [1] "Torreon-Coahuila"
```

```
#> [1] "Comitan de Dominguez-Chiapas"
#> [1] "Ahumada-Chihuahua"
#> [1] "Ascension-Chihuahua"
#> [1] "Juarez-Chihuahua"
#> [1] "Nuevo Casas Grandes-Chihuahua"
#> [1] "Apaseo el Alto-Guanajuato"
#> [1] "Acapulco de Juarez-Guerrero"
#> [1] "Chilpancingo de los Bravo-Guerrero"
#> [1] "Petatlan-Guerrero"
#> [1] "Atotonilco el Grande-Hidalgo"
#> [1] "Atotonilco de Tula-Hidalgo"
#> [1] "Guadalajara-Jalisco"
#> [1] "Valle de Juarez-Jalisco"
#> [1] "Huixquilucan-Mexico"
#> [1] "Toluca-Mexico"
#> [1] "Cuernavaca-Morelos"
#> [1] "Huitzilac-Morelos"
#> [1] "Tepoztlan-Morelos"
#> [1] "Xochitepec-Morelos"
#> [1] "Tepic-Nayarit"
#> [1] "Garcia-Nuevo Leon"
#> [1] "San Pedro Garza Garcia-Nuevo Leon"
#> [1] "General Escobedo-Nuevo Leon"
#> [1] "Monterrey-Nuevo Leon"
#> [1] "Puebla-Puebla"
#> [1] "Cozumel-Quintana Roo"
#> [1] "Benito Juarez-Quintana Roo"
#> [1] "San Luis Potosi-San Luis Potosi"
#> [1] "Culiacan-Sinaloa"
#> [1] "Centla-Tabasco"
#> [1] "Abasolo-Tamaulipas"
#> [1] "Altamira-Tamaulipas"
#> [1] "El Mante-Tamaulipas"
#> [1] "Matamoros-Tamaulipas"
#> [1] "Miguel Aleman-Tamaulipas"
#> [1] "Nuevo Laredo-Tamaulipas"
#> [1] "Reynosa-Tamaulipas"
#> [1] "San Fernando-Tamaulipas"
#> [1] "Victoria-Tamaulipas"
#> [1] "Soledad de Doblado-Veracruz"
#> [1] "Veracruz-Veracruz"
#> [1] "Quintana Roo-Yucatan"
#> [1] "Juchipila-Zacatecas"
#> [1] "Zacatecas-Zacatecas"
#> [1] "Aguascalientes-Aguascalientes"
#> [1] "Ensenada-Baja California"
#> [1] "Playas de Rosarito-Baja California"
#> [1] "Comondu-Baja California Sur"
#> [1] "La Paz-Baja California Sur"
```

```
#> [1] "Carmen-Campeche"
#> [1] "Allende-Coahuila"
#> [1] "Escobedo-Coahuila"
#> [1] "Morelos-Coahuila"
#> [1] "Nava-Coahuila"
#> [1] "Parras-Coahuila"
#> [1] "Sabinas-Coahuila"
#> [1] "San Pedro-Coahuila"
#> [1] "Villa Union-Coahuila"
#> [1] "Zaragoza-Coahuila"
#> [1] "Colima-Colima"
#> [1] "Manzanillo-Colima"
#> [1] "Tecoman-Colima"
#> [1] "Altamirano-Chiapas"
#> [1] "Palenque-Chiapas"
#> [1] "El Porvenir-Chiapas"
#> [1] "Reforma-Chiapas"
#> [1] "Tonala-Chiapas"
#> [1] "Aquiles Serdan-Chihuahua"
#> [1] "Bocoyna-Chihuahua"
#> [1] "Chihuahua-Chihuahua"
#> [1] "Guadalupe-Chihuahua"
#> [1] "Hidalgo del Parral-Chihuahua"
#> [1] "Jimenez-Chihuahua"
#> [1] "Praxedis G. Guerrero-Chihuahua"
#> [1] "Gustavo A. Madero-CDMX"
#> [1] "Alvaro Obregon-CDMX"
#> [1] "Durango-Durango"
#> [1] "Gomez Palacio-Durango"
#> [1] "Lerdo-Durango"
#> [1] "Santiago Papasquiaro-Durango"
#> [1] "Vicente Guerrero-Durango"
#> [1] "Nuevo Ideal-Durango"
#> [1] "Celaya-Guanajuato"
#> [1] "Guanajuato-Guanajuato"
#> [1] "Leon-Guanajuato"
#> [1] "Salamanca-Guanajuato"
#> [1] "Zihuatanejo de Azueta-Guerrero"
#> [1] "Taxco de Alarcon-Guerrero"
#> [1] "Tecpan de Galeana-Guerrero"
#> [1] "Actopan-Hidalgo"
#> [1] "Ajacuba-Hidalgo"
#> [1] "Alfajayucan-Hidalgo"
#> [1] "El Arenal-Hidalgo"
#> [1] "Atitalaquia-Hidalgo"
#> [1] "Atlapexco-Hidalgo"
#> [1] "Chapantongo-Hidalgo"
#> [1] "Chilcuautla-Hidalgo"
#> [1] "Francisco I. Madero-Hidalgo"
```

```
#> [1] "Huautla-Hidalgo"
#> [1] "Huazalingo-Hidalgo"
#> [1] "Huejutla de Reyes-Hidalgo"
#> [1] "Huichapan-Hidalgo"
#> [1] "Ixmiquilpan-Hidalgo"
#> [1] "Jaltocan-Hidalgo"
#> [1] "Mineral del Chico-Hidalgo"
#> [1] "Mixquiahuala de Juarez-Hidalgo"
#> [1] "Nopala de Villagran-Hidalgo"
#> [1] "San Felipe Orizatlan-Hidalgo"
#> [1] "Pachuca de Soto-Hidalgo"
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#> [1] "Chilchota-Michoacan"
#> [1] "Chinicuila-Michoacan"
#> [1] "Churintzio-Michoacan"
#> [1] "Erongaricuaro-Michoacan"
#> [1] "Hidalgo-Michoacan"
#> [1] "Huandacareo-Michoacan"
#> [1] "Lagunillas-Michoacan"
#> [1] "Marcos Castellanos-Michoacan"
#> [1] "Nahuatzen-Michoacan"
#> [1] "Nuevo Parangaricutiro-Michoacan"
#> [1] "Ocampo-Michoacan"
#> [1] "Paracho-Michoacan"
#> [1] "Patzcuaro-Michoacan"
#> [1] "Periban-Michoacan"
#> [1] "La Piedad-Michoacan"
#> [1] "Puruandiro-Michoacan"
#> [1] "Los Reyes-Michoacan"
#> [1] "Tancitaro-Michoacan"
#> [1] "Tangamandapio-Michoacan"
#> [1] "Tangancicuaro-Michoacan"
#> [1] "Tingambato-Michoacan"
#> [1] "Tzintzuntzan-Michoacan"
```
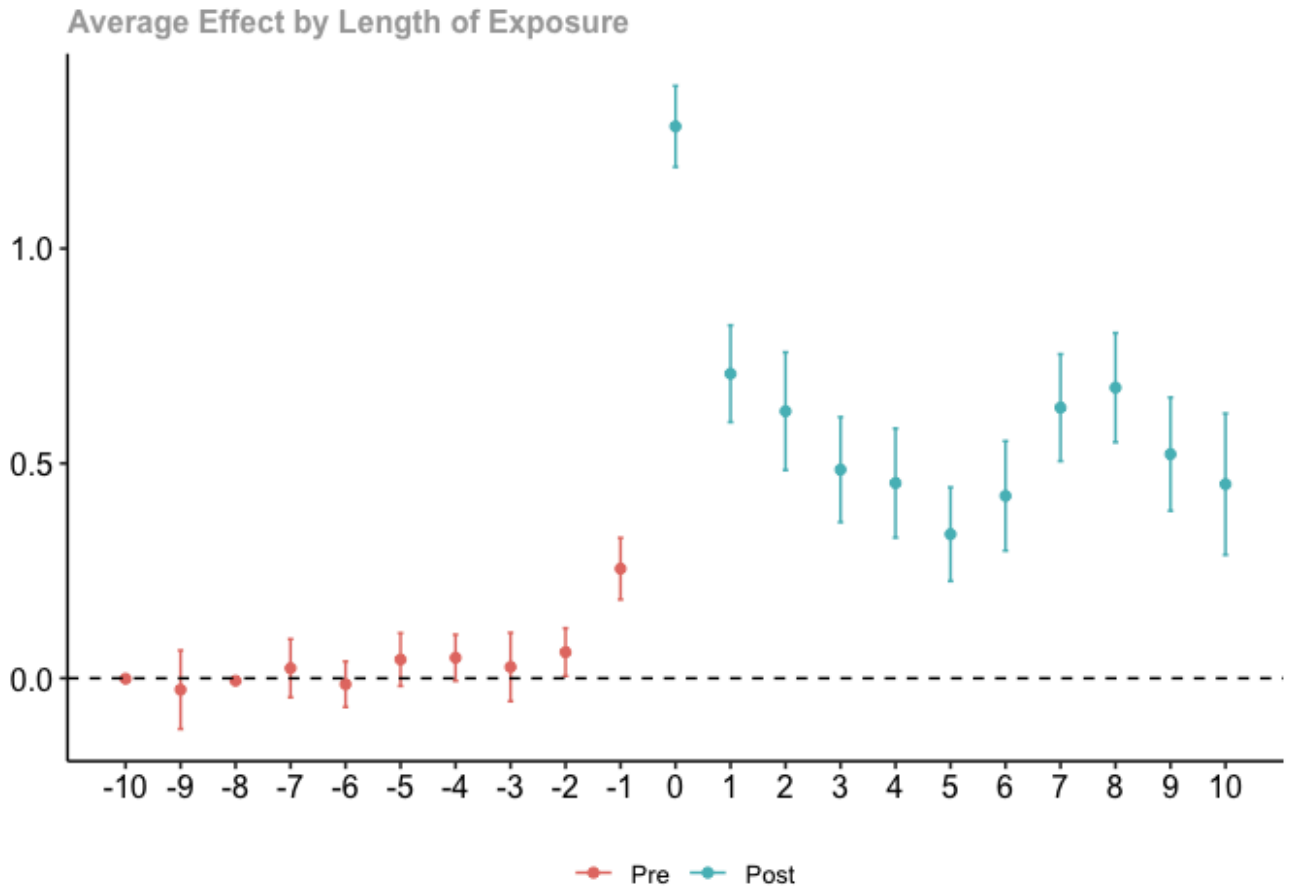

```
#> [1] "Vista Hermosa-Michoacan"
#> [1] "Zacapu-Michoacan"
#> [1] "Ziracuaretiro-Michoacan"
#> [1] "Hidalgo-Nuevo Leon"
#> [1] "San Miguel Soyaltepec-Oaxaca"
#> [1] "Hueyapan-Puebla"
#> [1] "Colon-Queretaro"
#> [1] "Felipe Carrillo Puerto-Quintana Roo"
#> [1] "Acultzingo-Veracruz"
#> [1] "Aquila-Veracruz"
#> [1] "Omealca-Veracruz"
#> [1] "Los Reyes-Veracruz"
#> [1] "General Panfilo Natera-Zacatecas"
#> [1] "Cuatro Cienegas-Coahuila"
#> [1] "Benito Juarez-CDMX"
#> [1] "Atarjea-Guanajuato"
#> [1] "Comonfort-Guanajuato"
#> [1] "Cortazar-Guanajuato"
#> [1] "Doctor Mora-Guanajuato"
#> [1] "Dolores Hidalgo Cuna de la Independencia Nacional-Guanajuato"
#> [1] "Jaral del Progreso-Guanajuato"
#> [1] "San Diego de la Union-Guanajuato"
#> [1] "San Jose Iturbide-Guanajuato"
#> [1] "San Luis de la Paz-Guanajuato"
#> [1] "Santa Catarina-Guanajuato"
#> [1] "Santa Cruz de Juventino Rosas-Guanajuato"
#> [1] "Santiago Maravatio-Guanajuato"
#> [1] "Tarimoro-Guanajuato"
#> [1] "Tierra Blanca-Guanajuato"
#> [1] "Victoria-Guanajuato"
#> [1] "Xichu-Guanajuato"
#> [1] "Ayutla de los Libres-Guerrero"
#> [1] "Azoyu-Guerrero"
#> [1] "Benito Juarez-Guerrero"
#> [1] "Copala-Guerrero"
#> [1] "Cuajinicuilapa-Guerrero"
#> [1] "Cuautepec-Guerrero"
#> [1] "Florencio Villarreal-Guerrero"
#> [1] "Iguala de la Independencia-Guerrero"
#> [1] "Igualapa-Guerrero"
#> [1] "Juan R. Escudero-Guerrero"
#> [1] "Ometepec-Guerrero"
#> [1] "San Luis Acatlan-Guerrero"
#> [1] "San Marcos-Guerrero"
#> [1] "Tecoanapa-Guerrero"
#> [1] "Tlacoachistlahuaca-Guerrero"
#> [1] "Xochistlahuaca-Guerrero"
#> [1] "Marquelia-Guerrero"
#> [1] "Juchitan-Guerrero"
```

```
#> [1] "San Sebastian del Oeste-Jalisco"
#> [1] "Cosolapa-Oaxaca"
#> [1] "Acateno-Puebla"
#> [1] "Antiguo Morelos-Tamaulipas"
#> [1] "Nuevo Morelos-Tamaulipas"
#> [1] "Ocampo-Tamaulipas"
#> [1] "Amatlan de los Reyes-Veracruz"
#> [1] "Angel R. Cabada-Veracruz"
#> [1] "Coatzintla-Veracruz"
#> [1] "Lerdo de Tejada-Veracruz"
#> [1] "Papantla-Veracruz"
#> [1] "Tezonapa-Veracruz"
#> [1] "Tihuatlan-Veracruz"
#> [1] "Mulege-Baja California Sur"
#> [1] "Loreto-Baja California Sur"
#> [1] "Chinipas-Chihuahua"
#> [1] "Iztapalapa-CDMX"
#> [1] "Penjamo-Guanajuato"
#> [1] "Purisima del Rincon-Guanajuato"
#> [1] "San Francisco del Rincon-Guanajuato"
#> [1] "Silao de la Victoria-Guanajuato"
#> [1] "Valle de Santiago-Guanajuato"
#> [1] "Acatlan de Juarez-Jalisco"
#> [1] "Atemajac de Brizuela-Jalisco"
#> [1] "Casimiro Castillo-Jalisco"
#> [1] "Encarnacion de Diaz-Jalisco"
#> [1] "El Grullo-Jalisco"
#> [1] "Guachinango-Jalisco"
#> [1] "Jamay-Jalisco"
#> [1] "Villa Purificacion-Jalisco"
#> [1] "El Salto-Jalisco"
#> [1] "San Miguel el Alto-Jalisco"
#> [1] "Tapalpa-Jalisco"
#> [1] "Tonala-Jalisco"
#> [1] "Zacoalco de Torres-Jalisco"
#> [1] "Zapotlanejo-Jalisco"
#> [1] "Ecuandureo-Michoacan"
#> [1] "Ixtlan-Michoacan"
#> [1] "Tanhuato-Michoacan"
#> [1] "Venustiano Carranza-Michoacan"
#> [1] "Villamar-Michoacan"
#> [1] "Elota-Sinaloa"
#> [1] "Nogales-Veracruz"
#> [1] "Tonayan-Veracruz"
#> [1] "Zongolica-Veracruz"
#> [1] "Balleza-Chihuahua"
#> [1] "Madera-Chihuahua"
#> [1] "Rosario-Chihuahua"
#> [1] "Tlahuac-CDMX"
```

```
#> [1] "Miguel Hidalgo-CDMX"
#> [1] "San Lorenzo-Oaxaca"
#> [1] "Villa Juarez-San Luis Potosi"
#> [1] "Tulum-Quintana Roo"
#> [1] "Agua Dulce-Veracruz"
#> [1] "Ojocaliente-Zacatecas"
#> [1] "Carichi-Chihuahua"
#> [1] "Gomez Farias-Chihuahua"
#> [1] "Guerrero-Chihuahua"
#> [1] "Ignacio Zaragoza-Chihuahua"
#> [1] "Maguarichi-Chihuahua"
#> [1] "Moris-Chihuahua"
#> [1] "Nonoava-Chihuahua"
#> [1] "Ocampo-Chihuahua"
#> [1] "San Francisco de Conchos-Chihuahua"
#> [1] "Santa Barbara-Chihuahua"
#> [1] "Temosachic-Chihuahua"
#> [1] "Venustiano Carranza-CDMX"
#> [1] "La Huerta-Jalisco"
#> [1] "Atizapan-Mexico"
#> [1] "Nicolas Romero-Mexico"
#> [1] "Tlalnepantla de Baz-Mexico"
#> [1] "Tultepec-Mexico"
#> [1] "Tultitlan-Mexico"
#> [1] "Jojutla-Morelos"
#> [1] "Othon P. Blanco-Quintana Roo"
#> [1] "Bavispe-Sonora"
#> [1] "Huatabampo-Sonora"
#> [1] "Imuris-Sonora"
#> [1] "San Carlos-Tamaulipas"
#> [1] "Acapetahua-Chiapas"
#> [1] "Angel Albino Corzo-Chiapas"
#> [1] "Arriaga-Chiapas"
#> [1] "Cintalapa-Chiapas"
#> [1] "Frontera Comalapa-Chiapas"
#> [1] "Frontera Hidalgo-Chiapas"
#> [1] "Mapastepec-Chiapas"
#> [1] "Motozintla-Chiapas"
#> [1] "Pijijiapan-Chiapas"
#> [1] "Villa Comaltitlan-Chiapas"
#> [1] "Siltepec-Chiapas"
#> [1] "Pueblo Nuevo-Guanajuato"
#> [1] "Villa de Ramos-San Luis Potosi"
#> [1] "Cucurpe-Sonora"
#> [1] "Mazatan-Sonora"
#> [1] "Santa Cruz-Sonora"
#> [1] "General Francisco R. Murguia-Zacatecas"
#> [1] "Juan Aldama-Zacatecas"
#> [1] "Loreto-Zacatecas"
```

```
#> [1] "Mazapil-Zacatecas"
#> [1] "Miguel Auza-Zacatecas"

mx_panel$first_treat[is.na(mx_panel$first_treat)]<-0

mx_panel$muni_numeric<-as.numeric(as.factor(mx_panel$muni_id))

dominant_attgt <- att_gt(yname = "dominant",
                         tname = "year",
                         idname = "muni_numeric",
                         gname = "first_treat",
                         data = mx_panel
)
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#> dropped 84 rows from original data due to missing data
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#> Dropped 53 units that were already treated in the first period.
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#>   Check groups: 2018.
#> Warning in att_gt(yname = "dominant", tname = "year", idname = "muni_numeri
#> : Not returning pre-test Wald statistic due to singular covariance matrix
#> Warning in att_gt(yname = "dominant", tname = "year", idname = "muni_numeri
#> : Simultaneous critical value is arguably `too large' to be realible. This
#> usually happens when number of observations per group is small and/or there
#> no much variation in outcomes.

dominant.es <- aggte(dominant_attgt, type = "dynamic")
summary(dominant.es)
#>
#> Call:
#> aggte(MP = dominant_attgt, type = "dynamic")
#>
#> Reference: Callaway, Brantly and Pedro H.C. Sant'Anna.  "Difference-in-Diff
#>
#>
#> Overall summary of ATT's based on event-study/dynamic aggregation:
#>     ATT    Std. Error     [ 95%  Conf. Int.]
#>  0.5993        0.0302     0.5402      0.6584 *
#>
#>
#> Dynamic Effects:
#>  Event time Estimate Std. Error [95% Simult.  Conf. Band]
#>         -10  -0.0012     0.0009       -0.0037      0.0013
#>          -9  -0.0267     0.0320       -0.1182      0.0648
#>          -8  -0.0060     0.0014       -0.0099     -0.0020 *
#>          -7   0.0233     0.0237       -0.0445      0.0911
#>          -6  -0.0140     0.0186       -0.0671      0.0392
#>          -5   0.0434     0.0215       -0.0181      0.1050
#>          -4   0.0476     0.0188       -0.0062      0.1015
```

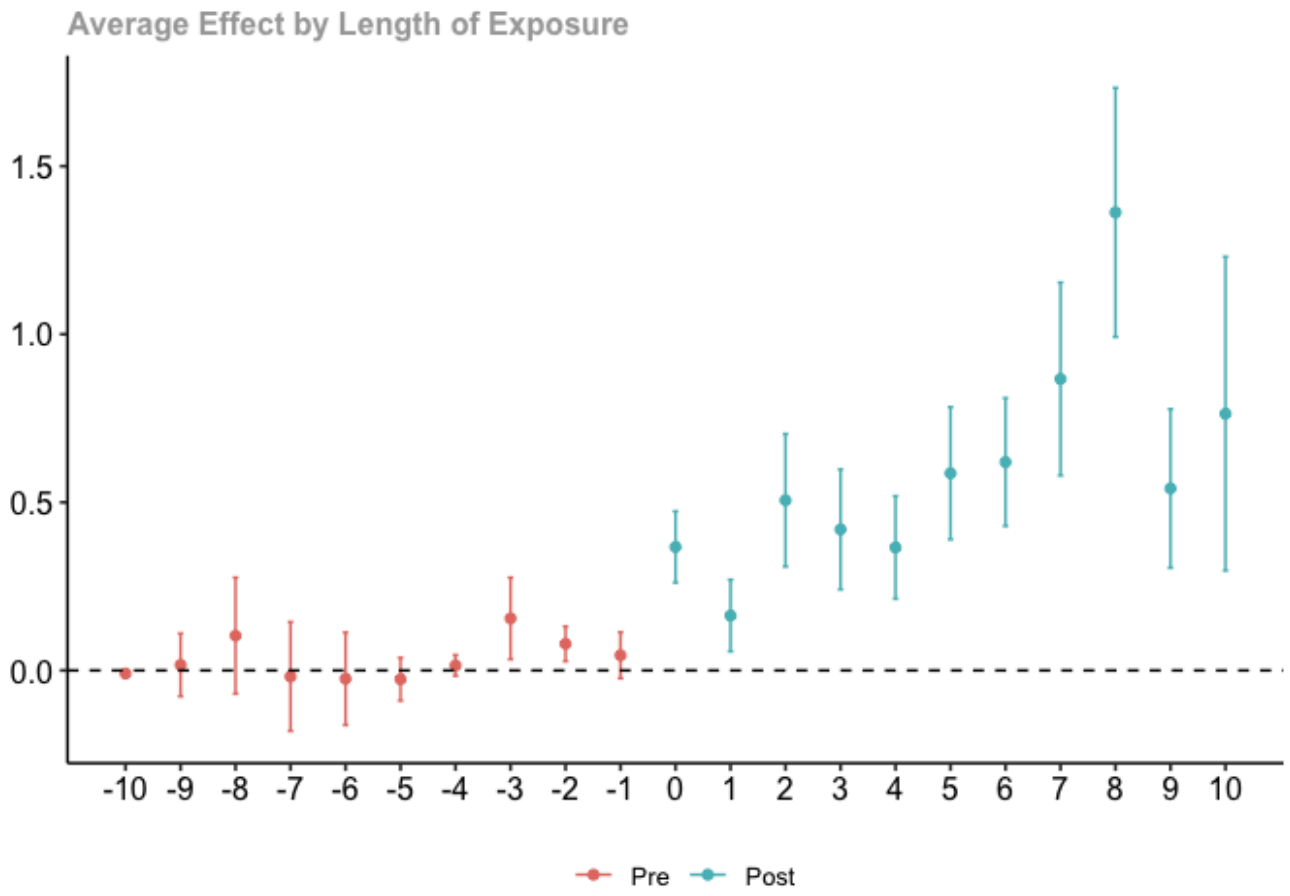
```
#>          -3   0.0261     0.0278       -0.0537      0.1058
#>          -2   0.0607     0.0194        0.0050      0.1164 *
#>          -1   0.2549     0.0251        0.1831      0.3267 *
#>           0   1.2841     0.0330        1.1897      1.3785 *
#>           1   0.7086     0.0394        0.5959      0.8213 *
#>           2   0.6215     0.0479        0.4843      0.7586 *
#>           3   0.4854     0.0427        0.3631      0.6078 *
#>           4   0.4542     0.0444        0.3271      0.5813 *
#>           5   0.3352     0.0381        0.2261      0.4443 *
#>           6   0.4243     0.0445        0.2968      0.5519 *
#>           7   0.6297     0.0435        0.5052      0.7542 *
#>           8   0.6763     0.0444        0.5491      0.8034 *
#>           9   0.5215     0.0461        0.3896      0.6535 *
#>          10   0.4516     0.0575        0.2870      0.6162 *
#> ---
#> Signif. codes: `*' confidence band does not cover 0
#>
#> Control Group:  Never Treated,  Anticipation Periods:  0
#> Estimation Method:  Doubly Robust

att<-dominant.es$overall.att
seatt<-dominant.es$overall.se

sac<-data.frame(cbind(att, seatt))
sac$outcome<-'Major'

ggdid(dominant.es)
```




```
#ggsave('output/major_did.pdf', plot= ggdid(dominant.es), height=6, width=8)
```

```
small_attgt <- att_gt(yname = "small_groups",
                      tname = "year",
                      idname = "muni_numeric",
                      gname = "first_treat",
                      data = mx_panel
)
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#> dropped 84 rows from original data due to missing data
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#> Dropped 53 units that were already treated in the first period.
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#>   Check groups: 2018.
#> Warning in att_gt(yname = "small_groups", tname = "year", idname =
#> "muni_numeric", : Not returning pre-test Wald statistic due to singular
#> covariance matrix
#> Warning in att_gt(yname = "small_groups", tname = "year", idname =
#> "muni_numeric", : Simultaneous critical value is arguably `too large' to be
#> realible. This usually happens when number of observations per group is sma
#> and/or there is no much variation in outcomes.

small.es <- aggte(small_attgt, type = "dynamic")
```

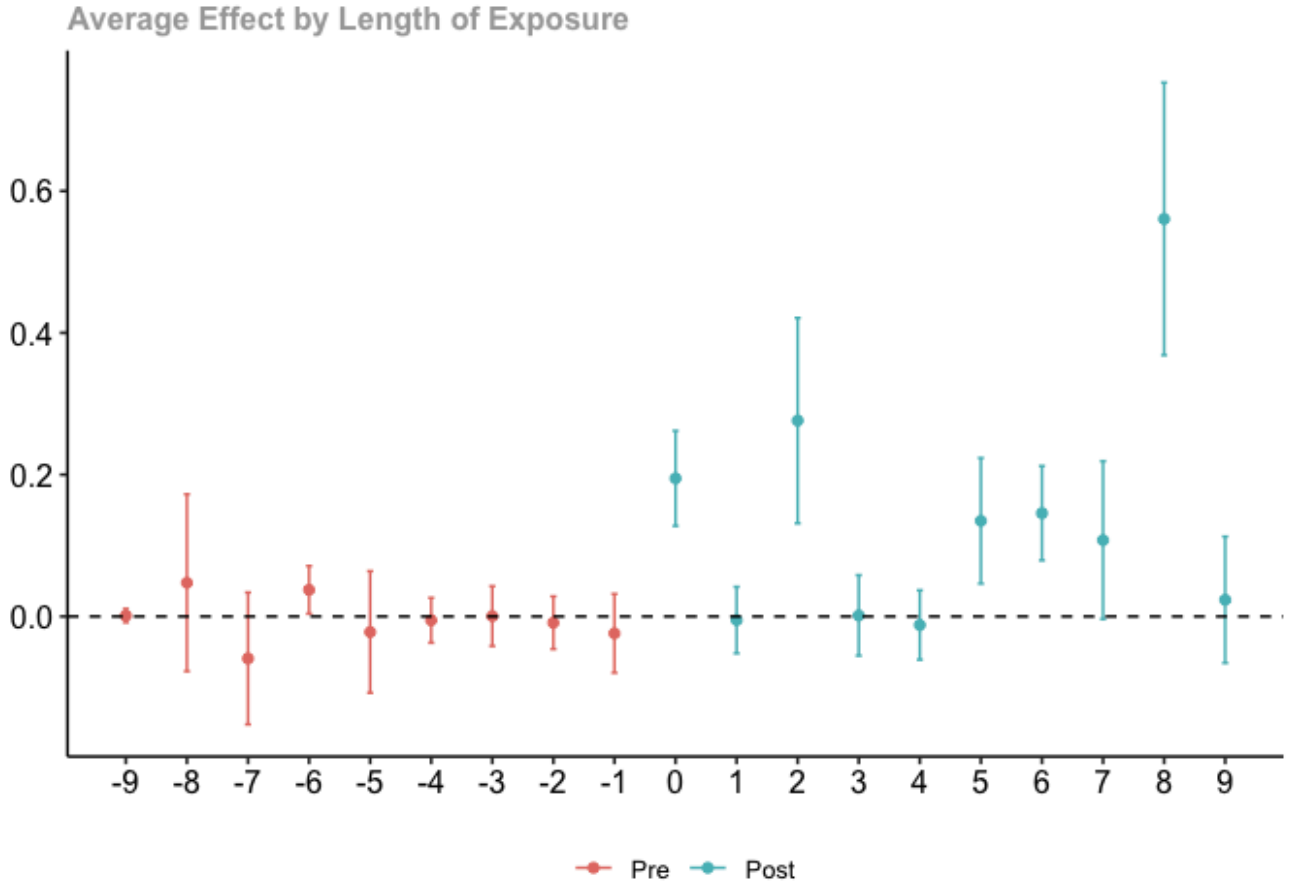
```
att<-small.es$overall.att
seatt<-small.es$overall.se

sac_new<-data.frame(cbind(att, seatt))
sac_new$outcome<-'Minor'

sac<-rbind(sac, sac_new)

ggdid(small.es)
```




```
#ggsave('output/minor_did.pdf', plot= ggdid(small.es), height=6, width=8)


emergence_attgt <- att_gt(yname = "emergence_small",
                          tname = "year",
                          idname = "muni_numeric",
                          gname = "first_treat",
                          data = mx_panel
)
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#> dropped 2541 rows from original data due to missing data
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#> Dropped 242 units that were already treated in the first period.
```

```
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#>   Check groups: 2018.
#> Warning in att_gt(yname = "emergence_small", tname = "year", idname =
#> "muni_numeric", : Not returning pre-test Wald statistic due to singular
#> covariance matrix
#> Warning in att_gt(yname = "emergence_small", tname = "year", idname =
#> "muni_numeric", : Simultaneous critical value is arguably `too large' to be
#> realible. This usually happens when number of observations per group is sma
#> and/or there is no much variation in outcomes.

emergence.es <- aggte(emergence_attgt, type = "dynamic")
summary(emergence.es)
#>
#> Call:
#> aggte(MP = emergence_attgt, type = "dynamic")
#>
#> Reference: Callaway, Brantly and Pedro H.C. Sant'Anna.  "Difference-in-Diff
#>
#>
#> Overall summary of ATT's based on event-study/dynamic aggregation:
#>     ATT    Std. Error     [ 95%  Conf. Int.]
#>  0.1428        0.0171     0.1092      0.1763 *
#>
#>
#> Dynamic Effects:
#>  Event time Estimate Std. Error [95% Simult.  Conf. Band]
#>          -9   0.0012     0.0035       -0.0084      0.0108
#>          -8   0.0475     0.0454       -0.0774      0.1724
#>          -7  -0.0593     0.0338       -0.1523      0.0338
#>          -6   0.0375     0.0122        0.0038      0.0712 *
#>          -5  -0.0219     0.0312       -0.1078      0.0639
#>          -4  -0.0054     0.0115       -0.0371      0.0263
#>          -3   0.0004     0.0153       -0.0418      0.0426
#>          -2  -0.0089     0.0135       -0.0461      0.0283
#>          -1  -0.0239     0.0202       -0.0795      0.0318
#>           0   0.1948     0.0244        0.1277      0.2618 *
#>           1  -0.0051     0.0170       -0.0520      0.0417
#>           2   0.2763     0.0526        0.1314      0.4211 *
#>           3   0.0015     0.0206       -0.0553      0.0583
#>           4  -0.0121     0.0178       -0.0610      0.0369
#>           5   0.1349     0.0322        0.0463      0.2235 *
#>           6   0.1456     0.0242        0.0791      0.2122 *
#>           7   0.1076     0.0405       -0.0037      0.2190
#>           8   0.5607     0.0698        0.3685      0.7529 *
#>           9   0.0235     0.0324       -0.0656      0.1127
#> ---
#> Signif. codes: `*' confidence band does not cover 0
#>
#> Control Group:  Never Treated,  Anticipation Periods:  0
```

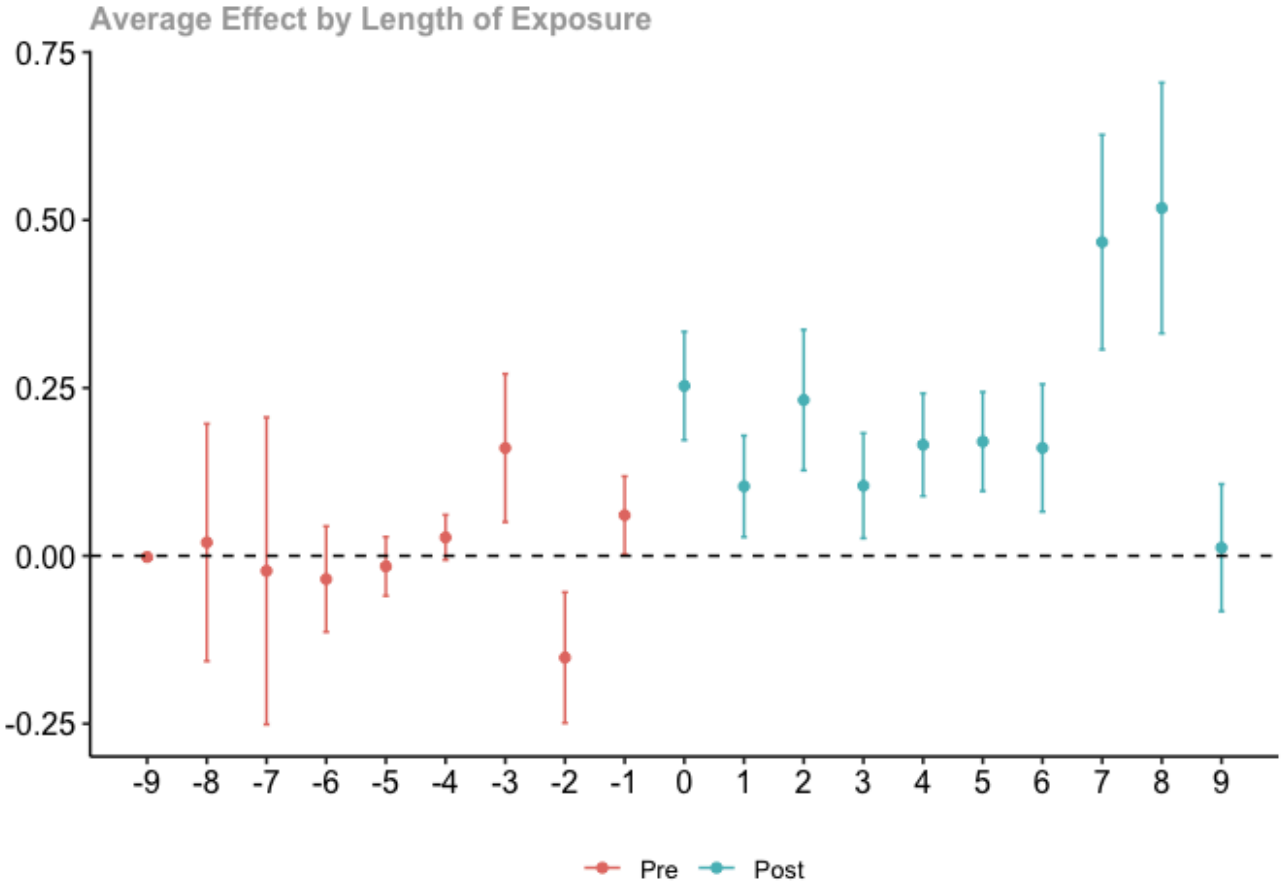
```
#> Estimation Method:  Doubly Robust

att<-emergence.es$overall.att
seatt<-emergence.es$overall.se

sac_new<-data.frame(cbind(att, seatt))
sac_new$outcome<-'Emergence'

sac<-rbind(sac, sac_new)

ggdid(emergence.es)
```




```
#ggsave('output/emergence_did.pdf', plot= ggdid(emergence.es), height=6, width


expansion_attgt <- att_gt(yname = "expansion_small",
                          tname = "year",
                          idname = "muni_numeric",
                          gname = "first_treat",
                          data = mx_panel
)
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#> dropped 2541 rows from original data due to missing data
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
```

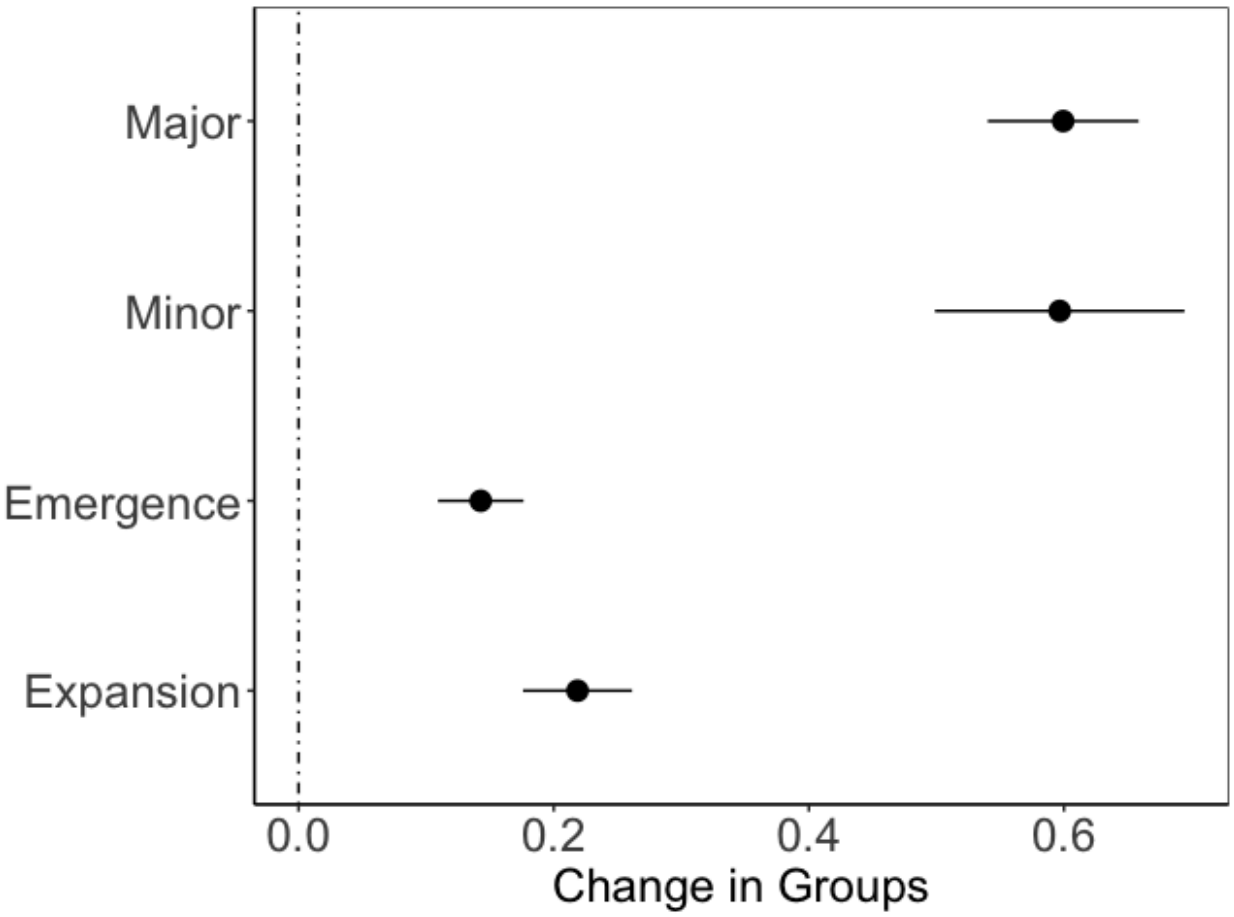
```
#> Dropped 242 units that were already treated in the first period.
#> Warning in pre_process_did(yname = yname, tname = tname, idname = idname, :
#>   Check groups: 2018.
#> Warning in att_gt(yname = "expansion_small", tname = "year", idname =
#> "muni_numeric", : Not returning pre-test Wald statistic due to singular
#> covariance matrix
#> Warning in att_gt(yname = "expansion_small", tname = "year", idname =
#> "muni_numeric", : Simultaneous critical value is arguably `too large' to be
#> realible. This usually happens when number of observations per group is sma
#> and/or there is no much variation in outcomes.
expansion.es <- aggte(expansion_attgt, type = "dynamic")
summary(expansion.es)
#>
#> Call:
#> aggte(MP = expansion_attgt, type = "dynamic")
#>
#> Reference: Callaway, Brantly and Pedro H.C. Sant'Anna.  "Difference-in-Diff
#>
#>
#> Overall summary of ATT's based on event-study/dynamic aggregation:
#>     ATT    Std. Error     [ 95%  Conf. Int.]
#>  0.2186        0.0218     0.1759      0.2614 *
#>
#>
#> Dynamic Effects:
#>  Event time Estimate Std. Error [95% Simult.  Conf. Band]
#>          -9  -0.0018     0.0018       -0.0066      0.0031
#>          -8   0.0199     0.0648       -0.1568      0.1967
#>          -7  -0.0224     0.0839       -0.2511      0.2063
#>          -6  -0.0346     0.0289       -0.1133      0.0441
#>          -5  -0.0157     0.0161       -0.0596      0.0283
#>          -4   0.0274     0.0123       -0.0062      0.0610
#>          -3   0.1606     0.0405        0.0503      0.2709 *
#>          -2  -0.1516     0.0357       -0.2489     -0.0543 *
#>          -1   0.0605     0.0213        0.0026      0.1184 *
#>           0   0.2531     0.0296        0.1723      0.3338 *
#>           1   0.1035     0.0277        0.0280      0.1790 *
#>           2   0.2320     0.0384        0.1273      0.3367 *
#>           3   0.1044     0.0287        0.0262      0.1826 *
#>           4   0.1654     0.0281        0.0889      0.2419 *
#>           5   0.1702     0.0271        0.0963      0.2440 *
#>           6   0.1607     0.0348        0.0658      0.2556 *
#>           7   0.4672     0.0587        0.3072      0.6271 *
#>           8   0.5179     0.0685        0.3313      0.7046 *
#>           9   0.0121     0.0348       -0.0826      0.1068
#> ---
#> Signif. codes: `*' confidence band does not cover 0
#>
#> Control Group:  Never Treated,  Anticipation Periods:  0
```

```
#> Estimation Method:  Doubly Robust

att<-expansion.es$overall.att
seatt<-expansion.es$overall.se

sac_new<-data.frame(cbind(att, seatt))
sac_new$outcome<-'Expansion'

sac<-rbind(sac, sac_new)

ggdid(expansion.es)
```




```
#ggsave('output/expansion_did.pdf', plot= ggdid(expansion.es), height=6, width


sac$ylow<-sac$att-sac$seatt*1.96
sac$yhigh<-sac$att+sac$seatt*1.96

sac$outcome<-factor(sac$outcome, c('Major', 'Minor', 'Emergence',
                                   'Expansion'))

#look of plot
coef_plot_base<-ggplot()+  theme_bw()+
  coord_flip()+  scale_y_continuous(name='Change in Groups')+
```

```
  theme(plot.title = element_text(hjust = 0.5, size=20),
        text = element_text(size=18),
        axis.text=element_text(size=18),
        legend.position='none')+
  theme(panel.grid.major = element_blank(), panel.grid.minor = element_blank()
        panel.background = element_blank(), axis.line = element_line(colour =
  scale_linetype_discrete(name='', guide=guide_legend())+
  xlab("")+  geom_hline(aes(yintercept=0), lty=4)+
  scale_shape_discrete(name='', guide=guide_legend())



callaway<-coef_plot_base+geom_pointrange(data=sac, aes(x=outcome, y=att, ymin=
                                                       position=position_dodge(width=.4), si
  scale_x_discrete(limits=rev)

callaway
```




```
#ggsave('output/callaway_att.pdf', plot= callaway, height=6, width=8)
```

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