```
> ## Section 2 of the Online Appendix: including or not weekend days and holidays
>
> library(dplyr)
> library(ggplot2)
> library(gridExtra)
> library(grid)
> library(reshape2)
> library(grid)
> library(rdrobust)
> library(rdlocrand)
> library(lubridate)
>
>
> ## Clear workspace
>
> rm=list(ls())
>
> ## Set working directory
> setwd("~/Dropbox/Documents/Projects/Active_Projects/Compulsory_Voting_BR/Replication_Files/PSRM/")
>
> ##Opening the data:
>
> load("ReplicationData.RData")
>
>
> ############
> ### 2010 ###
> ############
>
> data2010$turnout <- as.numeric(data2010$VOTOU.1°.TURNO) - 1
>
>
> ##############################
> ## Discontinuity analysis ###
> ##############################
>
> ## 18-year olds
>
> ## Election Day: subsetting the 14-day window
>
> data.18.rddED <- dplyr::filter(data2010, (dob >= "1992-09-27" & dob <= "1992-10-10") & turnout == 1)
>
> DataRDDED18 <- data.18.rddED %>%
+   filter(GRAU.INSTRUÇÃO != "Analfabeto") %>%
+   group_by(dob) %>%
+   summarise(voters = n(),
+             turnout = unique(turnout))
`summarise()` ungrouping output (override with `.groups` argument)
>
> DataRDDED18$daysToFrom <- seq(6, -7, by = -1)
>
> ##Using the rdrandinf package
>
> rddED18 <- rdrandinf(DataRDDED18$voters, DataRDDED18$daysToFrom, wl = -7, wr = 6, seed = 50, ci = .05)

Selected window = [-7;6]

Running randomization-based test...
Randomization-based test complete.

Running sensitivity analysis...
Sensitivity analysis complete.


Number of obs     =            14
Order of poly     =             0
Kernel type       =       uniform
Reps              =          1000
Window            =   set by user
H0:          tau  =             0
Randomization     = fixed margins

Cutoff c =    0.000   Left of c  Right of c
      Number of obs           7           7
 Eff. number of obs           7           7
    Mean of outcome    4834.286    5769.429
    S.d. of outcome     345.063     447.650
             Window      -7.000       6.000

================================================================================
                                Finite sample           Large sample
```

```
                          ------------------  ------------------------------
          Statistic          T        P>|T|        P>|T|    Power vs d = 172.532
================================================================================
     Diff. in means    935.143        0.002        0.000                  0.127
================================================================================

95% confidence interval: [432.85,1157.8]
>
> ## % increase
> rddED18$obs.stat/rddED18$sumstats[3,1]*100
[1] 19.34397
>
> ## % increase: lower bound
> rddED18$ci[1]/rddED18$sumstats[3,1]*100
[1] 8.953753
>
> ## % increase: upper bound
> rddED18$ci[2]/rddED18$sumstats[3,1]*100
[1] 23.94976
>
>
> ##Identifying weekend days and holidays:
>
> DataRDDED18$WeekendHolidays <- as.numeric(weekdays(DataRDDED18$dob) %in% c("Saturday", "Sunday"))
>
> ## Values for figure
>
> meanTreat <- rddED18$sumstats[3,2]
> meanControl <- rddED18$sumstats[3,1]
>
> DataRDDED18$obliged <- as.numeric(DataRDDED18$daysToFrom >= 0)
>
> lowerTreat <- meanTreat - qt(0.975,df=length(DataRDDED18$voters[DataRDDED18$obliged==1])-1)*rddED18$sumstats[4,2]/
sqrt(length(DataRDDED18$voters[DataRDDED18$obliged==1]))
>
> upperTreat <- meanTreat + qt(0.975,df=length(DataRDDED18$voters[DataRDDED18$obliged==1])-1)*rddED18$sumstats[4,2]/
sqrt(length(DataRDDED18$voters[DataRDDED18$obliged==1]))
>
> lowerControl <- meanControl - qt(0.975,df=length(DataRDDED18$voters[DataRDDED18$obliged==0])-1)*rddED18$sumstats[4,1]/
sqrt(length(DataRDDED18$voters[DataRDDED18$obliged==0]))
>
> upperControl <- meanControl + qt(0.975,df=length(DataRDDED18$voters[DataRDDED18$obliged==0])-1)*rddED18$sumstats[4,1]/
sqrt(length(DataRDDED18$voters[DataRDDED18$obliged==0]))
>
>
> ##Graph:
>
> graph <- ggplot(DataRDDED18,aes(x=dob,y=voters))+geom_point(aes(shape=factor(WeekendHolidays)))
+geom_vline(xintercept=as.numeric(as.Date("1992/10/03")+0.5))+ylim(4200,6400)+ylab("Number of voters in 2010")+theme_bw()
+theme(axis.title.x = element_text(vjust = 0),axis.title.y = element_text(vjust = 0.5))+scale_x_date(date_breaks = "2 day",
date_labels = "%m-%d")+annotate('text',x=as.Date("1992/10/07"),y=5800,label="Not obliged to vote in 2010", hjust =
0.5)+annotate('text',x=as.Date("1992/09/30"),y=4600,label="Obliged to vote in 2010", hjust = 0.5)+theme(legend.position="none",
axis.title.x=element_blank())+ggtitle("A. Including weekend days and holidays")
>
> graph <- graph + geom_segment(aes(x=min(dob),xend = as.Date("1992/10/03"),y = meanTreat, yend=meanTreat)) +
geom_segment(aes(x=max(dob),xend = as.Date("1992/10/04"), y = meanControl), yend=meanControl) + geom_segment(aes(x=min(dob),xend =
as.Date("1992/10/03"),y = upperTreat, yend=upperTreat),color='grey')+ geom_segment(aes(x=min(dob),xend = as.Date("1992/10/03"),y =
lowerTreat, yend=lowerTreat),color='grey')+ geom_segment(aes(x=max(dob),xend = as.Date("1992/10/04"),y = upperControl,
yend=upperControl),color='grey') + geom_segment(aes(x=max(dob),xend = as.Date("1992/10/04"),y = lowerControl,
yend=lowerControl),color='grey')
>
>
> ##Excluding weekend days:
>
> DataRDDED18nowe <- DataRDDED18[ ! DataRDDED18$WeekendHolidays==1,]
>
>
> ##Using the rdrandinf package
>
> rddED18nowe <- rdrandinf(DataRDDED18nowe$voters, DataRDDED18nowe$daysToFrom, wl = -7, wr = 6, seed = 50, ci = .05)

Selected window = [-7;6]

Running randomization-based test...
Randomization-based test complete.

Running sensitivity analysis...
Sensitivity analysis complete.


Number of obs     =            10
```

```
Order of poly     =             0
Kernel type       =       uniform
Reps              =           252
Window            =   set by user
H0:          tau  =             0
Randomization     = fixed margins

Cutoff c =    0.000   Left of c  Right of c
      Number of obs           5           5
 Eff. number of obs           5           5
    Mean of outcome    5006.400    6011.600
    S.d. of outcome     187.233     174.334
             Window      -7.000       6.000

================================================================================
                                Finite sample            Large sample
                              ------------------  ----------------------------
          Statistic          T        P>|T|        P>|T|    Power vs d =  93.617
================================================================================
     Diff. in means   1005.200        0.000        0.000                   0.130
================================================================================

95% confidence interval: [780.96,1184.61]
>
> ## % increase
> rddED18nowe$obs.stat/rddED18nowe$sumstats[3,1]*100
[1] 20.0783
>
> ## % increase: lower bound
> rddED18nowe$ci[1]/rddED18nowe$sumstats[3,1]*100
[1] 15.59923
>
> ## % increase: upper bound
> rddED18nowe$ci[2]/rddED18nowe$sumstats[3,1]*100
[1] 23.66191
>
>
> ## Values for figure
>
> meanTreatnowe <- rddED18nowe$sumstats[3,2]
> meanControlnowe <- rddED18nowe$sumstats[3,1]
>
> lowerTreatnowe <- meanTreatnowe -
qt(0.975,df=length(DataRDDED18nowe$voters[DataRDDED18nowe$obliged==1])-1)*rddED18nowe$sumstats[4,2]/
sqrt(length(DataRDDED18nowe$voters[DataRDDED18nowe$obliged==1]))
>
> upperTreatnowe <- meanTreatnowe +
qt(0.975,df=length(DataRDDED18nowe$voters[DataRDDED18nowe$obliged==1])-1)*rddED18nowe$sumstats[4,2]/
sqrt(length(DataRDDED18nowe$voters[DataRDDED18nowe$obliged==1]))
>
> lowerControlnowe <- meanControlnowe -
qt(0.975,df=length(DataRDDED18nowe$voters[DataRDDED18nowe$obliged==0])-1)*rddED18nowe$sumstats[4,1]/
sqrt(length(DataRDDED18nowe$voters[DataRDDED18nowe$obliged==0]))
>
> upperControlnowe <- meanControlnowe +
qt(0.975,df=length(DataRDDED18nowe$voters[DataRDDED18nowe$obliged==0])-1)*rddED18nowe$sumstats[4,1]/
sqrt(length(DataRDDED18nowe$voters[DataRDDED18nowe$obliged==0]))
>
>
> ##Graph:
>
> graphnowe <- ggplot(DataRDDED18nowe,aes(x=dob,y=voters))+geom_point(aes(group=obliged))
+geom_vline(xintercept=as.numeric(as.Date("1992/10/03")+0.5))+ylim(4200,6400)+xlab('Date of birth in 1992')+ylab("Number of voters
in 2010")+theme_bw()+theme(axis.title.x = element_text(vjust = 0),axis.title.y = element_text(vjust = 0.5))
+scale_x_date(date_breaks = "2 day", date_labels = "%m-%d")+annotate('text',x=as.Date("1992/10/07"),y=5800,label="Not obliged to
vote in 2010", hjust = 0.5)+annotate('text',x=as.Date("1992/09/30"),y=4600,label="Obliged to vote in 2010", hjust =
0.5)+ggtitle("B. Excluding weekend days and holidays")
>
> graphnowe <- graphnowe + geom_segment(aes(x=min(dob),xend = as.Date("1992/10/03"),y = meanTreatnowe, yend=meanTreatnowe)) +
geom_segment(aes(x=as.Date("1992/10/10"),xend = as.Date("1992/10/04"), y = meanControlnowe), yend=meanControlnowe) +
geom_segment(aes(x=min(dob),xend = as.Date("1992/10/03"),y = upperTreatnowe, yend=upperTreatnowe),color='grey')+
geom_segment(aes(x=min(dob),xend = as.Date("1992/10/03"),y = lowerTreatnowe, yend=lowerTreatnowe),color='grey')+
geom_segment(aes(x=as.Date("1992/10/10"),xend = as.Date("1992/10/04"),y = upperControlnowe, yend=upperControlnowe),color='grey') +
geom_segment(aes(x=as.Date("1992/10/10"),xend = as.Date("1992/10/04"),y = lowerControlnowe, yend=lowerControlnowe),color='grey')
>
> ##Join both graphs:
>
> graphcombined <- grid.arrange(graph, graphnowe, ncol=1)
>
> ggsave(file="~/Dropbox/Documents/Projects/Active_Projects/Compulsory_Voting_BR/Replication_files/PSRM/
Online_Appendix_S2_plot_ED_2010.eps", plot=graphcombined)
```

```
Saving 7 x 7 in image
>
>
>
>
> ## End-of-Year: subsetting the 14-day window
>
> data.18.rddEoY <- dplyr::filter(data2010, (dob >= "1992-12-25" & dob <= "1993-01-07") & turnout == 1)
>
> DataRDDEoY18 <- data.18.rddEoY %>%
+   filter(GRAU.INSTRUÇÃO != "Analfabeto") %>%
+   group_by(dob) %>%
+   summarise(voters = n(),
+             turnout = unique(turnout))
`summarise()` ungrouping output (override with `.groups` argument)
>
> DataRDDEoY18$daysToFrom <- seq(6, -7, by = -1)
>
> ##Using the rdrandinf package
>
> rddEoY18 <- rdrandinf(DataRDDEoY18$voters, DataRDDEoY18$daysToFrom, wl = -7, wr = 6, seed = 50, ci = .05)

Selected window = [-7;6]

Running randomization-based test...
Randomization-based test complete.

Running sensitivity analysis...
Sensitivity analysis complete.


Number of obs      =            14
Order of poly      =             0
Kernel type        =       uniform
Reps               =          1000
Window             =   set by user
H0:           tau  =             0
Randomization      = fixed margins

Cutoff c =    0.000   Left of c  Right of c
      Number of obs           7           7
 Eff. number of obs           7           7
    Mean of outcome    3347.857    3629.143
    S.d. of outcome     295.834     381.798
             Window      -7.000       6.000

================================================================================
                               Finite sample            Large sample
                             ------------------  ----------------------------
          Statistic          T        P>|T|        P>|T|    Power vs d = 147.917
================================================================================
     Diff. in means    281.286        0.140        0.123                   0.128
================================================================================

95% confidence interval: [-89.18,685.42]
>
> ## % increase
> rddEoY18$obs.stat/rddEoY18$sumstats[3,1]*100
[1] 8.401963
>
> ## % increase: lower bound
> rddEoY18$ci[1]/rddEoY18$sumstats[3,1]*100
[1] -2.663793
>
> ## % increase: upper bound
> rddEoY18$ci[2]/rddEoY18$sumstats[3,1]*100
[1] 20.47339
>
>
> ##Identifying weekend days and holidays:
>
> DataRDDEoY18$WeekendHolidays <- as.numeric(weekdays(DataRDDEoY18$dob) %in% c("Saturday", "Sunday") |
DataRDDEoY18$dob=="1992-12-24" | DataRDDEoY18$dob=="1992-12-25" | DataRDDEoY18$dob=="1992-12-31" | DataRDDEoY18$dob=="1993-01-01")
>
> ## Values for figure
>
> meanTreat <- rddEoY18$sumstats[3,2]
> meanControl <- rddEoY18$sumstats[3,1]
>
> DataRDDEoY18$obliged <- as.numeric(DataRDDEoY18$daysToFrom >= 0)
>
```

```
> lowerTreat <- meanTreat - qt(0.975,df=length(DataRDDEoY18$voters[DataRDDEoY18$obliged==1])-1)*rddEoY18$sumstats[4,2]/
sqrt(length(DataRDDEoY18$voters[DataRDDEoY18$obliged==1]))
>
> upperTreat <- meanTreat + qt(0.975,df=length(DataRDDEoY18$voters[DataRDDEoY18$obliged==1])-1)*rddEoY18$sumstats[4,2]/
sqrt(length(DataRDDEoY18$voters[DataRDDEoY18$obliged==1]))
>
> lowerControl <- meanControl - qt(0.975,df=length(DataRDDEoY18$voters[DataRDDEoY18$obliged==0])-1)*rddEoY18$sumstats[4,1]/
sqrt(length(DataRDDEoY18$voters[DataRDDEoY18$obliged==0]))
>
> upperControl <- meanControl + qt(0.975,df=length(DataRDDEoY18$voters[DataRDDEoY18$obliged==0])-1)*rddEoY18$sumstats[4,1]/
sqrt(length(DataRDDEoY18$voters[DataRDDEoY18$obliged==0]))
>
>
> ##Graph:
>
> graph <- ggplot(DataRDDEoY18,aes(x=dob,y=voters))+geom_point(aes(shape=factor(WeekendHolidays)))
+geom_vline(xintercept=as.numeric(as.Date("1992/12/31")+0.5))+ylim(2700,4400)+ylab("Number of voters in 2010")+theme_bw()
+theme(axis.title.x = element_text(vjust = 0),axis.title.y = element_text(vjust = 0.5))+scale_x_date(date_breaks = "2 day",
date_labels = "%m-%d")+annotate('text',x=as.Date("1993/01/03"),y=2700,label="17-yo Cohort")
+annotate('text',x=as.Date("1992/12/28"),y=2700,label="18-yo Cohort")+theme(legend.position="none", axis.title.x=element_blank())
+ggtitle("A. Including weekend days and holidays")
>
> graph <- graph + geom_segment(aes(x=min(dob),xend = as.Date("1992/12/31"),y = meanTreat, yend=meanTreat)) +
geom_segment(aes(x=max(dob),xend = as.Date("1993/01/01"), y = meanControl), yend=meanControl) + geom_segment(aes(x=min(dob),xend =
as.Date("1992/12/31"),y = upperTreat, yend=upperTreat),color='grey')+ geom_segment(aes(x=min(dob),xend = as.Date("1992/12/31"),y =
lowerTreat, yend=lowerTreat),color='grey')+ geom_segment(aes(x=max(dob),xend = as.Date("1993/01/01"),y = upperControl,
yend=upperControl),color='grey') + geom_segment(aes(x=max(dob),xend = as.Date("1993/01/01"),y = lowerControl,
yend=lowerControl),color='grey')
>
>
> ##Excluding weekend days:
>
> DataRDDEoY18nowe <- DataRDDEoY18[ ! DataRDDEoY18$WeekendHolidays==1,]
>
>
> ##Using the rdrandinf package
>
> rddEoY18nowe <- rdrandinf(DataRDDEoY18nowe$voters, DataRDDEoY18nowe$daysToFrom, wl = -7, wr = 6, seed = 50, ci = .05)

Selected window = [-7;6]

Running randomization-based test...
Randomization-based test complete.

Running sensitivity analysis...
Sensitivity analysis complete.


Number of obs     =             7
Order of poly     =             0
Kernel type       =       uniform
Reps              =            35
Window            =   set by user
H0:          tau  =             0
Randomization     = fixed margins

Cutoff c =    0.000   Left of c  Right of c
      Number of obs           4           3
 Eff. number of obs           4           3
    Mean of outcome    3574.250    4015.000
    S.d. of outcome     115.589     139.216
             Window      -7.000       6.000

================================================================================
                                Finite sample           Large sample
                              ------------------  ----------------------------
          Statistic          T        P>|T|        P>|T|    Power vs d =  57.795
================================================================================
     Diff. in means    440.750        0.029        0.000                   0.090
================================================================================

95% confidence interval: [206.41,553.09]
>
> ## % increase
> rddEoY18nowe$obs.stat/rddEoY18nowe$sumstats[3,1]*100
[1] 12.33126
>
> ## % increase: lower bound
> rddEoY18nowe$ci[1]/rddEoY18nowe$sumstats[3,1]*100
[1] 5.774918
>
```

```
> ## % increase: upper bound
> rddEoY18nowe$ci[2]/rddEoY18nowe$sumstats[3,1]*100
[1] 15.4743
>
> ## Values for figure
>
> meanTreatnowe <- rddEoY18nowe$sumstats[3,2]
> meanControlnowe <- rddEoY18nowe$sumstats[3,1]
>
> lowerTreatnowe <- meanTreatnowe -
qt(0.975,df=length(DataRDDEoY18nowe$voters[DataRDDEoY18nowe$obliged==1])-1)*rddEoY18nowe$sumstats[4,2]/
sqrt(length(DataRDDEoY18nowe$voters[DataRDDEoY18nowe$obliged==1]))
>
> upperTreatnowe <- meanTreatnowe +
qt(0.975,df=length(DataRDDEoY18nowe$voters[DataRDDEoY18nowe$obliged==1])-1)*rddEoY18nowe$sumstats[4,2]/
sqrt(length(DataRDDEoY18nowe$voters[DataRDDEoY18nowe$obliged==1]))
>
> lowerControlnowe <- meanControlnowe -
qt(0.975,df=length(DataRDDEoY18nowe$voters[DataRDDEoY18nowe$obliged==0])-1)*rddEoY18nowe$sumstats[4,1]/
sqrt(length(DataRDDEoY18nowe$voters[DataRDDEoY18nowe$obliged==0]))
>
> upperControlnowe <- meanControlnowe +
qt(0.975,df=length(DataRDDEoY18nowe$voters[DataRDDEoY18nowe$obliged==0])-1)*rddEoY18nowe$sumstats[4,1]/
sqrt(length(DataRDDEoY18nowe$voters[DataRDDEoY18nowe$obliged==0]))
>
>
> ##Graph:
>
> graphnowe <- ggplot(DataRDDEoY18nowe,aes(x=dob,y=voters))+geom_point(aes(group=obliged))
+geom_vline(xintercept=as.numeric(as.Date("1992/12/31")+0.5))+ylim(2700,4400)+xlab('Date of birth in 1992/93')+ylab("Number of
voters in 2010")+theme_bw()+theme(axis.title.x = element_text(vjust = 0),axis.title.y = element_text(vjust = 0.5))
+scale_x_date(date_breaks = "2 day", date_labels = "%m-%d")+annotate('text',x=as.Date("1993/01/03"),y=2700,label="17-yo Cohort")
+annotate('text',x=as.Date("1992/12/28"),y=2700,label="18-yo Cohort")+ggtitle("B. Excluding weekend days and holidays")
>
> graphnowe <- graphnowe + geom_segment(aes(x=as.Date("1992/12/25"),xend = as.Date("1992/12/31"),y = meanTreatnowe,
yend=meanTreatnowe)) + geom_segment(aes(x=as.Date("1993/01/07"),xend = as.Date("1993/01/01"), y = meanControlnowe),
yend=meanControlnowe) + geom_segment(aes(x=as.Date("1992/12/25"),xend = as.Date("1992/12/31"),y = upperTreatnowe,
yend=upperTreatnowe),color='grey')+ geom_segment(aes(x=as.Date("1992/12/25"),xend = as.Date("1992/12/31"),y = lowerTreatnowe,
yend=lowerTreatnowe),color='grey')+ geom_segment(aes(x=as.Date("1993/01/07"),xend = as.Date("1993/01/01"),y = upperControlnowe,
yend=upperControlnowe),color='grey') + geom_segment(aes(x=as.Date("1993/01/07"),xend = as.Date("1993/01/01"),y = lowerControlnowe,
yend=lowerControlnowe),color='grey')
>
>
> ##Join both graphs:
>
> graphcombined <- grid.arrange(graph, graphnowe, ncol=1)
>
> ggsave(file="~/Dropbox/Documents/Projects/Active_Projects/Compulsory_Voting_BR/Replication_files/PSRM/
Online_Appendix_S2_plot_EoY_2010.eps", plot=graphcombined)
Saving 7 x 7 in image
>
>
>
```