The Multi100 Project:

Task 02

23 February 2023

Contents

1 Introduction

This Markdown file contains the code used to reanalyse the findings presented in the paper "The Beheading of Criminal Organizations and the Dynamics of Violence in Mexico" by Calderón et al. (2015). My analyst ID is `9EFM2_2`, and the paper ID is `Caldero_n_JournConflictRes_2015_Nv99`. The instructions for this task are: "*Your analysis should produce a single, main result in terms of statistical families of z-, t-, F-, or X^2 tests (or their alternative or non-parametric versions). You should be as inclusive as possible regarding your sample choice. You should disregard spillover effects in neighbouring municipalities in your analysis. You should disregard strategic features of the municipalities in your analysis.*" The article files can be accessed at `https://osf.io/bsv24/?view_only=84df9267c74b482fa3cf2f4dc611ee48`.

As requested, I have focused exclusively on the main results presented in the paper, the effect of government interventions on violence in treated municipalities. I have also included Ciudad Juárez, the most violent city in the dataset (*idunico* = 8037), in the analysis (Calderón et al. 2015, 9). I have

used negative binomials regressions both with and without the weights provided by the authors. The analyses presented here were conducted using Stata 15 and the `Statamarkdown` package for `R` (R Core Team 2022).

The findings suggest that removing the leader of a criminal organization can decrease violence, but only in the weighted sample (model 03). After the capture, there was a significant impact on both homicides associated with drug trafficking and the general population for up to six months ($z = 2.47$ and $z = 2.41$, respectively). However, the effect was not significant in the period between six and twelve months, as in the original paper.

2 Reanalysis

Here, I am sharing the code used to reanalyze the results from the paper. The first model assesses the impact of leadership capture on homicides that are potentially associated with drug trafficking. The second model examines the same effect but incorporates the weights estimated by the authors. Both models feature Ciudad Juárez. The original findings are presented in Table 02 of the paper (Calderón et al. 2015, 18).

To start the analysis, I load the data and install the required packages.

```
# Install necessary packages
r <- getOption("repos")
r["CRAN"] <- "https://cran.rstudio.com/"
options(repos = r)


# List of packages
packages <- c("devtools", "knitr", "rmarkdown", "tidyverse")


installed_packages <- packages %in% rownames(installed.packages())
if (any(installed_packages == FALSE)) {
  install.packages(packages[!installed_packages])
}
invisible(lapply(packages, library, character.only = TRUE))
```

```
# Install and load Statamarkdown
devtools::install_github("Hemken/Statamarkdown")
library(Statamarkdown)
```

The first two models are presented below. Results indicate that the unweighted model did not find a significant effect of leadership captures on homicides among young males. In contrast, the weighted model showed a significant effect, but this effect was only significant in the first six months following leadership capture.

```
// Load data
sysuse ./replication.data.beheadings.march.15.dta, clear
tsset idunico date
set matsize 11000

// Table 02: Upper Panel

// Model 01

quiet xi: nbreg d_homi_male_15_39 pob_male_15_39 i.date i.idunico lpub_after06 ///
lpub_after612 lpub_after12 lieupub_after06 lieupub_after612 lieupub_after12 ///
if treat_leader==1 & date>=563 & date<=611, vce(cluster idunico)

estimates table, keep(lpub_after06 lpub_after612 lpub_after12 lieupub_after06 ///
lieupub_after612 lieupub_after12) b(%9.3fc) se(%9.3fc) t(%9.3fc) p(%9.3fc) style(columns)
ereturn list
```

```
       panel variable:  idunico (strongly balanced)
        time variable:  date, 456 to 611
                delta:  1 unit
```

Variable	active
lpub_after06	0.097
	0.159
	0.611
	0.541
lpub_aft~612	-0.250
	0.274
	-0.914
	0.361
lpub_after12	-0.672
	0.360
	-1.864
	0.062
lieupub_a~06	-0.105
	0.116
	-0.903
	0.367
lieupub_~612	0.181
	0.131
	1.382
	0.167
lieupub_~r12	0.313
	0.284
	1.102
	0.270

```
            legend: b/se/t/p


scalars:
               e(r2_p) =  .301195010232103
                  e(p) =  .
               e(chi2) =  .
               e(df_m) =  11
              e(rank0) =  2
               e(ll_0) =  -2402.803724273839
         e(k_eq_model) =  1
                 e(ll) =  -1679.091231955445
            e(N_clust) =  14
                 e(rc) =  0
          e(converged) =  1
               e(k_dv) =  1
               e(k_eq) =  2
                  e(k) =  2604
                 e(ic) =  6
                  e(N) =  686
               e(rank) =  13
              e(alpha) =  .1713999900109264
              e(k_aux) =  1


macros:
            e(cmdline) : "nbreg d_homi_male_15_39 pob_male_15_39 _Idate_* _Iid.."
                e(cmd) : "nbreg"
            e(predict) : "nbreg_p"
            e(dispers) : "mean"
           e(chi2type) : "Wald"
```

```
                e(opt) : "moptimize"
            e(vcetype) : "Robust"
            e(clustvar) : "idunico"
                e(vce) : "cluster"
              e(title) : "Negative binomial regression"
               e(user) : "nbreg_lf"
          e(ml_method) : "e2"
          e(technique) : "nr"
              e(which) : "max"
             e(depvar) : "d_homi_male_15_39"
         e(properties) : "b V"

matrices:
                  e(b) :  1 x 2604
                  e(V) :  2604 x 2604
                e(Cns) :  2534 x 2605
               e(ilog) :  1 x 20
           e(gradient) :  1 x 2604
       e(V_modelbased) :  2604 x 2604

functions:
             e(sample)
```

```
// Model 03
sysuse ./replication.data.beheadings.march.15.dta, clear
tsset idunico date
set matsize 11000

quiet xi: nbreg d_homi_male_15_39 pob_male_15_39 i.date i.idunico lpub_after06 ///
lpub_after612 lpub_after12 lieupub_after06 lieupub_after612 lieupub_after12 ///
if date>=563 & date<=611 [iw = weights_treat_lead_dto], vce(cluster idunico)
```

```
estimates table, keep(lpub_after06 lpub_after612 lpub_after12 lieupub_after06 ///
lieupub_after612 lieupub_after12) b(%9.3fc) se(%9.3fc) t(%9.3fc) p(%9.3fc) style(columns)
ereturn list
```

```
       panel variable:  idunico (strongly balanced)
        time variable:  date, 456 to 611
                delta:  1 unit
```

```
+--------------------------+
|     Variable |  active   |
|--------------+-----------|
| lpub_after06 |     0.311 |
|              |     0.126 |
|              |     2.474 |
|              |     0.013 |
| lpub_aft~612 |     0.178 |
|              |     0.197 |
|              |     0.899 |
|              |     0.369 |
| lpub_after12 |    -0.125 |
|              |     0.250 |
|              |    -0.501 |
|              |     0.617 |
| lieupub_a~06 |    -0.178 |
|              |     0.114 |
|              |    -1.555 |
|              |     0.120 |
```

```
| lieupub_~612 |     0.329 |
|              |     0.129 |
|              |     2.556 |
|              |     0.011 |
| lieupub_~r12 |     0.008 |
|              |     0.183 |
|              |     0.044 |
|              |     0.965 |
+--------------------------+
            legend: b/se/t/p



scalars:
               e(r2_p) =  .2789495325367742
                  e(p) =  .
               e(chi2) =  .
               e(df_m) =  55
              e(rank0) =  2
               e(ll_0) =  -3396.915748144732
         e(k_eq_model) =  1
                 e(ll) =  -2449.347688132952
            e(N_clust) =  61
                 e(rc) =  0
          e(converged) =  1
               e(k_dv) =  1
               e(k_eq) =  2
                  e(k) =  2604
                 e(ic) =  7
                  e(N) =  2989
               e(rank) =  57
```

```
              e(alpha) =  .2311829343488489
              e(k_aux) =  1


macros:
            e(cmdline) : "nbreg d_homi_male_15_39 pob_male_15_39 _Idate_* _Iid.."
                e(cmd) : "nbreg"
            e(predict) : "nbreg_p"
            e(dispers) : "mean"
               e(wexp) : "= weights_treat_lead_dto"
              e(wtype) : "iweight"
           e(chi2type) : "Wald"
                e(opt) : "moptimize"
            e(vcetype) : "Robust"
           e(clustvar) : "idunico"
                e(vce) : "cluster"
              e(title) : "Negative binomial regression"
               e(user) : "nbreg_lf"
         e(ml_method) : "e2"
          e(technique) : "nr"
              e(which) : "max"
             e(depvar) : "d_homi_male_15_39"
         e(properties) : "b V"


matrices:
                  e(b) :  1 x 2604
                  e(V) :  2604 x 2604
                e(Cns) :  2487 x 2605
               e(ilog) :  1 x 20
           e(gradient) :  1 x 2604
       e(V_modelbased) :  2604 x 2604
```

```
functions:
             e(sample)
```

The models presented below replicate the lower panel of Table 02 and estimate the impact of leadership captures on homicides among the general population. The first model does not include the weights, while the second model does. Similarly to the previous models, the unweighted model did not show a statistically significant effect, but the weighted model did. The effect also vanishes after six months.

```
// Table 02: Lower Panel
sysuse ./replication.data.beheadings.march.15.dta, clear
tsset idunico date
set matsize 11000

// Model 01

quiet xi: nbreg d_homi_not_male_15_39 pob_not_male_15_39 i.date i.idunico ///
lpub_after06 lpub_after612 lpub_after12 lieupub_after06 lieupub_after612 ///
lieupub_after12 if treat_leader==1 & date>=563 & date<=611, vce(cluster idunico)

estimates table, keep(lpub_after06 lpub_after612 lpub_after12 lieupub_after06 ///
lieupub_after612 lieupub_after12) b(%9.3fc) se(%9.3fc) t(%9.3fc) p(%9.3fc) style(columns)
ereturn list
```

```
       panel variable:  idunico (strongly balanced)
        time variable:  date, 456 to 611
                delta:  1 unit
```

Variable	active
lpub_after06	0.097
	0.152
	0.637
	0.524
lpub_aft~612	-0.141
	0.252
	-0.559
	0.576
lpub_after12	-0.336
	0.369
	-0.909
	0.363
lieupub_a~06	0.043
	0.109
	0.394
	0.693
lieupub_~612	0.035
	0.099
	0.353
	0.724
lieupub_~r12	0.209
	0.252
	0.830
	0.406

legend: b/se/t/p

```
scalars:
               e(r2_p) =  .3004740486138838
                  e(p) =  .
               e(chi2) =  .
               e(df_m) =  11
              e(rank0) =  2
               e(ll_0) =  -2090.303487938623
         e(k_eq_model) =  1
                 e(ll) =  -1462.221536085983
            e(N_clust) =  14
                 e(rc) =  0
          e(converged) =  1
               e(k_dv) =  1
               e(k_eq) =  2
                  e(k) =  2604
                 e(ic) =  7
                  e(N) =  686
               e(rank) =  13
              e(alpha) =  .1247226741006078
              e(k_aux) =  1

macros:
            e(cmdline) : "nbreg d_homi_not_male_15_39 pob_not_male_15_39 _Idat.."
                e(cmd) : "nbreg"
            e(predict) : "nbreg_p"
            e(dispers) : "mean"
           e(chi2type) : "Wald"
                e(opt) : "moptimize"
            e(vcetype) : "Robust"
```

```
            e(clustvar) : "idunico"
                 e(vce) : "cluster"
               e(title) : "Negative binomial regression"
                e(user) : "nbreg_lf"
           e(ml_method) : "e2"
           e(technique) : "nr"
               e(which) : "max"
              e(depvar) : "d_homi_not_male_15_39"
          e(properties) : "b V"

matrices:
                   e(b) :  1 x 2604
                   e(V) :  2604 x 2604
                 e(Cns) :  2534 x 2605
                e(ilog) :  1 x 20
            e(gradient) :  1 x 2604
        e(V_modelbased) :  2604 x 2604

functions:
              e(sample)
```

```
// Model 03
sysuse ./replication.data.beheadings.march.15.dta, clear
tsset idunico date
set matsize 11000

quiet xi: nbreg d_homi_not_male_15_39 pob_not_male_15_39 i.date i.idunico ///
lpub_after06 lpub_after612 lpub_after12 lieupub_after06 lieupub_after612 ///
lieupub_after12 if date>=563 & date<=611 [iw = weights_treat_lead_rest], vce(cluster idunico)

estimates table, keep(lpub_after06 lpub_after612 lpub_after12 lieupub_after06 ///
```

```
lieupub_after612 lieupub_after12) b(%9.3fc) se(%9.3fc) t(%9.3fc) p(%9.3fc) style(columns)
ereturn list
```

```
       panel variable:  idunico (strongly balanced)
        time variable:  date, 456 to 611
                delta:  1 unit
```

```
+---------------------------+
|     Variable |  active    |
|--------------+------------|
| lpub_after06 |     0.293 |
|              |     0.121 |
|              |     2.412 |
|              |     0.016 |
| lpub_aft~612 |     0.290 |
|              |     0.185 |
|              |     1.568 |
|              |     0.117 |
| lpub_after12 |     0.145 |
|              |     0.256 |
|              |     0.567 |
|              |     0.571 |
| lieupub_a~06 |    -0.065 |
|              |     0.127 |
|              |    -0.513 |
|              |     0.608 |
| lieupub_~612 |     0.207 |
|              |     0.142 |
```

```
|               |     1.450 |
|               |     0.147 |
| lieupub_~r12 |    -0.179 |
|               |     0.138 |
|               |    -1.300 |
|               |     0.194 |
+---------------------------+
             legend: b/se/t/p



scalars:
                e(r2_p) =  .2731813661704064
                   e(p) =  .
                e(chi2) =  .
                e(df_m) =  54
               e(rank0) =  2
                e(ll_0) =  -2961.803275204442
          e(k_eq_model) =  1
                  e(ll) =  -2152.693810156108
             e(N_clust) =  114
                  e(rc) =  0
           e(converged) =  1
                e(k_dv) =  1
                e(k_eq) =  2
                   e(k) =  2604
                  e(ic) =  7
                   e(N) =  5586
                e(rank) =  56
               e(alpha) =  .1661728485759601
               e(k_aux) =  1
```

```
macros:
             e(cmdline) : "nbreg d_homi_not_male_15_39 pob_not_male_15_39 _Idat.."
                 e(cmd) : "nbreg"
             e(predict) : "nbreg_p"
             e(dispers) : "mean"
                e(wexp) : "= weights_treat_lead_rest"
               e(wtype) : "iweight"
            e(chi2type) : "Wald"
                 e(opt) : "moptimize"
             e(vcetype) : "Robust"
            e(clustvar) : "idunico"
                 e(vce) : "cluster"
               e(title) : "Negative binomial regression"
                e(user) : "nbreg_lf"
           e(ml_method) : "e2"
           e(technique) : "nr"
               e(which) : "max"
              e(depvar) : "d_homi_not_male_15_39"
          e(properties) : "b V"

matrices:
                   e(b) :  1 x 2604
                   e(V) :  2604 x 2604
                 e(Cns) :  2434 x 2605
                e(ilog) :  1 x 20
            e(gradient) :  1 x 2604
        e(V_modelbased) :  2604 x 2604

functions:
```

```
            e(sample)
```

3 Session Information

```
sessionInfo()
```

```
R version 4.2.1 (2022-06-23)
Platform: x86_64-apple-darwin17.0 (64-bit)
Running under: macOS Monterey 12.6.3

Matrix products: default
BLAS:   /Library/Frameworks/R.framework/Versions/4.2/Resources/lib/libRblas.0.dylib
LAPACK: /Library/Frameworks/R.framework/Versions/4.2/Resources/lib/libRlapack.dylib

locale:
[1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8

attached base packages:
[1] stats     graphics  grDevices utils
[5] datasets  methods   base

other attached packages:
 [1] Statamarkdown_0.7.2
 [2] forcats_0.5.1
 [3] stringr_1.4.1
 [4] dplyr_1.0.10
 [5] purrr_0.3.5
 [6] readr_2.1.2
 [7] tidyr_1.2.1
 [8] tibble_3.1.8
 [9] ggplot2_3.3.6
```

```
[10] tidyverse_1.3.1

[11] knitr_1.42

[12] devtools_2.4.5

[13] usethis_2.1.6

[14] rmarkdown_2.17

[15] nvimcom_0.9-143


loaded via a namespace (and not attached):
 [1] httr_1.4.4        pkgload_1.3.0
 [3] jsonlite_1.8.3    modelr_0.1.8
 [5] shiny_1.7.2       assertthat_0.2.1
 [7] cellranger_1.1.0  yaml_2.3.7
 [9] remotes_2.4.2     sessioninfo_1.2.2
[11] pillar_1.8.1      backports_1.4.1
[13] glue_1.6.2        digest_0.6.30
[15] promises_1.2.0.1  rvest_1.0.2
[17] colorspace_2.0-3  htmltools_0.5.3
[19] httpuv_1.6.5      pkgconfig_2.0.3
[21] broom_1.0.1       haven_2.5.0
[23] xtable_1.8-4      scales_1.2.1
[25] processx_3.7.0    later_1.3.0
[27] tzdb_0.3.0        generics_0.1.3
[29] ellipsis_0.3.2    cachem_1.0.6
[31] withr_2.5.0       cli_3.4.1
[33] magrittr_2.0.3    crayon_1.5.2
[35] readxl_1.4.1      mime_0.12
[37] memoise_2.0.1     evaluate_0.20
[39] ps_1.7.1          fs_1.5.2
[41] fansi_1.0.3       xml2_1.3.3
[43] pkgbuild_1.3.1    profvis_0.3.7
```

```
[45] tools_4.2.1       prettyunits_1.1.1
[47] hms_1.1.2         lifecycle_1.0.3
[49] munsell_0.5.0     reprex_2.0.1
[51] callr_3.7.2       compiler_4.2.1
[53] rlang_1.0.6       grid_4.2.1
[55] rstudioapi_0.14   htmlwidgets_1.5.4
[57] miniUI_0.1.1.1    gtable_0.3.1
[59] curl_4.3.3        DBI_1.1.3
[61] R6_2.5.1          lubridate_1.8.0
[63] fastmap_1.1.0     utf8_1.2.2
[65] stringi_1.7.8     Rcpp_1.0.9
[67] vctrs_0.5.0       dbplyr_2.2.1
[69] tidyselect_1.2.0  xfun_0.37
[71] urlchecker_1.0.1
```

References

Calderón, G., Robles, G., Díaz-Cayeros, A., and Magaloni, B. (2015). The Beheading of Criminal Organizations and the Dynamics of Violence in Mexico. *Journal of Conflict Resolution*, 59(8):1455–1485.

R Core Team (2022). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria.