41903 Pset 3

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Question 1

Question 2

(a)

```
setwd("C:/Users/17036/OneDrive/Documents/GitHub/metrics3-zombie-boards/Psets/3")
murder <- read.delim("PS3Data/MURDER_RAW.txt", header=FALSE)

colnames(murder) <- c('id','state','year','mrdrte','exec','unem','d90','d93',
                      'cmrdrte','cexec','cunem','cexec1','cunem1')

# Use only data for 1990 and 1993
data <- murder %>%
  filter(year==90 | year==93)

reg_pooled <- lm(mrdrte~d93+exec+unem, data=data)
### calculate standard errors
# standard homoskedastic standard errors
se.homo_pooled <- sqrt(diag(vcov(reg_pooled)))
# robust standard errors
HCV.coef_pooled <- vcovHC(reg_pooled, type = 'HC1')
se.robust_pooled <- sqrt(diag(HCV.coef_pooled))
# clustered standard errors
CLCV.coef_pooled <- cluster.vcov(reg_pooled,data$state)
se.cluster_pooled <- sqrt(diag(CLCV.coef_pooled))
```

Table 1: Statistical models

	Homoskedastic	Robust	Clustered
(Intercept)	−5.2780	−5.2780	−5.2780
	(4.4278)	(5.3868)	(6.6760)
d93	−2.0674	−2.0674	−2.0674
	(2.1446)	(1.9981)	(1.3066)
exec	0.1277	0.1277	0.1277
	(0.2632)	(0.1342)	(0.1678)
unem	2.5289**	2.5289**	2.5289**
	(0.7817)	(1.1076)	(1.5047)
R^2	0.1016	0.1016	0.1016
Adj. R^2	0.0741	0.0741	0.0741
Num. obs.	102	102	102

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

```
texreg(list(reg_pooled, reg_pooled, reg_pooled), digits=4, caption.above=TRUE,
       override.se = list(se.homo_pooled, se.robust_pooled, se.cluster_pooled),
       custom.model.names=c("Homoskedastic", "Robust", "Clustered"))
```

(b)

In this setting FE and FD are numerically identical because there are only two time periods, 1990 and 1993.

(c)

First Differences

```
data_90 <- data %>%
  filter(year==90)
data_93 <- data %>%
  filter(year==93)
data_fd <- left_join(data_90,data_93,by=c("id"))
data_fd$delta_mrdrte <- data_fd$mrdrte.y-data_fd$mrdrte.x
data_fd$delta_exec <- data_fd$exec.y-data_fd$exec.x
data_fd$delta_unem <- data_fd$unem.y-data_fd$unem.x
reg_fd <- lm(delta_mrdrte~delta_exec+delta_unem, data=data_fd)
### calculate standard errors
# standard homoskedastic standard errors
se.homo_fd <- sqrt(diag(vcov(reg_fd)))
# robust standard errors
HCV.coef_fd <- vcovHC(reg_fd, type = 'HC1')
se.robust_fd <- sqrt(diag(HCV.coef_fd))
# clustered standard errors
CLCV.coef_fd <- cluster.vcov(reg_fd,data_fd$state.x)
se.cluster_fd <- sqrt(diag(CLCV.coef_fd))
```

Table 2: Statistical models

	Homoskedastic	Robust	Clustered
(Intercept)	0.4133	0.4133	0.4133
	(0.2094)	(0.2000)	(0.2000)
delta_exec	−0.1038*	−0.1038*	−0.1038*
	(0.0434)	(0.0170)	(0.0170)
delta_unem	−0.0666	−0.0666	−0.0666
	(0.1587)	(0.1469)	(0.1469)
R^2	0.1097	0.1097	0.1097
Adj. R^2	0.0727	0.0727	0.0727
Num. obs.	51	51	51

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

```
texreg(list(reg_fd, reg_fd, reg_fd), digits=4, caption.above=TRUE,
       override.se = list(se.homo_fd,se.robust_fd,se.cluster_fd),
       custom.model.names=c("Homoskedastic", "Robust", "Clustered"))
```

Fixed Effects

```
data_fe <- data %>%
  group_by(id) %>%
  mutate(mrdrte_demean = mrdrte-mean(mrdrte), exec_demean = exec-mean(exec), unem_demean = unem-mean(un
reg_fe <- lm(mrdrte_demean~exec_demean+unem_demean+d93,data=data_fe)
### calculate standard errors
# standard homoskedastic standard errors
se.homo_fe <- sqrt(diag(vcov(reg_fe)))
# robust standard errors
HCV.coef_fe <- vcovHC(reg_fe, type = 'HC1')
se.robust_fe <- sqrt(diag(HCV.coef_fe))
# clustered standard errors
CLCV.coef_fe <- cluster.vcov(reg_fe,data_fe$state)
se.cluster_fe <- sqrt(diag(CLCV.coef_fe))
```

Table 3: Statistical models

	Homoskedastic	Robust	Clustered
(Intercept)	-0.2066^{*}	-0.2066^{*}	-0.2066^{*}
	(0.0904)	(0.0877)	(0.0995)
exec_demean	-0.1038^{***}	-0.1038^{***}	-0.1038^{***}
	(0.0304)	(0.0119)	(0.0169)
unem_demean	-0.0666	-0.0666	-0.0666
	(0.1111)	(0.1028)	(0.1461)
d93	0.4133^{**}	0.4133^{**}	0.4133^{**}
	(0.1465)	(0.1400)	(0.1989)
R^2	0.1653	0.1653	0.1653
Adj. R^2	0.1398	0.1398	0.1398
Num. obs.	102	102	102

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

```
texreg(list(reg_fe, reg_fe, reg_fe), digits=4, caption.above=TRUE,
       override.se = list(se.homo_fe,se.robust_fe,se.cluster_fe),
       custom.model.names=c("Homoskedastic", "Robust", "Clustered"))
```

(d)

Question 3

Question 4