



```

name: <unnamed>
log: //Client/C$/Users/yfkas/Documents/GitHub/ARE213_Fall2023/PSet 2/Stata/pse
> t2_logfile.smcl
log type: smcl
opened on: 30 Oct 2023, 12:48:50

1 .
2 .
3 . set more off

4 . set varabbrev off

5 . set linesize 255

6 .
7 .
8 . if "`c(username)'" == "yfkashlan" {
9 .
10.         global do_loc "//Client/C$/Users/yfkas/Documents/GitHub/ARE213_Fall2023/PSe
> t 2/Stata"
11.         global dta_loc "//Client/C$/Users/yfkas/Dropbox (Personal)/ARE213/Pset2/data
> "
12.
13.         // programs
14.         net set ado "//Client/C$/Users/yfkas/Documents/stata_packages"
15.         adopath + "//Client/C$/Users/yfkas/Documents/stata_packages"
        [1] (BASE) "C:\Program Files\Stata16\ado\base/"
        [2] (SITE) "C:\Program Files\Stata16\ado\site/"
        [3]      "."
        [4] (PERSONAL) "C:\Users\yfkashlan\ado\personal/"
        [5] (PLUS) "c:\ado\plus/"
        [6] (OLDPLACE) "c:\ado/"
        [7]      "//Client/C$/Users/yfkas/Documents/stata_packages"
16.
17. }

18.
19. if "`c(username)'" == "rajdevb" {
20.
21.         local mainfolder "/Users/rajdevb"
22.
23.         global do_loc "`mainfolder'/Desktop/GIT_RajdevBrar/GitHub_are213/ARE213_Fa
> ll2023"
24.         global dta_loc "`mainfolder'/Dropbox/ARE213/Pset1"
25. }

26.
27. // install programs
28. // do "$do_loc/Code/01_programs.do"
29.
30. // analyze
31. do "$do_loc/Code/02_analysis_q1.do"

32. /*
> Title:          02_analysis_q1.do
> Outline:       Question 1, PSet 2
>
> Q1a
>         1. Is the panel balanced (a.k.a. complete)?
>         2. Visualize the timing of primary belt laws.
>         3. Are there any reversals of primary belt laws?
>         4. Are there never-treated states?
>         5. How does the timing of primary and secondary belt laws relate to each oth
> er?
>
> Q1b Compare log fatalities per capita with fatality count
> Q1c Plot outcome in an informative way. Interpret.
>
> */

```

```

33.
34.
35.
36. * ===== *
37. * Question 1
38. * ===== *
39.
40. use "$dta_loc/pset2", clear

41. isid state year

42.
43. sort state year primary secondary

44.
45. count if primary == 1 & secondary == 1 // no state applies both laws at once
0

46.
47.
48. // Q1a.1 -----
49. preserve

50.      byso state : egen state_ct = count(year)

51.      tab state_ct

      state_ct |      Freq.      Percent      Cum.
-----+-----
          23 |      1,104      100.00      100.00
-----+-----
       Total |      1,104      100.00

52.
53.      byso year : egen year_ct = count(state)

54.      tab year_ct

      year_ct |      Freq.      Percent      Cum.
-----+-----
          48 |      1,104      100.00      100.00
-----+-----
       Total |      1,104      100.00

55.
56.      gen bal_test = 0 // generate a variable without missing values

57.      keep state year bal_test

58.      reshape wide bal_test, i(state) j(year)
(note: j = 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995
> 1996 1997 1998 1999 2000 2001 2002 2003)

Data                                long   ->   wide
-----+-----
Number of obs.                      1104   ->    48
Number of variables                   3     ->    24
j variable (23 values)               year   ->   (dropped)
xij variables:
                                bal_test   ->  bal_test1981 bal_test1982 ... bal_test2
> 003

```

```

59.          // If the i-j combination contains a missing value for primary,
60.          // then reshape returns a missing value
61.
62.          foreach var of varlist bal_test* {
63.              2.              assert `var' !=_.
64.              3.              }
65.
66. restore
67.
68. // ANS: balanced indeed
69.
70. // Q1a.2 -----
71. // twoway (line primary year if state == 1) ///
72. //      (line primary year if state == 4)
73.
74. // I can't run this on my computer for some reason :(
75. *panelview primary, i(state) t(year) type(treat)
76.
77. // Q1a.3 -----
78. preserve
79.
80. //      br state year primary
81. //      keep state year primary
82. //      byso state (year) : gen prim_delta = primary[_n]-primary[_n-1]
83. //      (48 missing values generated)
84.
85.          assert prim_delta >= 0 | prim_delta == .
86.
87. restore
88.
89. // ANS: Change in primary law within states is never negative
90.
91. // Q1a.4 -----
92. byso state : egen prim_ever = max(primary)
93.
94. preserve
95.
96.          collapse (max) prim_ever, by(state)
97.
98.          count if prim_ever == 0
99.      30
100.
101. restore
102.
103. // ANS: 30 states are never-treated
104.
105. // Q1a.5 -----
106. preserve
107.
108.          keep state year primary secondary
109.
110.          count if primary == 1 & secondary == 1 // no state applies both laws at once
111.      0
112.
113.          foreach law in primary secondary {
114.              2.              gen year_`law' = year if `law' == 1
115.              3.              }
116.          (922 missing values generated)
117.          (589 missing values generated)

```

```

99.      byso state secondary (year) : egen yr_sec_end = max(year_secondary)
      (589 missing values generated)

100     byso state primary (year) : egen yr_prim_start = min(year_primary)
      (922 missing values generated)

101     sort state year primary secondary

102     collapse (mean) yr_sec_end yr_prim_start , by(state)

103     assert yr_sec_end < yr_prim_start if !missing(yr_prim_start) & !missing(yr_s
> ec_end)

104     assert yr_sec_end + 1 == yr_prim_start if !missing(yr_prim_start) & !missing
> (yr_sec_end)

105 restore

106 // ANS: Primary and secondary laws never overlapped.
107 // Primary laws were adopted (if at all) one year after secondary laws were phased o
> ut.
108
109 // correlate adopting prim and sec within state
110 preserve

111     collapse (max) primary secondary , by(state)

112     corr primary secondary
      (obs=48)

```

	primary	second~y
primary	1.0000	
secondary	-0.4619	1.0000

```

113     tab primary secondary

```

(max) primary	(max) secondary		Total
	0	1	
0	1	29	30
1	7	11	18
Total	8	40	48

```

114     // not immediately useful
115 restore

116
117
118 // Q1b -----
119 gen fat_pc = fatalities/population

120 gen ln_fat_pc = ln(fatalities/population)

121 label var ln_fat_pc "Log fatalities per capita"

122 // hist ln_fat_pc
123 // ANS: taking the log of the fraction of fatalities per capita (the outcome)

```

```

124 // is a good idea because it normalizes its distribution.
125
126
127 // Q1c -----
128
129 /*
130 > // First try
131 > collapse (mean) fatalities ln_fat_pc fat_pc, by(prim_ever year)
132 > // States that adopt the law have lower log fatalities/cap every year
133 > twoway (scatter ln_fat_pc year if prim_ever == 0) ///
134 >         (scatter ln_fat_pc year if prim_ever == 1), ///
135 >         legend(label(1 "Never treated") label(2 "Treated"))
136 >
137 > // States that adopt the law have higher total fatalities every year
138 > twoway (scatter fatalities year if prim_ever == 0) ///
139 >         (scatter fatalities year if prim_ever == 1), ///
140 >         legend(label(1 "Never treated") label(2 "Treated"))
141 >
142 > // States that adopt the law have lower fatalities/cap every year
143 > twoway (scatter fat_pc year if prim_ever == 0) ///
144 >         (scatter fat_pc year if prim_ever == 1), ///
145 >         legend(label(1 "Never treated") label(2 "Treated"))
146 >
147 > // Can also do relative to event time
148 > gen year_primary = year if primary == 1
149 > byso state primary (year) : egen yr_prim_start = min(year_primary)
150 > byso state (yr_prim_start): replace yr_prim_start = yr_prim_start[1]
151 > gen yr_relative = year - yr_prim_start if yr_prim_start != .
152 > sort state year
153 > tab yr_relative
154 > // hard to choose cutoff
155 > */
156
157
158
159
160 // Plot raw data as in his "favorite event plot" by Fadlon and Nielsen (2015)
161 // plot a few states that do and do not adopt with vertical lines for E_i
162 gen year_primary = year if primary == 1
163     (922 missing values generated)
164
165 byso state primary (year) : egen cohort = min(year_primary)
166     (922 missing values generated)
167
168 byso state (cohort): replace cohort = cohort[1]
169     (232 real changes made)
170
171 replace cohort = 999 if cohort == .
172     (690 real changes made)
173
174
175 sort state year // clean up
176
177 drop year_primary
178
179
180 label define cohort 999 "No shock" ///
181 >         1984 "1984" ///
182 >         1986 "1986" ///
183 >         1987 "1987" ///
184 >         1991 "1991" ///
185 >         1993 "1993" ///
186 >         1996 "1996" ///
187 >         1998 "1998" ///
188 >         2000 "2000" ///
189 >         2002 "2002" ///
190 >         2003 "2003"

```

```

143 label values cohort cohort
144
145 preserve
146
147 collapse (mean) fatalities ln_fat_pc fat_pc, by(cohort year)
148
149 // plot raw data by cohort with vertical E_i
150 twoway (line ln_fat_pc year if cohort == 999, lcolor(black) ) ///
151 > (line ln_fat_pc year if cohort == 1984, lcolor(ebblue) ) ///
152 > (line ln_fat_pc year if cohort == 1987, lcolor(gs10) ) ///
153 > (line ln_fat_pc year if cohort == 1993, lcolor(midgreen) ) ///
154 > (line ln_fat_pc year if cohort == 2002, lcolor(dkorange) ), ///
155 > legend(label(1 "No shock") ///
156 > label(2 "1984") ///
157 > label(3 "1987") ///
158 > label(4 "1993") ///
159 > label(5 "2002")) ///
160 > xline(1984, lcolor(ebblue) lpatter(dash)) ///
161 > xline(1987, lcolor(gs10) lpatter(dash)) ///
162 > xline(1993, lcolor(midgreen) lpatter(dash)) ///
163 > xline(2000, lcolor(dkorange) lpatter(dash))
164
165 restore
166
167
168 // save new dta with additional vars
169 compress
170 variable fatalities was float now int
171 variable rural_speed was float now byte
172 variable urban_speed was float now byte
173 variable prim_ever was float now byte
174 variable cohort was float now int
175 (14,352 bytes saved)
176
177 save "$dta_loc/pset2_q1", replace
178 file //Client/C$/Users/yfkas/Dropbox (Personal)/ARE213/Pset2/data/pset2_q1.dta saved
179
180
181
182
183
184
185 end of do-file
186
187 do "$do_loc/Code/02_analysis_q2.do"
188
189 /*
190 > Title: 02_analysis_q2.do
191 > Outline: Question 1, PSet 2
192 >
193 > Q2 Testing assumptions for DiD design
194 >
195 > */
196
197
198 pause on

```

```

166
167 use "$dta_loc/pset2_q1", clear

168 isid state year

169
170 sort state year primary secondary

171
172 ** Q2a -----
173 /* List the assumptions. Then perform tests you find feasible and useful.
   > For each of them, describe the alternative and the testing procedure.
   >
   > We assume
   > 1) No spillovers
   > 2) No anticipation effects: Y_i1 does not depend on D_i2
   > 3) No lagged effects: Y_i2 does not depend on D_i1 (not sure about this. Carried fro
   > m C2 slides)
   > 4) Parallel trends:
   >     - This can be applied to (monotonically) transformed data
   >     - This can only be tested in the pre-period
   > 5) Target estimand tau is linear in tau_it
   >
   > // I test assumption 4 which is a first order concern for ID
   > Following Marcus and Santanna (2020), page 250:
   > "...one can directly test if  $E[Y_3 - Y_2|C=1] = E[Y_3 - Y_2|G=1]$  using a standard t-t
   > est.
   > Rejecting the null hypothesis would provide direct evidence against the identifying
   > assumptions."
   > */
174
175 drop college beer unemploy totalvmt precip snow32 rural_speed urban_speed

176 // Get cohort averages \bar{y}_{gt}
177 // average across states with cohort-year (g,t)
178 // Get delta Y and test means
179 byso state (year) : gen del_lny = ln_fat_pc[_n] - ln_fat_pc[_n-1]
   (48 missing values generated)

180
181 labellist cohort
   cohort:
           999 No shock
           1984 1984
           1986 1986
           1987 1987
           1991 1991
           1993 1993
           1996 1996
           1998 1998
           2000 2000
           2002 2002
           2003 2003

182 foreach g in `r(values)' {
   2.     dis as result "-----"
   3.     dis as result "COHORT g=`g'"
   4.     preserve
   5.         keep if inlist(cohort, 999, `g')
   6.         forval t = 1984/`g' {
   7.             dis as text ""
   8.             dis as result "Run ttest comparing dely_C, `t' with dely_g`g',
   > `t'"
   9.             qui sum del_lny if cohort == 999 & year == `t' // get con
   > trol mean
  10.             local delyc_rd = round(`r(mean)', 0.001)
  11.             qui count if cohort == `g' & year == `t'
  12.             local n_g `r(N)'
  13.             if `n_g' == 1 {
  14.                 // test cohort C (control group) against cohort g's s
   > calar

```

```

183             qui sum del_lny if cohort == `g' & year == `t'
15.                 local delyg = `r(mean)'
16.                 local delyg_rd = round(`r(mean)', 0.001)
17.                 qui ttest del_lny == `r(mean)' if year == `t' & cohort
> t == 999
18.             }
19.             else if `r(N)' > 1 qui ttest del_lny if year == `t', by (
> cohort)
20.                 // collect test stats
184             local se_rd = round(`r(se)', 0.001)
21.                 local t_rd = round(`r(t)', 0.001)
22.                 local p_rd = round(`r(p)', 0.001)
23.
185             // display results
186             dis as text "ttest E[del_ly|C=1]-E[del_ly|g=`g'] with g size
> = `n_g'"
24.                 dis as text "ttest `delyc_rd'-'delyg_rd'"
25.                 if `p_rd' < 0.05 dis as error "SE = `se_rd', t-stat = `t_
> rd', p-value= `p_rd'"
26.                 else dis as text "SE = `se_rd', t-stat = `t_rd', p-value=
> `p_rd'"
27.             }
28.             restore
29. }

```

COHORT g=999

(414 observations deleted)

COHORT g=1984

(391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1984,1984

ttest E[del_ly|C=1]-E[del_ly|g=1984] with g size = 1

ttest .006--.012

SE = .021, t-stat = .838, p-value= .409

COHORT g=1986

(322 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1986,1984

ttest E[del_ly|C=1]-E[del_ly|g=1986] with g size = 4

ttest .006--.012

SE = .062, t-stat = 1.048, p-value= .303

Run ttest comparing dely_C,1985 with dely_g1986,1985

ttest E[del_ly|C=1]-E[del_ly|g=1986] with g size = 4

ttest -.02--.012

SE = .046, t-stat = -.756, p-value= .455

Run ttest comparing dely_C,1986 with dely_g1986,1986

ttest E[del_ly|C=1]-E[del_ly|g=1986] with g size = 4

ttest .049--.012

SE = .042, t-stat = 2.357, p-value= .025

COHORT g=1987

(391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1987,1984

ttest E[del_ly|C=1]-E[del_ly|g=1987] with g size = 1

ttest .006--.147

SE = .021, t-stat = -6.553, p-value= 0

Run ttest comparing dely_C,1985 with dely_g1987,1985

ttest E[del_ly|C=1]-E[del_ly|g=1987] with g size = 1

ttest -.02--.009

SE = .016, t-stat = -1.893, p-value= .068

Run ttest comparing dely_C,1986 with dely_g1987,1986

ttest E[del_ly|C=1]-E[del_ly|g=1987] with g size = 1

ttest .049--.095

SE = .015, t-stat = -3.085, p-value= .004

Run ttest comparing dely_C,1987 with dely_g1987,1987
 ttest E[del_ly|C=1]-E[del_ly|g=1987] with g size = 1
 ttest -.006--.052
 SE = .014, t-stat = 3.352, p-value= .002

 COHORT g=1991
 (391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1991,1984
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest .006-.036
 SE = .021, t-stat = -1.384, p-value= .177

Run ttest comparing dely_C,1985 with dely_g1991,1985
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest -.02--.024
 SE = .016, t-stat = .231, p-value= .8190000000000001

Run ttest comparing dely_C,1986 with dely_g1991,1986
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest .049-.098
 SE = .015, t-stat = -3.247, p-value= .003

Run ttest comparing dely_C,1987 with dely_g1991,1987
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest -.006--.005
 SE = .014, t-stat = -.111, p-value= .912

Run ttest comparing dely_C,1988 with dely_g1991,1988
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest .006-.073
 SE = .015, t-stat = -4.384, p-value= 0

Run ttest comparing dely_C,1989 with dely_g1991,1989
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest -.054--.096
 SE = .018, t-stat = 2.331, p-value= .027

Run ttest comparing dely_C,1990 with dely_g1991,1990
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest -.024--.103
 SE = .022, t-stat = 3.658, p-value= .001

Run ttest comparing dely_C,1991 with dely_g1991,1991
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest -.057--.203
 SE = .015, t-stat = 9.499000000000001, p-value= 0

 COHORT g=1993
 (391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1993,1984
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest .006-.074
 SE = .021, t-stat = -3.172, p-value= .004

Run ttest comparing dely_C,1985 with dely_g1993,1985
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.02--.035
 SE = .016, t-stat = .9490000000000001, p-value= .351

Run ttest comparing dely_C,1986 with dely_g1993,1986
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest .049-.032
 SE = .015, t-stat = 1.139, p-value= .264

Run ttest comparing dely_C,1987 with dely_g1993,1987
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.006-.022
 SE = .014, t-stat = -2.096, p-value= .045

Run ttest comparing dely_C,1988 with dely_g1993,1988
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest .006--.045
 SE = .015, t-stat = 3.397, p-value= .002

Run ttest comparing dely_C,1989 with dely_g1993,1989
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.054--.022
 SE = .018, t-stat = -1.807, p-value= .081

Run ttest comparing dely_C,1990 with dely_g1993,1990
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.024--.067
 SE = .022, t-stat = 2.012, p-value= .054

Run ttest comparing dely_C,1991 with dely_g1993,1991
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.057--.119
 SE = .015, t-stat = 4.044, p-value= 0

Run ttest comparing dely_C,1992 with dely_g1993,1992
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.061--.128
 SE = .014, t-stat = 4.646, p-value= 0

Run ttest comparing dely_C,1993 with dely_g1993,1993
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.004--.016
 SE = .012, t-stat = .9570000000000001, p-value= .347

COHORT g=1996
 (368 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1996,1984
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest .006--.016
 SE = .085, t-stat = -.065, p-value= .9480000000000001

Run ttest comparing dely_C,1985 with dely_g1996,1985
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.02--.016
 SE = .062, t-stat = -.179, p-value= .859

Run ttest comparing dely_C,1986 with dely_g1996,1986
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest .049--.016
 SE = .059, t-stat = .007, p-value= .995

Run ttest comparing dely_C,1987 with dely_g1996,1987
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.006--.016
 SE = .055, t-stat = .625, p-value= .537

Run ttest comparing dely_C,1988 with dely_g1996,1988
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest .006--.016
 SE = .061, t-stat = -1.054, p-value= .3

Run ttest comparing dely_C,1989 with dely_g1996,1989
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.054--.016
 SE = .07, t-stat = -.233, p-value= .8170000000000001

Run ttest comparing dely_C,1990 with dely_g1996,1990
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.024--.016
 SE = .086, t-stat = -.491, p-value= .627

Run ttest comparing dely_C,1991 with dely_g1996,1991

ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.057--.016
 SE = .06, t-stat = 1.181, p-value= .247

Run ttest comparing dely_C,1992 with dely_g1996,1992

ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.061--.016
 SE = .058, t-stat = -.5700000000000001, p-value= .5730000000000001

Run ttest comparing dely_C,1993 with dely_g1996,1993

ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.004--.016
 SE = .048, t-stat = -.336, p-value= .739

Run ttest comparing dely_C,1994 with dely_g1996,1994

ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.001--.016
 SE = .079, t-stat = .351, p-value= .728

Run ttest comparing dely_C,1995 with dely_g1996,1995

ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest .023--.016
 SE = .06, t-stat = -.154, p-value= .879

Run ttest comparing dely_C,1996 with dely_g1996,1996

ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.02--.016
 SE = .059, t-stat = -.752, p-value= .458

COHORT g=1998

(345 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1998,1984

ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest .006--.016
 SE = .069, t-stat = .891, p-value= .38

Run ttest comparing dely_C,1985 with dely_g1998,1985

ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.02--.016
 SE = .052, t-stat = -.884, p-value= .383

Run ttest comparing dely_C,1986 with dely_g1998,1986

ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest .049--.016
 SE = .049, t-stat = .521, p-value= .606

Run ttest comparing dely_C,1987 with dely_g1998,1987

ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.006--.016
 SE = .046, t-stat = .662, p-value= .513

Run ttest comparing dely_C,1988 with dely_g1998,1988

ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest .006--.016
 SE = .05, t-stat = -.224, p-value= .8240000000000001

Run ttest comparing dely_C,1989 with dely_g1998,1989

ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.054--.016
 SE = .059, t-stat = .171, p-value= .865

Run ttest comparing dely_C,1990 with dely_g1998,1990

ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.024--.016
 SE = .07, t-stat = -.252, p-value= .803

Run ttest comparing dely_C,1991 with dely_g1998,1991
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.057--.016
 SE = .049, t-stat = -.984, p-value= .333

Run ttest comparing dely_C,1992 with dely_g1998,1992
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.061--.016
 SE = .047, t-stat = .643, p-value= .525

Run ttest comparing dely_C,1993 with dely_g1998,1993
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.004--.016
 SE = .04, t-stat = -.5600000000000001, p-value= .58

Run ttest comparing dely_C,1994 with dely_g1998,1994
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.001--.016
 SE = .065, t-stat = -.351, p-value= .728

Run ttest comparing dely_C,1995 with dely_g1998,1995
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest .023--.016
 SE = .049, t-stat = .726, p-value= .474

Run ttest comparing dely_C,1996 with dely_g1998,1996
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.02--.016
 SE = .051, t-stat = -.657, p-value= .516

Run ttest comparing dely_C,1997 with dely_g1998,1997
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest .023--.016
 SE = .054, t-stat = .404, p-value= .6890000000000001

Run ttest comparing dely_C,1998 with dely_g1998,1998
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.006--.016
 SE = .038, t-stat = .583, p-value= .5640000000000001

COHORT g=2000
 (345 observations deleted)

Run ttest comparing dely_C,1984 with dely_g2000,1984
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .006--.016
 SE = .07, t-stat = -.513, p-value= .612

Run ttest comparing dely_C,1985 with dely_g2000,1985
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.02--.016
 SE = .05, t-stat = -.171, p-value= .865

Run ttest comparing dely_C,1986 with dely_g2000,1986
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .049--.016
 SE = .05, t-stat = -1.01, p-value= .32

Run ttest comparing dely_C,1987 with dely_g2000,1987
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.006--.016
 SE = .044, t-stat = -.101, p-value= .92

Run ttest comparing dely_C,1988 with dely_g2000,1988
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .006--.016
 SE = .05, t-stat = .131, p-value= .897

Run ttest comparing dely_C,1989 with dely_g2000,1989
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.054--.016
 SE = .059, t-stat = .266, p-value= .792

Run ttest comparing dely_C,1990 with dely_g2000,1990
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.024--.016
 SE = .07, t-stat = -.435, p-value= .666

Run ttest comparing dely_C,1991 with dely_g2000,1991
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.057--.016
 SE = .05, t-stat = .606, p-value= .549

Run ttest comparing dely_C,1992 with dely_g2000,1992
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.061--.016
 SE = .047, t-stat = .21, p-value= .835

Run ttest comparing dely_C,1993 with dely_g2000,1993
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.004--.016
 SE = .04, t-stat = -.887, p-value= .382

Run ttest comparing dely_C,1994 with dely_g2000,1994
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.001--.016
 SE = .065, t-stat = .053, p-value= .9580000000000001

Run ttest comparing dely_C,1995 with dely_g2000,1995
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .023--.016
 SE = .049, t-stat = -.167, p-value= .868

Run ttest comparing dely_C,1996 with dely_g2000,1996
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.02--.016
 SE = .048, t-stat = -.6840000000000001, p-value= .499

Run ttest comparing dely_C,1997 with dely_g2000,1997
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .023--.016
 SE = .054, t-stat = .904, p-value= .373

Run ttest comparing dely_C,1998 with dely_g2000,1998
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.006--.016
 SE = .037, t-stat = 1.897, p-value= .067

Run ttest comparing dely_C,1999 with dely_g2000,1999
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .01--.016
 SE = .054, t-stat = -.014, p-value= .989

Run ttest comparing dely_C,2000 with dely_g2000,2000
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.031--.016
 SE = .058, t-stat = .314, p-value= .756

COHORT g=2002
 (391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g2002,1984
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .006-.011
 SE = .021, t-stat = -.226, p-value= .8230000000000001

Run ttest comparing dely_C,1985 with dely_g2002,1985
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.02--.027
 SE = .016, t-stat = -3.023, p-value= .005

Run ttest comparing dely_C,1986 with dely_g2002,1986
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .049--.066
 SE = .015, t-stat = 7.736, p-value= 0

Run ttest comparing dely_C,1987 with dely_g2002,1987
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.006--.086
 SE = .014, t-stat = -6.826000000000001, p-value= 0

Run ttest comparing dely_C,1988 with dely_g2002,1988
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .006--.026
 SE = .015, t-stat = 2.133, p-value= .042

Run ttest comparing dely_C,1989 with dely_g2002,1989
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.054--.019
 SE = .018, t-stat = -1.988, p-value= .056

Run ttest comparing dely_C,1990 with dely_g2002,1990
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.024--.022
 SE = .022, t-stat = -2.123, p-value= .042

Run ttest comparing dely_C,1991 with dely_g2002,1991
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.057--.215
 SE = .015, t-stat = 10.3, p-value= 0

Run ttest comparing dely_C,1992 with dely_g2002,1992
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.061--.073
 SE = .014, t-stat = .8230000000000001, p-value= .417

Run ttest comparing dely_C,1993 with dely_g2002,1993
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.004--.007
 SE = .012, t-stat = .264, p-value= .794

Run ttest comparing dely_C,1994 with dely_g2002,1994
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.001--.053
 SE = .02, t-stat = 2.615, p-value= .014

Run ttest comparing dely_C,1995 with dely_g2002,1995
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .023--.004
 SE = .015, t-stat = 1.253, p-value= .22

Run ttest comparing dely_C,1996 with dely_g2002,1996
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.02--.07
 SE = .015, t-stat = -6.043, p-value= 0

Run ttest comparing dely_C,1997 with dely_g2002,1997
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .023--.071
 SE = .017, t-stat = 5.668, p-value= 0

Run ttest comparing dely_C,1998 with dely_g2002,1998
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.006--.037
 SE = .011, t-stat = 2.8, p-value= .009

Run ttest comparing dely_C,1999 with dely_g2002,1999
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .01--.051
 SE = .017, t-stat = 3.63, p-value= .001

Run ttest comparing dely_C,2000 with dely_g2002,2000
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.031--.02
 SE = .018, t-stat = -.646, p-value= .523

Run ttest comparing dely_C,2001 with dely_g2002,2001
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.007--.013
 SE = .019, t-stat = -1.035, p-value= .309

Run ttest comparing dely_C,2002 with dely_g2002,2002
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .034--.003
 SE = .016, t-stat = 1.922, p-value= .064

COHORT g=2003
 (391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g2003,1984
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .006--.157
 SE = .021, t-stat = -7.031000000000001, p-value= 0

Run ttest comparing dely_C,1985 with dely_g2003,1985
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.02--.234
 SE = .016, t-stat = 13.806, p-value= 0

Run ttest comparing dely_C,1986 with dely_g2003,1986
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .049--.253
 SE = .015, t-stat = -13.673, p-value= 0

Run ttest comparing dely_C,1987 with dely_g2003,1987
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.006--.056
 SE = .014, t-stat = -4.602, p-value= 0

Run ttest comparing dely_C,1988 with dely_g2003,1988
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .006--.075
 SE = .015, t-stat = -4.502, p-value= 0

Run ttest comparing dely_C,1989 with dely_g2003,1989
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.054--.338
 SE = .018, t-stat = 15.836, p-value= 0

Run ttest comparing dely_C,1990 with dely_g2003,1990
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.024--.157
 SE = .022, t-stat = -8.333, p-value= 0

Run ttest comparing dely_C,1991 with dely_g2003,1991
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.057--.322
 SE = .015, t-stat = 17.29, p-value= 0

Run ttest comparing dely_C,1992 with dely_g2003,1992
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.061--.299
 SE = .014, t-stat = -24.956, p-value= 0

Run ttest comparing dely_C,1993 with dely_g2003,1993
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.004--.248
 SE = .012, t-stat = 19.931, p-value= 0

Run ttest comparing dely_C,1994 with dely_g2003,1994
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.001--.007
 SE = .02, t-stat = .281, p-value= .78

Run ttest comparing dely_C,1995 with dely_g2003,1995
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .023-.06
 SE = .015, t-stat = -2.473, p-value= .02

Run ttest comparing dely_C,1996 with dely_g2003,1996
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.02--.057
 SE = .015, t-stat = 2.542, p-value= .017

Run ttest comparing dely_C,1997 with dely_g2003,1997
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .023-.195
 SE = .017, t-stat = -10.395, p-value= 0

Run ttest comparing dely_C,1998 with dely_g2003,1998
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.006--.234
 SE = .011, t-stat = 20.188, p-value= 0

Run ttest comparing dely_C,1999 with dely_g2003,1999
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .01--.155
 SE = .017, t-stat = 9.794, p-value= 0

Run ttest comparing dely_C,2000 with dely_g2003,2000
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.031-.192
 SE = .018, t-stat = -12.675, p-value= 0

Run ttest comparing dely_C,2001 with dely_g2003,2001
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.007-.089
 SE = .019, t-stat = -5.053, p-value= 0

Run ttest comparing dely_C,2002 with dely_g2003,2002
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .034--.105
 SE = .016, t-stat = 8.6, p-value= 0

Run ttest comparing dely_C,2003 with dely_g2003,2003
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.019-.121
 SE = .014, t-stat = -9.881, p-value= 0

187
 188
 189
 190
 191


```

192 ** Q2b -----
193 /*
194 > Do secondary belt laws pose a potential problem for your DiD design? If so, test
195 > whether that problem is likely to be significant. If not, explain why not.
196 >
197 > ANS: States implement secondary belt laws before switching to primary. Thus
198 > secondary laws are indeed a threat to any effect caused by the primary laws in
199 > that primary laws have anticipatory effects wrought by the preceeding secondary
200 > laws or perhaps even some national awareness (spillovers).
201 >
202 > Not sure how to test this. Taker-uppers of 2ndary laws are not the same as
203 > primary. That is, within a primary cohort, there exist different secondary
204 > cohorts.
205 >
206 > */
194
195
196
197 // Secondary cohorts for sole states in primary cohort:
198 // list cohort sec if inlist(cohort, 1987, 1993, 2002) & year == 1981
199 // 1986 -> 1987
200 // 1986 -> 1993
201 // 1987 -> 2002
202
203 // replot q1 graph with secondary cohort verticals
204 preserve
205
206 collapse (mean) fatalities ln_fat_pc fat_pc, by(cohort year)
207
208 // plot raw data by cohort with vertical E_i
209 twoway (line ln_fat_pc year if cohort == 999, lcolor(black) ) ///
210       (line ln_fat_pc year if cohort == 1987, lcolor(gs10) ) ///
211       (line ln_fat_pc year if cohort == 1993, lcolor(red) ) ///
212       (line ln_fat_pc year if cohort == 2002, lcolor(blue) ), ///
213       legend(label(1 "No shock") ///
214             label(2 "1987") ///
215             label(3 "1993") ///
216             label(4 "2002")) ///
217       xline(1986.1, lcolor(gs10) lpatter(dot)) ///
218       xline(1986.2, lcolor(red) lpatter(dot)) ///
219       xline(1987.1, lcolor(blue) lpatter(dot)) ///
220       ///
221       xline(1987, lcolor(gs10) lpatter(dash)) ///
222       xline(1993, lcolor(red) lpatter(dash)) ///
223       xline(2002, lcolor(blue) lpatter(dash))
209 restore
210 // ANS: Let the data speak for themselves. The raw data show that, in some states,
211 // the secondary laws were better markers of declines in fatality rates. The 1993
212 // cohort is interesting in that both sets of laws seem to be associated with
213 // declines in fatalities.
214
215 // Meeting todos: Run Max's test and discuss theoretically
216 // States with out any laws will have seen states take up secondary before primary
217
218 ** Q2c -----
219 /*
220 > Repeat the tests from part 2(a) (and, if any, 2(b)) using fatalities per capita as
221 > the outcome, without logs. Do the conclusions change? Discuss.
222 >
223 > */

```

```

220
221 byso state (year) : gen del_y = fat_pc[_n] - fat_pc[_n-1]
    (48 missing values generated)

222
223 labellist cohort
    cohort:
        999 No shock
        1984 1984
        1986 1986
        1987 1987
        1991 1991
        1993 1993
        1996 1996
        1998 1998
        2000 2000
        2002 2002
        2003 2003

224 foreach g in `r(values)' {
    2.      dis as result "-----"
    3.      dis as result "COHORT g=`g'"
    4.      preserve
    5.          keep if inlist(cohort, 999, `g')
    6.          forval t = 1984/`g' {
    7.              dis as text ""
    8.              dis as result "Run ttest comparing dely_C,`t' with dely_g`g',
> `t'"
    9.              qui sum del_y if cohort == 999 & year == `t' // get contr
> ol mean
    10.              local delyc_rd = round(`r(mean)', 0.001)
    11.              qui count if cohort == `g' & year == `t'
    12.              local n_g `r(N)'
    13.              if `n_g' == 1 {
    14.                  // test cohort C (control group) against cohort g's s
> calar
225              qui sum del_y if cohort == `g' & year == `t'
    15.                  local delyg = `r(mean)'
    16.                  local delyg_rd = round(`r(mean)', 0.001)
    17.                  qui ttest del_y == `r(mean)' if year == `t' & cohort
> == 999
    18.                  }
    19.                  else if `r(N)' > 1 qui ttest del_y if year == `t', by (co
> hort)
    20.                  // collect test stats
226              local se_rd = round(`r(se)', 0.001)
    21.              local t_rd = round(`r(t)', 0.001)
    22.              local p_rd = round(`r(p)', 0.001)
    23.
227              // display results
228              dis as text "ttest E[del_ly|C=1]-E[del_ly|g=`g'] with g size
> = `n_g'"
    24.              dis as text "ttest `delyc_rd'-'`delyg_rd'"
    25.              if `p_rd' < 0.05 dis as error "SE = `se_rd', t-stat = `t_
> rd', p-value= `p_rd'"
    26.              else dis as text "SE = `se_rd', t-stat = `t_rd', p-value=
> `p_rd'"
    27.          }
    28.      restore
    29.  }

-----
COHORT g=999
(414 observations deleted)
-----
COHORT g=1984
(391 observations deleted)

```

Run ttest comparing dely_C,1984 with dely_g1984,1984
 ttest E[del_ly|C=1]-E[del_ly|g=1984] with g size = 1
 ttest 0--.001
 SE = .005, t-stat = .396, p-value= .6950000000000001

COHORT g=1986
 (322 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1986,1984
 ttest E[del_ly|C=1]-E[del_ly|g=1986] with g size = 4
 ttest 0--.001
 SE = .013, t-stat = 1.219, p-value= .232

Run ttest comparing dely_C,1985 with dely_g1986,1985
 ttest E[del_ly|C=1]-E[del_ly|g=1986] with g size = 4
 ttest -.005--.001
 SE = .007, t-stat = -1.283, p-value= .209

Run ttest comparing dely_C,1986 with dely_g1986,1986
 ttest E[del_ly|C=1]-E[del_ly|g=1986] with g size = 4
 ttest .011--.001
 SE = .009, t-stat = 2.533, p-value= .016

COHORT g=1987
 (391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1987,1984
 ttest E[del_ly|C=1]-E[del_ly|g=1987] with g size = 1
 ttest 0-.032
 SE = .005, t-stat = -6.923, p-value= 0

Run ttest comparing dely_C,1985 with dely_g1987,1985
 ttest E[del_ly|C=1]-E[del_ly|g=1987] with g size = 1
 ttest -.005-.002
 SE = .002, t-stat = -3.249, p-value= .003

Run ttest comparing dely_C,1986 with dely_g1987,1986
 ttest E[del_ly|C=1]-E[del_ly|g=1987] with g size = 1
 ttest .011-.024
 SE = .003, t-stat = -4.075, p-value= 0

Run ttest comparing dely_C,1987 with dely_g1987,1987
 ttest E[del_ly|C=1]-E[del_ly|g=1987] with g size = 1
 ttest -.001--.013
 SE = .003, t-stat = 3.629, p-value= .001

COHORT g=1991
 (391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1991,1984
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest 0-.008
 SE = .005, t-stat = -1.562, p-value= .129

Run ttest comparing dely_C,1985 with dely_g1991,1985
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest -.005--.005
 SE = .002, t-stat = -.002, p-value= .999

Run ttest comparing dely_C,1986 with dely_g1991,1986
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest .011-.022
 SE = .003, t-stat = -3.39, p-value= .002

Run ttest comparing dely_C,1987 with dely_g1991,1987
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest -.001--.001
 SE = .003, t-stat = -.068, p-value= .9460000000000001

Run ttest comparing dely_C,1988 with dely_g1991,1988
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest .001-.017
 SE = .003, t-stat = -4.84, p-value= 0

Run ttest comparing dely_C,1989 with dely_g1991,1989
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest -.011--.023
 SE = .004, t-stat = 3.325, p-value= .002

Run ttest comparing dely_C,1990 with dely_g1991,1990
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest -.003--.022
 SE = .004, t-stat = 5.248, p-value= 0

Run ttest comparing dely_C,1991 with dely_g1991,1991
 ttest E[del_ly|C=1]-E[del_ly|g=1991] with g size = 1
 ttest -.012--.037
 SE = .003, t-stat = 8.218999999999999, p-value= 0

COHORT g=1993
 (391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1993,1984
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest 0-.014
 SE = .005, t-stat = -2.952, p-value= .006

Run ttest comparing dely_C,1985 with dely_g1993,1985
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.005--.007
 SE = .002, t-stat = .738, p-value= .466

Run ttest comparing dely_C,1986 with dely_g1993,1986
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest .011-.006
 SE = .003, t-stat = 1.338, p-value= .191

Run ttest comparing dely_C,1987 with dely_g1993,1987
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.001-.004
 SE = .003, t-stat = -1.739, p-value= .093

Run ttest comparing dely_C,1988 with dely_g1993,1988
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest .001--.009
 SE = .003, t-stat = 2.835, p-value= .008

Run ttest comparing dely_C,1989 with dely_g1993,1989
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.011--.004
 SE = .004, t-stat = -1.934, p-value= .063

Run ttest comparing dely_C,1990 with dely_g1993,1990
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.003--.012
 SE = .004, t-stat = 2.555, p-value= .016

Run ttest comparing dely_C,1991 with dely_g1993,1991
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.012--.019
 SE = .003, t-stat = 2.506, p-value= .018

Run ttest comparing dely_C,1992 with dely_g1993,1992
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest -.01--.019
 SE = .003, t-stat = 3.415, p-value= .002

Run ttest comparing dely_C,1993 with dely_g1993,1993
 ttest E[del_ly|C=1]-E[del_ly|g=1993] with g size = 1
 ttest 0--.002
 SE = .002, t-stat = .769, p-value= .448

COHORT g=1996
 (368 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1996,1984
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest 0--.002
 SE = .018, t-stat = -.161, p-value= .873

Run ttest comparing dely_C,1985 with dely_g1996,1985
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.005--.002
 SE = .009, t-stat = -.26, p-value= .796

Run ttest comparing dely_C,1986 with dely_g1996,1986
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest .011--.002
 SE = .013, t-stat = -.094, p-value= .926

Run ttest comparing dely_C,1987 with dely_g1996,1987
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.001--.002
 SE = .013, t-stat = .471, p-value= .641

Run ttest comparing dely_C,1988 with dely_g1996,1988
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest .001--.002
 SE = .014, t-stat = -1.019, p-value= .316

Run ttest comparing dely_C,1989 with dely_g1996,1989
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.011--.002
 SE = .014, t-stat = -.165, p-value= .87

Run ttest comparing dely_C,1990 with dely_g1996,1990
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.003--.002
 SE = .015, t-stat = -.39, p-value= .6990000000000001

Run ttest comparing dely_C,1991 with dely_g1996,1991
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.012--.002
 SE = .012, t-stat = 1.349, p-value= .188

Run ttest comparing dely_C,1992 with dely_g1996,1992
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.01--.002
 SE = .01, t-stat = -.379, p-value= .708

Run ttest comparing dely_C,1993 with dely_g1996,1993
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest 0--.002
 SE = .009, t-stat = -.32, p-value= .751

Run ttest comparing dely_C,1994 with dely_g1996,1994
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest .001--.002
 SE = .014, t-stat = .485, p-value= .631

Run ttest comparing dely_C,1995 with dely_g1996,1995
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest .006--.002
 SE = .011, t-stat = -.066, p-value= .9480000000000001

Run ttest comparing dely_C,1996 with dely_g1996,1996
 ttest E[del_ly|C=1]-E[del_ly|g=1996] with g size = 2
 ttest -.005--.002
 SE = .012, t-stat = -.8230000000000001, p-value= .417

COHORT g=1998
 (345 observations deleted)

Run ttest comparing dely_C,1984 with dely_g1998,1984
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest 0--.002
 SE = .015, t-stat = .744, p-value= .463

Run ttest comparing dely_C,1985 with dely_g1998,1985
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.005--.002
 SE = .008, t-stat = -.919, p-value= .365

Run ttest comparing dely_C,1986 with dely_g1998,1986
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest .011--.002
 SE = .011, t-stat = .662, p-value= .513

Run ttest comparing dely_C,1987 with dely_g1998,1987
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.001--.002
 SE = .011, t-stat = .5710000000000001, p-value= .5720000000000001

Run ttest comparing dely_C,1988 with dely_g1998,1988
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest .001--.002
 SE = .011, t-stat = -.265, p-value= .793

Run ttest comparing dely_C,1989 with dely_g1998,1989
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.011--.002
 SE = .012, t-stat = .02, p-value= .984

Run ttest comparing dely_C,1990 with dely_g1998,1990
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.003--.002
 SE = .012, t-stat = -.201, p-value= .842

Run ttest comparing dely_C,1991 with dely_g1998,1991
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.012--.002
 SE = .01, t-stat = -1.015, p-value= .318

Run ttest comparing dely_C,1992 with dely_g1998,1992
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.01--.002
 SE = .008, t-stat = .7010000000000001, p-value= .488

Run ttest comparing dely_C,1993 with dely_g1998,1993
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest 0--.002
 SE = .007, t-stat = -.614, p-value= .543

Run ttest comparing dely_C,1994 with dely_g1998,1994
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest .001--.002
 SE = .011, t-stat = -.263, p-value= .794

Run ttest comparing dely_C,1995 with dely_g1998,1995
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest .006--.002
 SE = .009, t-stat = .9440000000000001, p-value= .353

Run ttest comparing dely_C,1996 with dely_g1998,1996
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest -.005--.002
 SE = .01, t-stat = -1.052, p-value= .301

Run ttest comparing dely_C,1997 with dely_g1998,1997
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest .004--.002
 SE = .011, t-stat = .138, p-value= .891

Run ttest comparing dely_C,1998 with dely_g1998,1998
 ttest E[del_ly|C=1]-E[del_ly|g=1998] with g size = 3
 ttest 0--.002
 SE = .008, t-stat = .863, p-value= .395

COHORT g=2000
 (345 observations deleted)

Run ttest comparing dely_C,1984 with dely_g2000,1984
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest 0--.002
 SE = .015, t-stat = -.411, p-value= .6840000000000001

Run ttest comparing dely_C,1985 with dely_g2000,1985
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.005--.002
 SE = .007, t-stat = -.171, p-value= .865

Run ttest comparing dely_C,1986 with dely_g2000,1986
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .011--.002
 SE = .011, t-stat = -.9550000000000001, p-value= .347

Run ttest comparing dely_C,1987 with dely_g2000,1987
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.001--.002
 SE = .01, t-stat = -.188, p-value= .852

Run ttest comparing dely_C,1988 with dely_g2000,1988
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .001--.002
 SE = .011, t-stat = .323, p-value= .748

Run ttest comparing dely_C,1989 with dely_g2000,1989
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.011--.002
 SE = .011, t-stat = -.127, p-value= .9

Run ttest comparing dely_C,1990 with dely_g2000,1990
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.003--.002
 SE = .012, t-stat = -.54, p-value= .593

Run ttest comparing dely_C,1991 with dely_g2000,1991
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.012--.002
 SE = .01, t-stat = .064, p-value= .9490000000000001

Run ttest comparing dely_C,1992 with dely_g2000,1992
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.01--.002
 SE = .009, t-stat = .411, p-value= .6840000000000001

Run ttest comparing dely_C,1993 with dely_g2000,1993
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest 0--.002
 SE = .007, t-stat = -.621, p-value= .539

Run ttest comparing dely_C,1994 with dely_g2000,1994
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .001--.002
 SE = .011, t-stat = .003, p-value= .998

Run ttest comparing dely_C,1995 with dely_g2000,1995
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .006--.002
 SE = .009, t-stat = .042, p-value= .967

Run ttest comparing dely_C,1996 with dely_g2000,1996
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.005--.002
 SE = .01, t-stat = -.6900000000000001, p-value= .495

Run ttest comparing dely_C,1997 with dely_g2000,1997
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .004--.002
 SE = .011, t-stat = .493, p-value= .626

Run ttest comparing dely_C,1998 with dely_g2000,1998
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest 0--.002
 SE = .008, t-stat = 1.736, p-value= .093

Run ttest comparing dely_C,1999 with dely_g2000,1999
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest .002--.002
 SE = .011, t-stat = -.186, p-value= .854

Run ttest comparing dely_C,2000 with dely_g2000,2000
 ttest E[del_ly|C=1]-E[del_ly|g=2000] with g size = 3
 ttest -.005--.002
 SE = .012, t-stat = .518, p-value= .608

COHORT g=2002
 (391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g2002,1984
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest 0-.002
 SE = .005, t-stat = -.301, p-value= .765

Run ttest comparing dely_C,1985 with dely_g2002,1985
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.005-.004
 SE = .002, t-stat = -4.27, p-value= 0

Run ttest comparing dely_C,1986 with dely_g2002,1986
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .011--.011
 SE = .003, t-stat = 6.572, p-value= 0

Run ttest comparing dely_C,1987 with dely_g2002,1987
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.001-.014
 SE = .003, t-stat = -4.777, p-value= 0

Run ttest comparing dely_C,1988 with dely_g2002,1988
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .001--.004
 SE = .003, t-stat = 1.56, p-value= .13

Run ttest comparing dely_C,1989 with dely_g2002,1989
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.011--.003
 SE = .004, t-stat = -2.219, p-value= .034

Run ttest comparing dely_C,1990 with dely_g2002,1990
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.003--.004
 SE = .004, t-stat = -1.738, p-value= .093

Run ttest comparing dely_C,1991 with dely_g2002,1991
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.012--.033
 SE = .003, t-stat = 6.738, p-value= 0

Run ttest comparing dely_C,1992 with dely_g2002,1992
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.01--.01
 SE = .003, t-stat = -.017, p-value= .986

Run ttest comparing dely_C,1993 with dely_g2002,1993
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest 0--.001
 SE = .002, t-stat = .222, p-value= .8260000000000001

Run ttest comparing dely_C,1994 with dely_g2002,1994
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .001--.007
 SE = .004, t-stat = 2.145, p-value= .04

Run ttest comparing dely_C,1995 with dely_g2002,1995
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .006-0
 SE = .003, t-stat = 1.864, p-value= .073

Run ttest comparing dely_C,1996 with dely_g2002,1996
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.005-.009
 SE = .003, t-stat = -4.456, p-value= 0

Run ttest comparing dely_C,1997 with dely_g2002,1997
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .004--.009
 SE = .003, t-stat = 3.678, p-value= .001

Run ttest comparing dely_C,1998 with dely_g2002,1998
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest 0--.004
 SE = .002, t-stat = 1.804, p-value= .082

Run ttest comparing dely_C,1999 with dely_g2002,1999
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .002--.006
 SE = .004, t-stat = 2.16, p-value= .039

Run ttest comparing dely_C,2000 with dely_g2002,2000
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.005--.002
 SE = .004, t-stat = -.8290000000000001, p-value= .414

Run ttest comparing dely_C,2001 with dely_g2002,2001
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest -.002-.001
 SE = .004, t-stat = -.849, p-value= .403

Run ttest comparing dely_C,2002 with dely_g2002,2002
 ttest E[del_ly|C=1]-E[del_ly|g=2002] with g size = 1
 ttest .007-0
 SE = .003, t-stat = 2.174, p-value= .038

COHORT g=2003
 (391 observations deleted)

Run ttest comparing dely_C,1984 with dely_g2003,1984
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest 0-.031
 SE = .005, t-stat = -6.675, p-value= 0

Run ttest comparing dely_C,1985 with dely_g2003,1985
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.005--.044
 SE = .002, t-stat = 17.767, p-value= 0

Run ttest comparing dely_C,1986 with dely_g2003,1986
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .011-.049
 SE = .003, t-stat = -11.726, p-value= 0

Run ttest comparing dely_C,1987 with dely_g2003,1987
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.001-.013
 SE = .003, t-stat = -4.248, p-value= 0

Run ttest comparing dely_C,1988 with dely_g2003,1988
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .001-.018
 SE = .003, t-stat = -4.963, p-value= 0

Run ttest comparing dely_C,1989 with dely_g2003,1989
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.011--.071
 SE = .004, t-stat = 17.023, p-value= 0

Run ttest comparing dely_C,1990 with dely_g2003,1990
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.003-.03
 SE = .004, t-stat = -8.875, p-value= 0

Run ttest comparing dely_C,1991 with dely_g2003,1991
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.012--.057
 SE = .003, t-stat = 14.555, p-value= 0

Run ttest comparing dely_C,1992 with dely_g2003,1992
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.01-.052
 SE = .003, t-stat = -23.665, p-value= 0

Run ttest comparing dely_C,1993 with dely_g2003,1993
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest 0--.044
 SE = .002, t-stat = 19.983, p-value= 0

Run ttest comparing dely_C,1994 with dely_g2003,1994
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .001--.001
 SE = .004, t-stat = .595, p-value= .5570000000000001

Run ttest comparing dely_C,1995 with dely_g2003,1995
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .006-.01
 SE = .003, t-stat = -1.472, p-value= .152

Run ttest comparing dely_C,1996 with dely_g2003,1996
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest -.005--.009
 SE = .003, t-stat = 1.516, p-value= .14

Run ttest comparing dely_C,1997 with dely_g2003,1997
 ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
 ttest .004-.034
 SE = .003, t-stat = -8.846, p-value= 0

Run ttest comparing dely_C,1998 with dely_g2003,1998

ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
ttest 0--.04

SE = .002, t-stat = 15.976, p-value= 0

Run ttest comparing dely_C,1999 with dely_g2003,1999

ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
ttest .002--.022

SE = .004, t-stat = 6.667, p-value= 0

Run ttest comparing dely_C,2000 with dely_g2003,2000

ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
ttest -.005-.027

SE = .004, t-stat = -8.833, p-value= 0

Run ttest comparing dely_C,2001 with dely_g2003,2001

ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
ttest -.002-.015

SE = .004, t-stat = -4.19, p-value= 0

Run ttest comparing dely_C,2002 with dely_g2003,2002

ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
ttest .007--.017

SE = .003, t-stat = 7.884, p-value= 0

Run ttest comparing dely_C,2003 with dely_g2003,2003

ttest E[del_ly|C=1]-E[del_ly|g=2003] with g size = 1
ttest -.004-.02

SE = .002, t-stat = -9.979000000000001, p-value= 0

229 // The conclusion doesn't change much as the pre-trend test can be scaled monotonica
> lly

230 // without altering the qualitative comparison between means.

231

232

233 // repeat 2b

234 preserve

235 collapse (mean) fatalities ln_fat_pc fat_pc, by(cohort year)

236

237 // plot raw data by cohort with vertical E_i

238 twoway (line fat_pc year if cohort == 999, lcolor(black)) ///

> (line fat_pc year if cohort == 1987, lcolor(gs10)) ///

>

> (line fat_pc year if cohort == 1993, lcolor(red)) ///

> (line fat_pc year if cohort == 2002, lcolor(blue)), ///

> legend(label(1 "No shock") ///

> label(2 "1987") ///

> label(3 "1993") ///

> label(4 "2002")) ///

> xline(1986.1, lcolor(gs10) lpatter(dot)) ///

> xline(1986.2, lcolor(red) lpatter(dot)) ///

> xline(1987.1, lcolor(blue) lpatter(dot)) ///

>

> xline(1987, lcolor(gs10) lpatter(dash)) ///

> xline(1993, lcolor(red) lpatter(dash)) ///

> xline(2002, lcolor(blue) lpatter(dash))

239 restore

```

240
241 // 2c) The raw data show the same general trend.
242 /*
  > As per Roth and Santanna (2023), we can test against the null that the PTA is
  > invariant to (strictly monotonic) transformations. Compare change in pdfs of
  > raw outcome (fatalities per capita) over time across treatment and control. If
  > the distributions are indistinguishable, then the PTA holds under transformation.
  >
  > */
243
244 end of do-file

245 do "$do_loc/Code/02_analysis_q3a.do"

246 /*
  > Title:          02_analysis_q2.do
  > Outline:        Question 3a, PSet 2
  >
  > Q3 DiD estimation
  >
  > 3. Now proceed with the DiD estimation.
  >
  > (a) Report the de Chaisemartin and D'Haultfouille's manual averaging estimates of
  > the dynamic ATTs for the horizons where a reasonable sample is available.
  > */
247
248
249
250 use "$dta_loc/pset2_q1", clear

251 isid state year

252
253 sort state year primary secondary

254 drop college beer unemploy totalvmt precip snow32 rural_speed urban_speed

255
256
257 // I start with Sun and Abraham (2021) where control is never-treated
258 // as opposed to not yet treated.
259
260 // Compute cohort-horizon specific CATT_{g,e+h} as  $Y_{\{g,e+h\}} - Y_{\{g,e-1\}}$ 
261 // Consider 1997 first.
262 // get cohort level data
263 collapse (mean) fatalities ln_fat_pc fat_pc, by(cohort year)

264
265 preserve

266         local n1996 = 1996-1981 + 1

267         dis `n1996'
16

268         // get y_bar for each cohort at horizon 2
269         byso cohort (year) : gen del_y_1996_h2 = ln_fat_pc[`n1996'+2] - ln_fat_pc[`n
  > 1996'-1]

```

```

270
271         keep del_y_1996_h2 cohort
272         duplicates drop

Duplicates in terms of all variables

(242 observations deleted)

273         keep if inlist(cohort, 999, 1996)
(9 observations deleted)

274         gen CATT_1996_h2 = del_y_1996_h2[_n]-del_y_1996_h2[_n-1]
(1 missing value generated)

275 restore

276
277 // 1) loop over all cohorts and horizons
278 labellist cohort
    cohort:
        999 No shock
        1984 1984
        1986 1986
        1987 1987
        1991 1991
        1993 1993
        1996 1996
        1998 1998
        2000 2000
        2002 2002
        2003 2003

279 foreach g in `r(values)' {
280     if `g' != 999 { // omit control group
281         dis as error "g=`g'"
282         local n`g' = `g'-1981 + 1
283         dis `n`g'
284
285         // get y_bar for each cohort at horizon h
286         local h_max = 2003-`g'
287         dis `h_max'
288         forval h = 0/`h_max' {
289             preserve
290             dis as error "h=`h'"
291             byso cohort (year) : gen del_y_g`g'_h`h' = ///
292                 ln_fat_pc[`n`g'`'+`h'] - ln_fat_pc[`n`g'`'-1]
293             keep del_y_g`g'_h`h' cohort
294             duplicates drop
295             keep if inlist(cohort, 999, `g')
296             gen CATT_`g'_h`h' = del_y_g`g'_h`h'[_n] - del_y_g
297             > `g'_h`h'[_n-1]
298             16. //
299             pause
300             keep cohort CATT_`g'_h`h'
301             keep if CATT_`g'_h`h' != .
302             gen h = `h'
303             rename CATT_`g'_h`h' CATT_hg
304
305             // save to stack later
306             tempfile est_CATT_`g'_h`h'
307             save `est_CATT_`g'_h`h'
308         }
309     }
310 }

```

```

285                                restore
    23.                                }
    24.                                }
    25. }
g=1984
4
19
h=0

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000003.tmp saved
h=1

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000005.tmp saved
h=2

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000007.tmp saved
h=3

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000009.tmp saved
h=4

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000b.tmp saved
h=5

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000d.tmp saved
h=6

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000f.tmp saved
h=7

```

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000h.tmp saved
h=8

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000j.tmp saved
h=9

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000l.tmp saved
h=10

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000n.tmp saved
h=11

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000p.tmp saved
h=12

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000r.tmp saved
h=13

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000t.tmp saved
h=14

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000v.tmp saved
h=15

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00000x.tmp saved
h=16

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000011.tmp saved
h=17

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000013.tmp saved
h=18

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000015.tmp saved
h=19

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000017.tmp saved
g=1986
6
17
h=0

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000019.tmp saved
h=1

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001b.tmp saved
h=2

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001d.tmp saved
h=3

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001f.tmp saved
h=4

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001h.tmp saved
h=5

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001j.tmp saved
h=6

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001l.tmp saved
h=7

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001n.tmp saved
h=8

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001p.tmp saved
h=9

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001r.tmp saved
h=10

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001t.tmp saved
h=11

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001v.tmp saved
h=12

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00001x.tmp saved
h=13

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000021.tmp saved
h=14

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000023.tmp saved
h=15

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000025.tmp saved
h=16

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000027.tmp saved
h=17

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000029.tmp saved
g=1987
7
16
h=0

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002b.tmp saved
h=1

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002d.tmp saved
h=2

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002f.tmp saved
h=3

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002h.tmp saved
h=4

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002j.tmp saved
h=5

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002l.tmp saved
h=6

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002n.tmp saved
h=7

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002p.tmp saved
h=8

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002r.tmp saved
h=9

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002t.tmp saved
h=10

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002v.tmp saved
h=11

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00002x.tmp saved
h=12

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000031.tmp saved
h=13

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000033.tmp saved
h=14

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000035.tmp saved
h=15

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000037.tmp saved
h=16

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000039.tmp saved
g=1991
11
12
h=0

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003b.tmp saved
h=1

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003d.tmp saved
h=2

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003f.tmp saved
h=3

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003h.tmp saved
h=4

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003j.tmp saved
h=5

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003l.tmp saved
h=6

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003n.tmp saved
h=7

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003p.tmp saved
h=8

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003r.tmp saved
h=9

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003t.tmp saved
h=10

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003v.tmp saved
h=11

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00003x.tmp saved
h=12

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000041.tmp saved
g=1993
13
10
h=0

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000043.tmp saved
h=1

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000045.tmp saved
h=2

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000047.tmp saved
h=3

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000049.tmp saved
h=4

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004b.tmp saved
h=5

Duplicates in terms of all variables

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004d.tmp saved
h=6

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004f.tmp saved
h=7

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004h.tmp saved
h=8

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004j.tmp saved
h=9

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004l.tmp saved
h=10

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004n.tmp saved
g=1996
16
7
h=0

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004p.tmp saved
h=1

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004r.tmp saved
h=2

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004t.tmp saved
h=3

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004v.tmp saved
h=4

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00004x.tmp saved
h=5

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000051.tmp saved
h=6

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000053.tmp saved
h=7

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000055.tmp saved
g=1998
18
5
h=0

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000057.tmp saved
h=1

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000059.tmp saved
h=2

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005b.tmp saved
h=3

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005d.tmp saved
h=4

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005f.tmp saved
h=5

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005h.tmp saved
g=2000
20
3
h=0

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005j.tmp saved
h=1

Duplicates in terms of all variables

(242 observations deleted)
 (9 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005l.tmp saved
h=2

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005n.tmp saved
h=3

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005p.tmp saved
g=2002
22
1
h=0

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005r.tmp saved
h=1

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005t.tmp saved
g=2003
23
0
h=0

```

Duplicates in terms of all variables

```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005v.tmp saved

```

```

286
287 // 2) stack CATTs in new dta
288 use `est_CATT_1984_h0', clear // call first cohort

```

```

289 local counter 0

```

```

290 labellist cohort

```

```

cohort:
          999 No shock
          1984 1984
          1986 1986
          1987 1987
          1991 1991
          1993 1993
          1996 1996
          1998 1998
          2000 2000
          2002 2002
          2003 2003

```

```

291 foreach g in `r(values)' {
2.     if `g' != 999 { // omit control group
3.         local h_max = 2003-`g'
4.         dis `h_max'
5.         forval h = 0/`h_max' {
6.             dis "g, h = `g', `h'"
7.             if `counter' > 0 {
8.                 append using `est_CATT_`g'_h`h''
9.             }
10.            local counter = `counter' + 1
11.        }
12.    }
13. }
19
g, h = 1984, 0
g, h = 1984, 1
(label cohort already defined)
g, h = 1984, 2
(label cohort already defined)
g, h = 1984, 3
(label cohort already defined)
g, h = 1984, 4
(label cohort already defined)
g, h = 1984, 5
(label cohort already defined)
g, h = 1984, 6
(label cohort already defined)
g, h = 1984, 7
(label cohort already defined)
g, h = 1984, 8
(label cohort already defined)
g, h = 1984, 9
(label cohort already defined)
g, h = 1984, 10
(label cohort already defined)
g, h = 1984, 11
(label cohort already defined)
g, h = 1984, 12
(label cohort already defined)
g, h = 1984, 13
(label cohort already defined)
g, h = 1984, 14
(label cohort already defined)
g, h = 1984, 15
(label cohort already defined)
g, h = 1984, 16
(label cohort already defined)
g, h = 1984, 17
(label cohort already defined)
g, h = 1984, 18
(label cohort already defined)
g, h = 1984, 19
(label cohort already defined)
17
g, h = 1986, 0
(label cohort already defined)
g, h = 1986, 1
(label cohort already defined)
g, h = 1986, 2
(label cohort already defined)
g, h = 1986, 3
(label cohort already defined)
g, h = 1986, 4
(label cohort already defined)
g, h = 1986, 5
(label cohort already defined)
g, h = 1986, 6
(label cohort already defined)
g, h = 1986, 7
(label cohort already defined)
g, h = 1986, 8
(label cohort already defined)

```

```
g, h = 1986, 9
(label cohort already defined)
g, h = 1986, 10
(label cohort already defined)
g, h = 1986, 11
(label cohort already defined)
g, h = 1986, 12
(label cohort already defined)
g, h = 1986, 13
(label cohort already defined)
g, h = 1986, 14
(label cohort already defined)
g, h = 1986, 15
(label cohort already defined)
g, h = 1986, 16
(label cohort already defined)
g, h = 1986, 17
(label cohort already defined)
16
g, h = 1987, 0
(label cohort already defined)
g, h = 1987, 1
(label cohort already defined)
g, h = 1987, 2
(label cohort already defined)
g, h = 1987, 3
(label cohort already defined)
g, h = 1987, 4
(label cohort already defined)
g, h = 1987, 5
(label cohort already defined)
g, h = 1987, 6
(label cohort already defined)
g, h = 1987, 7
(label cohort already defined)
g, h = 1987, 8
(label cohort already defined)
g, h = 1987, 9
(label cohort already defined)
g, h = 1987, 10
(label cohort already defined)
g, h = 1987, 11
(label cohort already defined)
g, h = 1987, 12
(label cohort already defined)
g, h = 1987, 13
(label cohort already defined)
g, h = 1987, 14
(label cohort already defined)
g, h = 1987, 15
(label cohort already defined)
g, h = 1987, 16
(label cohort already defined)
12
g, h = 1991, 0
(label cohort already defined)
g, h = 1991, 1
(label cohort already defined)
g, h = 1991, 2
(label cohort already defined)
g, h = 1991, 3
(label cohort already defined)
g, h = 1991, 4
(label cohort already defined)
g, h = 1991, 5
(label cohort already defined)
g, h = 1991, 6
(label cohort already defined)
g, h = 1991, 7
(label cohort already defined)
g, h = 1991, 8
(label cohort already defined)
```

```
g, h = 1991, 9
(label cohort already defined)
g, h = 1991, 10
(label cohort already defined)
g, h = 1991, 11
(label cohort already defined)
g, h = 1991, 12
(label cohort already defined)
10
g, h = 1993, 0
(label cohort already defined)
g, h = 1993, 1
(label cohort already defined)
g, h = 1993, 2
(label cohort already defined)
g, h = 1993, 3
(label cohort already defined)
g, h = 1993, 4
(label cohort already defined)
g, h = 1993, 5
(label cohort already defined)
g, h = 1993, 6
(label cohort already defined)
g, h = 1993, 7
(label cohort already defined)
g, h = 1993, 8
(label cohort already defined)
g, h = 1993, 9
(label cohort already defined)
g, h = 1993, 10
(label cohort already defined)
7
g, h = 1996, 0
(label cohort already defined)
g, h = 1996, 1
(label cohort already defined)
g, h = 1996, 2
(label cohort already defined)
g, h = 1996, 3
(label cohort already defined)
g, h = 1996, 4
(label cohort already defined)
g, h = 1996, 5
(label cohort already defined)
g, h = 1996, 6
(label cohort already defined)
g, h = 1996, 7
(label cohort already defined)
5
g, h = 1998, 0
(label cohort already defined)
g, h = 1998, 1
(label cohort already defined)
g, h = 1998, 2
(label cohort already defined)
g, h = 1998, 3
(label cohort already defined)
g, h = 1998, 4
(label cohort already defined)
g, h = 1998, 5
(label cohort already defined)
3
g, h = 2000, 0
(label cohort already defined)
g, h = 2000, 1
(label cohort already defined)
g, h = 2000, 2
(label cohort already defined)
g, h = 2000, 3
(label cohort already defined)
1
g, h = 2002, 0
```

```

(label cohort already defined)
g, h = 2002, 1
(label cohort already defined)
0
g, h = 2003, 0
(label cohort already defined)

292 tempfile CATT_w_`g'

293 save `CATT_w_`g'', replace
      (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005w.tmp not found)
      file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00005w.tmp saved

294
295
296 // 3) Generate cohort-specific weights
297 use "$dta_loc/pset2_q1", clear

298 byso cohort: egen w_g = count(cohort)

299 replace w_g = w_g/23 // 23 is number of periods (works due to balance)
      (1,104 real changes made)

300 preserve // get total w

301      keep cohort w_g

302      duplicates drop

      Duplicates in terms of all variables

      (1,093 observations deleted)

303      egen tot_w_g = total(w_g)

304      assert tot_w_g == 48 // states

305      replace w_g = w_g/tot_w_g // get relative weights
      (11 real changes made)

306      drop tot_w_g

307
308      tempfile est_w_`g'

309      save `est_w_`g''
      file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000060.tmp saved

310 restore

311
312
313 // 4) take weighted average of CATT_{g,h} where weights are cohort size.
314 use `CATT_w_`g'', clear

315 merge m:1 cohort using `est_w_`g''
      (label cohort already defined)

```

Result	# of obs.	
not matched	1	
from master	0	(_merge==1)
from using	1	(_merge==2)
matched	100	(_merge==3)

```

316 assert cohort == 999 if _merge == 2 // no CATT for control group
317 drop _merge
318
319
320 // take sum product of CATT_{gh}*w_{g} for different horizons
321 byso h (cohort) : gen product_h = CATT_hg * w_g
    (1 missing value generated)
322 byso h (cohort) : egen ATT_h_SnA = sum(product_h)
323
324 drop if cohort == 999 // drop control cohort with no ATT
    (1 observation deleted)
325 keep h ATT_h_SnA
326 duplicates drop
    Duplicates in terms of all variables
    (80 observations deleted)
327
328 tempfile tau_SnA
329 save `tau_SnA', replace
    (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000061.tmp not found)
    file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000061.tmp saved
330 // How to get SE? Bootstrap. Ignore, not asked for.
331
332
333
334
335
336
337 // -----
338 // Now get dCDH equivalent where control cohort is larger and then shrinking
339 // to the control I used above. There will be a control group for each cohort, g.
340
341
342 use "$dta_loc/pset2_q1", clear
343 drop college beer unemploy totalvmt precip snow32 rural_speed urban_speed
344 sort cohort state year
345 assert !missing(cohort)
346
347 // 0) Get cohort specific cohort list
348 labellist cohort
    cohort:
        999 No shock
        1984 1984
        1986 1986
        1987 1987
        1991 1991
        1993 1993
        1996 1996
        1998 1998
        2000 2000
        2002 2002
        2003 2003

```



```

349 foreach g in `r(values)' {
2.     if `g' != 999 { // omit control group
3.         gen cohort_`g' = cohort
4.         replace cohort_`g' = 999 if cohort_`g' > `g'
5.         label values cohort_`g' cohort
6.     }
7. }
(391 real changes made)
(299 real changes made)
(276 real changes made)
(253 real changes made)
(230 real changes made)
(184 real changes made)
(115 real changes made)
(46 real changes made)
(23 real changes made)
(0 real changes made)

350 sort cohort state year

351
352 // 1) loop over all cohorts and horizons
353 labellist cohort // same list of cohorts (cohort_g) comes later
cohort:
    999 No shock
    1984 1984
    1986 1986
    1987 1987
    1991 1991
    1993 1993
    1996 1996
    1998 1998
    2000 2000
    2002 2002
    2003 2003

354 foreach g in `r(values)' {
2.     if `g' != 999 { // omit control group
3.         dis as error "g=`g'"
4.         local n`g' = `g'-1981 + 1
5.         dis `n`g''
6.
355         // get y_bar for each cohort at horizon h
356         local h_max = 2003-`g'
7.         dis `h_max'
8.         forval h = 0/`h_max' {
9.             preserve
10.            dis as error "h=`h'"
11.
357             // get new cohort specific annual means across state
> s
358             collapse (mean) fatalities ln_fat_pc fat_pc, by(coho
> rt_`g' year)
12.
359             byso cohort_`g' (year) : gen del_y_g`g'_h`h' = ///
>                 ln_fat_pc[`n`g'+'`h'] - ln_fat_pc[`n`g'-'1]
13.                 keep del_y_g`g'_h`h' cohort_`g'
14.                 duplicates drop
15.
360             keep if inlist(cohort_`g', 999, `g')
16.             // this step is also necessary for dCDH for 2nd c
> ohort onward

```

```

361
362          gen CATT_`g'`h`h' = del_y_g`g'`h`h'[_n] - del_y_g`g'
>    _h`h'[_n-1]
17.          keep cohort `g' CATT_`g'`h`h'
18.          keep if CATT_`g'`h`h' !=.
19.          gen h = `h'
20.          rename CATT_`g'`h`h' CATT_hg
21.          rename cohort_`g' cohort // for append later
22.
363          // save to stack later
364          tempfile dCDH_CATT_`g'`h`h'
23.          save `dCDH_CATT_`g'`h`h'', replace
24.
365          restore
25.          }
26.      }
27. }
g=1984
4
19
h=0

```

Duplicates in terms of all variables

```

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000063.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000063.tmp saved
h=1

```

Duplicates in terms of all variables

```

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000065.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000065.tmp saved
h=2

```

Duplicates in terms of all variables

```

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000067.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000067.tmp saved
h=3

```

Duplicates in terms of all variables

```

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000069.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000069.tmp saved
h=4

```

Duplicates in terms of all variables

```

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006b.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006b.tmp saved
h=5

```

Duplicates in terms of all variables

```
(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006d.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006d.tmp saved
h=6
```

Duplicates in terms of all variables

```
(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006f.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006f.tmp saved
h=7
```

Duplicates in terms of all variables

```
(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006h.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006h.tmp saved
h=8
```

Duplicates in terms of all variables

```
(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006j.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006j.tmp saved
h=9
```

Duplicates in terms of all variables

```
(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006l.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006l.tmp saved
h=10
```

Duplicates in terms of all variables

```
(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006n.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006n.tmp saved
h=11
```

Duplicates in terms of all variables

```
(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006p.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006p.tmp saved
h=12
```

Duplicates in terms of all variables

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006r.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006r.tmp saved

h=13

Duplicates in terms of all variables

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006t.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006t.tmp saved

h=14

Duplicates in terms of all variables

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006v.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006v.tmp saved

h=15

Duplicates in terms of all variables

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006x.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00006x.tmp saved

h=16

Duplicates in terms of all variables

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000071.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000071.tmp saved

h=17

Duplicates in terms of all variables

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000073.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000073.tmp saved

h=18

Duplicates in terms of all variables

(44 observations deleted)
(0 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000075.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000075.tmp saved

h=19

Duplicates in terms of all variables

(44 observations deleted)
 (0 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000077.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000077.tmp saved

g=1986

6

17

h=0

Duplicates in terms of all variables

(66 observations deleted)
 (1 observation deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000079.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000079.tmp saved

h=1

Duplicates in terms of all variables

(66 observations deleted)
 (1 observation deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007b.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007b.tmp saved

h=2

Duplicates in terms of all variables

(66 observations deleted)
 (1 observation deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007d.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007d.tmp saved

h=3

Duplicates in terms of all variables

(66 observations deleted)
 (1 observation deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007f.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007f.tmp saved

h=4

Duplicates in terms of all variables

(66 observations deleted)
 (1 observation deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007h.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007h.tmp saved

h=5

Duplicates in terms of all variables

(66 observations deleted)
 (1 observation deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007j.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007j.tmp saved

h=6

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007l.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007l.tmp saved
h=7
```

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007n.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007n.tmp saved
h=8
```

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007p.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007p.tmp saved
h=9
```

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007r.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007r.tmp saved
h=10
```

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007t.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007t.tmp saved
h=11
```

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007v.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007v.tmp saved
h=12
```

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007x.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00007x.tmp saved
h=13
```

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000081.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000081.tmp saved
```

h=14

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000083.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000083.tmp saved
```

h=15

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000085.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000085.tmp saved
```

h=16

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000087.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000087.tmp saved
```

h=17

Duplicates in terms of all variables

```
(66 observations deleted)
(1 observation deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000089.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000089.tmp saved
```

g=1987

7

16

h=0

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008b.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008b.tmp saved
```

h=1

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008d.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008d.tmp saved
```

h=2

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008f.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008f.tmp saved
h=3
```

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008h.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008h.tmp saved
h=4
```

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008j.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008j.tmp saved
h=5
```

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008l.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008l.tmp saved
h=6
```

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008n.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008n.tmp saved
h=7
```

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008p.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008p.tmp saved
h=8
```

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008r.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008r.tmp saved
h=9
```

Duplicates in terms of all variables


```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008t.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008t.tmp saved
```

h=10

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008v.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008v.tmp saved
```

h=11

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008x.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00008x.tmp saved
```

h=12

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000091.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000091.tmp saved
```

h=13

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000093.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000093.tmp saved
```

h=14

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000095.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000095.tmp saved
```

h=15

Duplicates in terms of all variables

```
(88 observations deleted)
(2 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000097.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000097.tmp saved
```

h=16

Duplicates in terms of all variables

(88 observations deleted)
 (2 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000099.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_000099.tmp saved

g=1991

11

12

h=0

Duplicates in terms of all variables

(110 observations deleted)
 (3 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009b.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009b.tmp saved

h=1

Duplicates in terms of all variables

(110 observations deleted)
 (3 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009d.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009d.tmp saved

h=2

Duplicates in terms of all variables

(110 observations deleted)
 (3 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009f.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009f.tmp saved

h=3

Duplicates in terms of all variables

(110 observations deleted)
 (3 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009h.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009h.tmp saved

h=4

Duplicates in terms of all variables

(110 observations deleted)
 (3 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009j.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009j.tmp saved

h=5

Duplicates in terms of all variables

(110 observations deleted)
 (3 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009l.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009l.tmp saved

h=6

Duplicates in terms of all variables

```
(110 observations deleted)
(3 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009n.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009n.tmp saved
h=7
```

Duplicates in terms of all variables

```
(110 observations deleted)
(3 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009p.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009p.tmp saved
h=8
```

Duplicates in terms of all variables

```
(110 observations deleted)
(3 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009r.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009r.tmp saved
h=9
```

Duplicates in terms of all variables

```
(110 observations deleted)
(3 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009t.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009t.tmp saved
h=10
```

Duplicates in terms of all variables

```
(110 observations deleted)
(3 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009v.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009v.tmp saved
h=11
```

Duplicates in terms of all variables

```
(110 observations deleted)
(3 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009x.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_00009x.tmp saved
h=12
```

Duplicates in terms of all variables

(110 observations deleted)
 (3 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000a1.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000a1.tmp saved

g=1993

13

10

h=0

Duplicates in terms of all variables

(132 observations deleted)
 (4 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000a3.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000a3.tmp saved

h=1

Duplicates in terms of all variables

(132 observations deleted)
 (4 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000a5.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000a5.tmp saved

h=2

Duplicates in terms of all variables

(132 observations deleted)
 (4 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000a7.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000a7.tmp saved

h=3

Duplicates in terms of all variables

(132 observations deleted)
 (4 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000a9.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000a9.tmp saved

h=4

Duplicates in terms of all variables

(132 observations deleted)
 (4 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ab.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ab.tmp saved

h=5

Duplicates in terms of all variables

(132 observations deleted)
 (4 observations deleted)
 (1 missing value generated)
 (1 observation deleted)
 (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ad.tmp not found)
 file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ad.tmp saved

h=6

Duplicates in terms of all variables

```
(132 observations deleted)
(4 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000af.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000af.tmp saved
h=7
```

Duplicates in terms of all variables

```
(132 observations deleted)
(4 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ah.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ah.tmp saved
h=8
```

Duplicates in terms of all variables

```
(132 observations deleted)
(4 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000aj.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000aj.tmp saved
h=9
```

Duplicates in terms of all variables

```
(132 observations deleted)
(4 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000al.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000al.tmp saved
h=10
```

Duplicates in terms of all variables

```
(132 observations deleted)
(4 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000an.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000an.tmp saved
g=1996
16
7
h=0
```

Duplicates in terms of all variables

```
(154 observations deleted)
(5 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ap.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ap.tmp saved
h=1
```

Duplicates in terms of all variables

```
(154 observations deleted)
(5 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ar.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ar.tmp saved
```

h=2

Duplicates in terms of all variables

```
(154 observations deleted)
(5 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000at.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000at.tmp saved
```

h=3

Duplicates in terms of all variables

```
(154 observations deleted)
(5 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000av.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000av.tmp saved
```

h=4

Duplicates in terms of all variables

```
(154 observations deleted)
(5 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ax.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000ax.tmp saved
```

h=5

Duplicates in terms of all variables

```
(154 observations deleted)
(5 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000b1.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000b1.tmp saved
```

h=6

Duplicates in terms of all variables

```
(154 observations deleted)
(5 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000b3.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000b3.tmp saved
```

h=7

Duplicates in terms of all variables

```
(154 observations deleted)
(5 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000b5.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000b5.tmp saved
```

g=1998

18

5

h=0

Duplicates in terms of all variables

```
(176 observations deleted)
(6 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000b7.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000b7.tmp saved
h=1
```

Duplicates in terms of all variables

```
(176 observations deleted)
(6 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000b9.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000b9.tmp saved
h=2
```

Duplicates in terms of all variables

```
(176 observations deleted)
(6 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bb.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bb.tmp saved
h=3
```

Duplicates in terms of all variables

```
(176 observations deleted)
(6 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bd.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bd.tmp saved
h=4
```

Duplicates in terms of all variables

```
(176 observations deleted)
(6 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bf.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bf.tmp saved
h=5
```

Duplicates in terms of all variables

```
(176 observations deleted)
(6 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bh.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bh.tmp saved
g=2000
20
3
h=0
```

Duplicates in terms of all variables

```
(198 observations deleted)
(7 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bj.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bj.tmp saved
```

h=1

Duplicates in terms of all variables

```
(198 observations deleted)
(7 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bl.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bl.tmp saved
```

h=2

Duplicates in terms of all variables

```
(198 observations deleted)
(7 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bn.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bn.tmp saved
```

h=3

Duplicates in terms of all variables

```
(198 observations deleted)
(7 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bp.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bp.tmp saved
```

g=2002

22

1

h=0

Duplicates in terms of all variables

```
(220 observations deleted)
(8 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000br.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000br.tmp saved
```

h=1

Duplicates in terms of all variables

```
(220 observations deleted)
(8 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bt.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bt.tmp saved
```

g=2003

23

0

h=0

Duplicates in terms of all variables


```

(242 observations deleted)
(9 observations deleted)
(1 missing value generated)
(1 observation deleted)
(note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bv.tmp not found)
file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bv.tmp saved

```

```
366
```

```
367 // 2) stack CATTs in new dta
```

```
368 use `dCDH_CATT_1984_h0', clear // call first cohort
```

```
369 local counter 0
```

```
370 labellist cohort
```

```
    cohort:
```

```
        999 No shock
```

```
        1984 1984
```

```
        1986 1986
```

```
        1987 1987
```

```
        1991 1991
```

```
        1993 1993
```

```
        1996 1996
```

```
        1998 1998
```

```
        2000 2000
```

```
        2002 2002
```

```
        2003 2003
```

```

371 foreach g in `r(values)' {
2.     if `g' != 999 { // omit control group
3.         local h_max = 2003-`g'
4.         dis `h_max'
5.         forval h = 0/`h_max' {
6.             dis "g, h = `g', `h'"
7.             if `counter' > 0 {
8.                 append using `dCDH_CATT_`g'_h`h''
9.             }
10.            local counter = `counter' + 1
11.        }
12.    }
13. }
19
g, h = 1984, 0
g, h = 1984, 1
(label cohort already defined)
g, h = 1984, 2
(label cohort already defined)
g, h = 1984, 3
(label cohort already defined)
g, h = 1984, 4
(label cohort already defined)
g, h = 1984, 5
(label cohort already defined)
g, h = 1984, 6
(label cohort already defined)
g, h = 1984, 7
(label cohort already defined)
g, h = 1984, 8
(label cohort already defined)
g, h = 1984, 9
(label cohort already defined)
g, h = 1984, 10
(label cohort already defined)
g, h = 1984, 11
(label cohort already defined)
g, h = 1984, 12
(label cohort already defined)
g, h = 1984, 13
(label cohort already defined)
g, h = 1984, 14
(label cohort already defined)
g, h = 1984, 15
(label cohort already defined)

```

```
g, h = 1984, 16
(label cohort already defined)
g, h = 1984, 17
(label cohort already defined)
g, h = 1984, 18
(label cohort already defined)
g, h = 1984, 19
(label cohort already defined)
17
g, h = 1986, 0
(label cohort already defined)
g, h = 1986, 1
(label cohort already defined)
g, h = 1986, 2
(label cohort already defined)
g, h = 1986, 3
(label cohort already defined)
g, h = 1986, 4
(label cohort already defined)
g, h = 1986, 5
(label cohort already defined)
g, h = 1986, 6
(label cohort already defined)
g, h = 1986, 7
(label cohort already defined)
g, h = 1986, 8
(label cohort already defined)
g, h = 1986, 9
(label cohort already defined)
g, h = 1986, 10
(label cohort already defined)
g, h = 1986, 11
(label cohort already defined)
g, h = 1986, 12
(label cohort already defined)
g, h = 1986, 13
(label cohort already defined)
g, h = 1986, 14
(label cohort already defined)
g, h = 1986, 15
(label cohort already defined)
g, h = 1986, 16
(label cohort already defined)
g, h = 1986, 17
(label cohort already defined)
16
g, h = 1987, 0
(label cohort already defined)
g, h = 1987, 1
(label cohort already defined)
g, h = 1987, 2
(label cohort already defined)
g, h = 1987, 3
(label cohort already defined)
g, h = 1987, 4
(label cohort already defined)
g, h = 1987, 5
(label cohort already defined)
g, h = 1987, 6
(label cohort already defined)
g, h = 1987, 7
(label cohort already defined)
g, h = 1987, 8
(label cohort already defined)
g, h = 1987, 9
(label cohort already defined)
g, h = 1987, 10
(label cohort already defined)
g, h = 1987, 11
(label cohort already defined)
g, h = 1987, 12
(label cohort already defined)
```

```
g, h = 1987, 13
(label cohort already defined)
g, h = 1987, 14
(label cohort already defined)
g, h = 1987, 15
(label cohort already defined)
g, h = 1987, 16
(label cohort already defined)
12
g, h = 1991, 0
(label cohort already defined)
g, h = 1991, 1
(label cohort already defined)
g, h = 1991, 2
(label cohort already defined)
g, h = 1991, 3
(label cohort already defined)
g, h = 1991, 4
(label cohort already defined)
g, h = 1991, 5
(label cohort already defined)
g, h = 1991, 6
(label cohort already defined)
g, h = 1991, 7
(label cohort already defined)
g, h = 1991, 8
(label cohort already defined)
g, h = 1991, 9
(label cohort already defined)
g, h = 1991, 10
(label cohort already defined)
g, h = 1991, 11
(label cohort already defined)
g, h = 1991, 12
(label cohort already defined)
10
g, h = 1993, 0
(label cohort already defined)
g, h = 1993, 1
(label cohort already defined)
g, h = 1993, 2
(label cohort already defined)
g, h = 1993, 3
(label cohort already defined)
g, h = 1993, 4
(label cohort already defined)
g, h = 1993, 5
(label cohort already defined)
g, h = 1993, 6
(label cohort already defined)
g, h = 1993, 7
(label cohort already defined)
g, h = 1993, 8
(label cohort already defined)
g, h = 1993, 9
(label cohort already defined)
g, h = 1993, 10
(label cohort already defined)
7
g, h = 1996, 0
(label cohort already defined)
g, h = 1996, 1
(label cohort already defined)
g, h = 1996, 2
(label cohort already defined)
g, h = 1996, 3
(label cohort already defined)
g, h = 1996, 4
(label cohort already defined)
g, h = 1996, 5
(label cohort already defined)
g, h = 1996, 6
```

```

(label cohort already defined)
g, h = 1996, 7
(label cohort already defined)
5
g, h = 1998, 0
(label cohort already defined)
g, h = 1998, 1
(label cohort already defined)
g, h = 1998, 2
(label cohort already defined)
g, h = 1998, 3
(label cohort already defined)
g, h = 1998, 4
(label cohort already defined)
g, h = 1998, 5
(label cohort already defined)
3
g, h = 2000, 0
(label cohort already defined)
g, h = 2000, 1
(label cohort already defined)
g, h = 2000, 2
(label cohort already defined)
g, h = 2000, 3
(label cohort already defined)
1
g, h = 2002, 0
(label cohort already defined)
g, h = 2002, 1
(label cohort already defined)
0
g, h = 2003, 0
(label cohort already defined)

372 tempfile dCDH_CATT_w_`g'

373 save `dCDH_CATT_w_`g'', replace
      (note: file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bw.tmp not found)
      file C:\Users\YFKASH~1\AppData\Local\Temp\47\ST_20e8_0000bw.tmp saved

374
375
376 // 3) skip. Same as before?
377
378 // 4) take weighted average of CATT_{g,h} where weights are cohort size.
379 use `dCDH_CATT_w_`g'', clear

380 merge m:1 cohort using `est_w_`g''
      (label cohort already defined)

      Result                                     # of obs.
      -----
not matched                                     1
      from master                               0   (_merge==1)
      from using                               1   (_merge==2)
matched                                         100  (_merge==3)

381 assert cohort == 999 if _merge == 2 // no CATT for control group

```

```

382 drop _merge

383
384 // take sum product of CATT_{gh}*w_{g} for different horizons
385 byso h (cohort) : gen product_h = CATT_hg * w_g
    (1 missing value generated)

386 byso h (cohort) : egen ATT_h_dCDH = sum(product_h)

387
388 drop if cohort == 999 // drop control cohort with no ATT
    (1 observation deleted)

389 keep h ATT_h_dCDH

390 duplicates drop

```

Duplicates in terms of all variables

(80 observations deleted)

```

391
392 merge 1:1 h using `tau_SnA'

```

Result	# of obs.
not matched	0
matched	20

(_merge==3)

```

393
394 // visualize: S&A estimates are larger in absolute terms
395 // twoway (kdensity ATT_h_dCDH) (kdensity ATT_h_SnA)
396 sum ATT_h_dCDH ATT_h_SnA

```

Variable	Obs	Mean	Std. Dev.	Min	Max
ATT_h_dCDH	20	-.0161386	.0048723	-.0223849	-.0041717
ATT_h_SnA	20	-.0182031	.0055064	-.0256901	-.0052039

```

397 drop _merge

398
399 label var h "Horizon"

400 label var ATT_h_dCDH "ATT dCDH (C = not-yet-treated)"

401 label var ATT_h_SnA "ATT Sun and Abraham (C = never-treated)"

402
403 // get overall mean
404 qui sum ATT_h_dCDH

405 global att_est_3a = round(`r(mean)', 0.001)

406
407 // plot
408 line ATT_h_dCDH h, ///
    >       yline($att_est_3a) ///
    >       note("Note: Displayed are horizon-specific ATT estimates along with the gene
    > ral average in red.") ///
    >       saving("$do_loc/Graphs/ATT_dCDH", replace)
    (file //Client/CS/Users/yfkas/Documents/GitHub/ARE213_Fall2023/PSet 2/Stata/Graphs/ATT
    > _dCDH.gph saved)

```

```

409
410 graph export "$do_loc/Graphs/ATT_dCDH.png", ///
    >         width(1200) height(900) ///
    >         replace
    (file //Client/C$/Users/yfkas/Documents/GitHub/ARE213_Fall2023/PSet 2/Stata/Graphs/ATT
    > _dCDH.png written in PNG format)

411
412 // save
413 compress
    variable h was float now byte
    (60 bytes saved)

414 save "$dta_loc\q3a_ATTs", replace
    file //Client/C$/Users/yfkas/Dropbox (Personal)/ARE213/Pset2/data\q3a_ATTs.dta saved

415
416
417
418
419
420
421
422
    end of do-file

423 do "$do_loc/Code/02_analysis_q3b.do"

424 /*
    > Title:           02_analysis_q3b.do
    > Outline:         Question 3, PSet 2
    >
    > Q3 DiD estimation
    >
    > 3. Now proceed with the DiD estimation.
    >
    > (b) Report the Borusyak, Jaravel, and Spiess's imputation estimates for the same
    > estimands. Use the most appropriate standard errors. Do the results mostly
    > agree with part 3(a)?
    >
    > Approach: following Theorem 2 in BJS (2023):
    > 1) Get predictions for alpha_i and beta_t by OLS in the omega_0
    > (untreated or not yet treated) population only.
    > 2) Get \hat{\tau}
    >     2a. Compute \hat{y}(0) = in omega_1 population and
    >     2b. compute \hat{\tau} = y - \hat{y}(0)
    > 3) Estimate tau_w by a weighted sum over omega_q
    > 4) Estimate SEs
    >     4a. Pool multiple cohorts for simplicity
    >     4b. get eps_it = tau_hat_{it} - tau_hat_{Et}
    >     4c. let v_it = w_it = size of omega_1 for simplicity
    >     4d. Compute var(tau_it) = sum_i (sum_t v_it eps_it)^2
    >
    > */
425 // set graphics off
426
427 use "$dta_loc/pset2_q1", clear

428 isid state year

```

429

430 sort state year primary secondary

431 drop college beer unemploy totalvmt precip snow32 rural_speed urban_speed

432

433 // 1) Get predictions for alpha_i and beta_t by OLS in omega_0

434 reg ln_fat_pc i.state i.year if primary ==0

Source	SS	df	MS	Number of obs	=	922
Model	90.1782575	69	1.30693127	F(69, 852)	=	114.44
Residual	9.72961864	852	.01141974	Prob > F	=	0.0000
				R-squared	=	0.9026
				Adj R-squared	=	0.8947
Total	99.9078762	921	.108477607	Root MSE	=	.10686

ln_fat_pc	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state						
AR	-.0162001	.0331796	-0.49	0.625	-.0813235	.0489233
AZ	-.068485	.0331796	-2.06	0.039	-.1336084	-.0033616
CA	-.3846694	.0395199	-9.73	0.000	-.4622371	-.3071017
CO	-.3826142	.0331796	-11.53	0.000	-.4477376	-.3174908
CT	-.6053001	.0540901	-11.19	0.000	-.7114656	-.4991345
DE	-.3341957	.0335068	-9.97	0.000	-.3999612	-.2684302
FL	-.1625973	.0331796	-4.90	0.000	-.2277207	-.0974739
GA	-.1255506	.0369693	-3.40	0.001	-.1981123	-.0529889
IA	-.4685753	.0540901	-8.66	0.000	-.5747408	-.3624097
ID	-.0594742	.0331796	-1.79	0.073	-.1245976	.0056492
IL	-.6493499	.0331796	-19.57	0.000	-.7144733	-.5842265
IN	-.3668006	.0357045	-10.27	0.000	-.4368796	-.2967216
KS	-.2902963	.0331796	-8.75	0.000	-.3554197	-.2251729
KY	-.1388279	.0331796	-4.18	0.000	-.2039513	-.0737045
LA	-.1926516	.0369693	-5.21	0.000	-.2652133	-.12009
MA	-1.016931	.0331796	-30.65	0.000	-1.082055	-.9518079
MD	-.5501205	.0357045	-15.41	0.000	-.6201996	-.4800415
ME	-.4103948	.0331796	-12.37	0.000	-.4755182	-.3452714
MI	-.4697366	.034671	-13.55	0.000	-.5377872	-.4016861
MN	-.6256298	.0331796	-18.86	0.000	-.6907532	-.5605064
MO	-.2010471	.0331796	-6.06	0.000	-.2661705	-.1359238
MS	.1729473	.0331796	5.21	0.000	.107824	.2380707
MT	.0858541	.0331796	2.59	0.010	.0207307	.1509775
NC	-.1706971	.050361	-3.39	0.001	-.2695434	-.0718509
ND	-.4756038	.0331796	-14.33	0.000	-.5407272	-.4104804
NE	-.3672645	.0331796	-11.07	0.000	-.4323879	-.3021411
NH	-.6292035	.0331796	-18.96	0.000	-.6943268	-.5640801
NJ	-.8072599	.034671	-23.28	0.000	-.8753105	-.7392093
NM	.3435514	.0540901	6.35	0.000	.2373859	.449717
NV	-.1127945	.0331796	-3.40	0.001	-.1779179	-.0476711
NY	-.8041455	.0669386	-12.01	0.000	-.9355293	-.6727617
OH	-.5828151	.0331796	-17.57	0.000	-.6479385	-.5176917
OK	-.1240088	.0357045	-3.47	0.001	-.1940878	-.0539298
OR	-.2197645	.0419141	-5.24	0.000	-.3020315	-.1374975
PA	-.5876597	.0331796	-17.71	0.000	-.6527831	-.5225363
RI	-1.037679	.0331796	-31.27	0.000	-1.102802	-.9725552
SC	.0494	.0331796	1.49	0.137	-.0157234	.1145234
SD	-.1332017	.0331796	-4.01	0.000	-.198325	-.0680783
TN	-.0729816	.0331796	-2.20	0.028	-.138105	-.0078582
TX	-.0642178	.0540901	-1.19	0.235	-.1703834	.0419477
UT	-.3947249	.0331796	-11.90	0.000	-.4598483	-.3296016
VA	-.5028121	.0331796	-15.15	0.000	-.5679354	-.4376887
VT	-.3550252	.0331796	-10.70	0.000	-.4201486	-.2899018
WA	-.570901	.0338619	-16.86	0.000	-.6373635	-.5044386
WI	-.4850967	.0331796	-14.62	0.000	-.5502201	-.4199733
WV	-.0951201	.0331796	-2.87	0.004	-.1602435	-.0299968
WY	.2530209	.0331796	7.63	0.000	.1878975	.3181443
year						
1982	-.1216089	.0218134	-5.57	0.000	-.1644231	-.0787947
1983	-.1579019	.0218134	-7.24	0.000	-.2007161	-.1150877
1984	-.1498036	.0219675	-6.82	0.000	-.1929204	-.1066868

1985	-.1661469	.0219675	-7.56	0.000	-.2092637	-.1230301
1986	-.1089457	.0225764	-4.83	0.000	-.1532576	-.0646338
1987	-.1168819	.0227392	-5.14	0.000	-.1615134	-.0722505
1988	-.1059111	.0227392	-4.66	0.000	-.1505425	-.0612797
1989	-.1675115	.0227392	-7.37	0.000	-.2121429	-.1228801
1990	-.1831926	.0227392	-8.06	0.000	-.227824	-.1385612
1991	-.2536254	.022899	-11.08	0.000	-.2985705	-.2086802
1992	-.3092342	.022899	-13.50	0.000	-.3541794	-.2642891
1993	-.3109858	.0230632	-13.48	0.000	-.3562531	-.2657185
1994	-.3134476	.0230632	-13.59	0.000	-.3587149	-.2681803
1995	-.291764	.0230632	-12.65	0.000	-.3370313	-.2464967
1996	-.3059367	.0234081	-13.07	0.000	-.3518809	-.2599924
1997	-.2862229	.0234081	-12.23	0.000	-.3321671	-.2402787
1998	-.3062277	.0239836	-12.77	0.000	-.3533015	-.2591539
1999	-.3025445	.0239836	-12.61	0.000	-.3496183	-.2554707
2000	-.3236965	.0246457	-13.13	0.000	-.3720699	-.2753232
2001	-.3268277	.0246457	-13.26	0.000	-.3752011	-.2784543
2002	-.2920869	.0248892	-11.74	0.000	-.3409381	-.2432356
2003	-.3085507	.0251457	-12.27	0.000	-.3579055	-.2591959
_cons	-1.169429	.0288583	-40.52	0.000	-1.22607	-1.112787

```

435
436
437 // 2) Get \hat{\tau}
438 // 2a) Compute \hat{y}(0) = in omega_1 population
439 predict yhat, xb

440 // 2b) Compute \hat{\tau} = y - \hat{y}(0)
441 gen tau_hat_it = ln_fat_pc - yhat if primary == 1 //
    (922 missing values generated)

442
443 // 3) Estimate tau_w by a weighted sum over omega_g
444 // For weights, w_it, I follow Liu et al. (2022) AJPS who use a regular average
445 gen h = year - cohort if cohort != 999
    (690 missing values generated)

446 byso h (cohort) : egen ATT_h_Liu = mean(tau_hat_it) // get horizon specific ATT
    (922 missing values generated)

447
448 // why are these ATTs much larger than ATT dCDH?
449 // Are my tau_hats right? What about my weights/averaging method?
450 label var h "Horizon"

451 label var ATT_h_Liu "ATT_h (Imputation ATTs by horizon, weighted regularly)"

452
453 egen ATT_Liu = mean(tau_hat_it) // tau_w (tau given weights)

454 label var ATT_Liu "ATT Liu et al (Imputation ATT, weighted regularly)"

455
456
457 preserve

458      keep h ATT_h_Liu ATT_Liu

```



```

459          keep if ATT_h_Liu != .
      (922 observations deleted)

460          duplicates drop

      Duplicates in terms of all variables

      (162 observations deleted)

461
462          // save
463          compress
      variable h was float now byte
      (60 bytes saved)

464          save "$dta_loc\q3b ATTs", replace
      file //Client/C$/Users/yfkas/Dropbox (Personal)/ARE213/Pset2/data\q3b_ATTs.dta saved

465
466          // get overall mean
467          qui sum ATT_Liu

468          global att_est_3b = round(`r(mean)', 0.001)

469
470          // plot
471          line ATT_h_Liu h, ///
      >               yline($att_est) ///
      >               note("Note: Displayed are horizon-specific ATT estimates along with
      > the general average in red.") ///
      >               saving("$do_loc/Graphs/ATT_BJS", replace)
      (file //Client/C$/Users/yfkas/Documents/GitHub/ARE213_Fall2023/PSet 2/Stata/Graphs/ATT
      > _BJS.gph saved)

472
473          graph export "$do_loc/Graphs/ATT_BJS.png", ///
      >               width(1200) height(900) 7//
      >               replace
      (file //Client/C$/Users/yfkas/Documents/GitHub/ARE213_Fall2023/PSet 2/Stata/Graphs/ATT
      > _BJS.png written in PNG format)

474
475 restore

476
477
478 // 4) Estimate standard error (conservative estimate)
479 // Following Theorem 3 in BJS (2023), the plug-in estimator (eqn (7))
480 // Approach 1: Pool multiple cohorts for simplicity
481 gen cohort_coarse = 999 if cohort == 999 // decade cohort
      (414 missing values generated)

482 replace cohort_coarse = 1980 if inrange(cohort, 1980, 1989)
      (138 real changes made)

483 replace cohort_coarse = 1990 if inrange(cohort, 1990, 1999)
      (161 real changes made)

484 replace cohort_coarse = 2000 if inrange(cohort, 2000, 2009)
      (115 real changes made)

```

```

485
486 // get eps_it = tau_hat_{it} - tau_hat_{Et}
487 byso cohort_coarse (h) : egen tau_hat_coarset = mean(tau_hat_it)
    (690 missing values generated)

488 replace tau_hat_coarset = . if primary != 1
    (232 real changes made, 232 to missing)

489 gen eps_it = tau_hat_it - tau_hat_coarset
    (922 missing values generated)

490 sum eps_it

```

Variable	Obs	Mean	Std. Dev.	Min	Max
eps_it	182	5.32e-10	.1400621	-.3030793	.3451158

```

491
492 // let v_it = w_it = size of omega_1
493 count if primary == 1
    182

494 gen v_it = 1/`r(N)'

495 gen v_e_it = v_it * eps_it
    (922 missing values generated)

496
497 // var(tau_it) = sum_i (sum_t v_it eps_it)^2
498 byso state : egen sumt_v_e = total(v_e_it) // sum over time within state, i

499 gen sumt_v_e_sq = sumt_v_e^2

500 keep state sumt_v_e_sq

501 duplicates drop

    Duplicates in terms of all variables

    (1,056 observations deleted)

502 egen sumi_sumt_v_e_sq = total(sumt_v_e_sq)

503 gen se = sqrt(sumi_sumt_v_e_sq)

504 qui sum se

505 global se_est_3b = round(`r(mean)', 0.001)

506
507
508
509 dis "ATT = $att_est_3b"
    ATT = -.108

510 dis "SE = $se_est_3b"
    SE = .033

511
end of do-file

```

```

512 do "$do_loc/Code/02_analysis_q3c.do"
513 /*
> Title:          02_analysis_q3c.do
> Outline:       Question 3, PSet 2
>
> Q3 DiD estimation
>
> 3. Now proceed with the DiD estimation.
>
> (c) Researchers sometimes use state population as weights. Describe two distinct rea
> sons
> for using such weights. For this part only, modify the imputation procedure
> to accommodate each of these reasons one by one. Discuss how the estimates
> change from part 3(b).
>
> */
514
515
516
517 use "$dta_loc/pset2_q1", clear
518 isid state year
519
520 sort state year primary secondary
521 drop college beer unemploy totalvmt precip snow32 rural_speed urban_speed
522
523
524
525
526 // Weighting approach 1: weight in regression step to address endogenous sampling
527 /*
>
> */
528
529
530 // 1) Get predictions for alpha_i and beta_t by OLS in omega_0
531 reg ln_fat_pc i.state i.year if primary == 0 [aw=population]_
(sum of wgt is 4,202,955.018)

```

Source	SS	df	MS	Number of obs	=	922
Model	77.8691429	69	1.1285383	F(69, 852)	=	160.13
Residual	6.00440134	852	.007047419	Prob > F	=	0.0000
				R-squared	=	0.9284
				Adj R-squared	=	0.9226
Total	83.8735443	921	.091067909	Root MSE	=	.08395

ln_fat_pc	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state						
AR	-.0136918	.0312761	-0.44	0.662	-.0750791	.0476955
AZ	-.0766459	.0275124	-2.79	0.005	-.1306459	-.0226459
CA	-.3966732	.0226667	-17.50	0.000	-.4411624	-.3521841
CO	-.3845504	.0282065	-13.63	0.000	-.4399128	-.329188
CT	-.6097192	.0496856	-12.27	0.000	-.7072398	-.5121986
DE	-.3379033	.0502288	-6.73	0.000	-.4364899	-.2393166
FL	-.1705662	.0227173	-7.51	0.000	-.2151547	-.1259777
GA	-.133798	.0273966	-4.88	0.000	-.1875708	-.0800252
IA	-.4725144	.0517185	-9.14	0.000	-.574025	-.3710038
ID	-.0623958	.0407776	-1.53	0.126	-.142432	.0176405
IL	-.6513126	.0230313	-28.28	0.000	-.6965174	-.6061078
IN	-.3737395	.0273553	-13.66	0.000	-.4274311	-.3200479
KS	-.2896731	.0310044	-9.34	0.000	-.3505271	-.2288191
KY	-.1372316	.027877	-4.92	0.000	-.1919473	-.0825159
LA	-.2024003	.03013	-6.72	0.000	-.261538	-.1432626
MA	-1.022963	.0253401	-40.37	0.000	-1.072699	-.9732266
MD	-.5591775	.0285128	-19.61	0.000	-.6151411	-.503214
ME	-.4115746	.0394184	-10.44	0.000	-.4889431	-.3342061

MI	-.473601	.0242856	-19.50	0.000	-.5212677	-.4259343
MN	-.624383	.026855	-23.25	0.000	-.6770928	-.5716733
MO	-.1973964	.0260311	-7.58	0.000	-.2484891	-.1463038
MS	.1768944	.0305549	5.79	0.000	.1169228	.236866
MT	.0869567	.0453893	1.92	0.056	-.0021312	.1760446
NC	-.1764174	.0361154	-4.88	0.000	-.247303	-.1055317
ND	-.4781701	.0505684	-9.46	0.000	-.5774234	-.3789168
NE	-.3666605	.0356008	-10.30	0.000	-.436536	-.296785
NH	-.6431222	.0407744	-15.77	0.000	-.7231523	-.5630921
NJ	-.8146541	.025021	-32.56	0.000	-.8637641	-.765544
NM	.3391503	.0711472	4.77	0.000	.1995059	.4787946
NV	-.1512801	.0373354	-4.05	0.000	-.2245603	-.078
NY	-.7998004	.0326363	-24.51	0.000	-.8638574	-.7357433
OH	-.5849555	.0232125	-25.20	0.000	-.6305159	-.5393951
OK	-.1304838	.0315468	-4.14	0.000	-.1924024	-.0685653
OR	-.2332761	.040061	-5.82	0.000	-.311906	-.1546462
PA	-.5894162	.0229826	-25.65	0.000	-.6345255	-.544307
RI	-1.040371	.0423878	-24.54	0.000	-1.123568	-.9571747
SC	.0519495	.0282416	1.84	0.066	-.0034818	.1073807
SD	-.1306376	.0484748	-2.69	0.007	-.2257815	-.0354937
TN	-.0705534	.026157	-2.70	0.007	-.1218931	-.0192137
TX	-.0706298	.0291231	-2.43	0.016	-.1277913	-.0134684
UT	-.3979894	.0338897	-11.74	0.000	-.4645064	-.3314724
VA	-.5074085	.0251292	-20.19	0.000	-.5567308	-.4580862
VT	-.3611723	.0535115	-6.75	0.000	-.4662021	-.2561424
WA	-.584587	.0267385	-21.86	0.000	-.6370681	-.5321059
WI	-.4851933	.026258	-18.48	0.000	-.5367312	-.4336554
WV	-.0988467	.0341986	-2.89	0.004	-.1659702	-.0317233
WY	.2545207	.0573303	4.44	0.000	.1419955	.3670459
year						
1982	-.1271942	.0167686	-7.59	0.000	-.1601068	-.0942816
1983	-.1679014	.0167314	-10.04	0.000	-.200741	-.1350618
1984	-.1345965	.0171462	-7.85	0.000	-.1682502	-.1009427
1985	-.1487544	.0171061	-8.70	0.000	-.1823295	-.1151794
1986	-.0897004	.0176796	-5.07	0.000	-.124401	-.0549998
1987	-.0930505	.0178107	-5.22	0.000	-.1280086	-.0580925
1988	-.0846886	.0177631	-4.77	0.000	-.1195533	-.049824
1989	-.1318734	.0177154	-7.44	0.000	-.1666443	-.0971024
1990	-.1703383	.0176602	-9.65	0.000	-.2050008	-.1356757
1991	-.2559687	.0176731	-14.48	0.000	-.2906566	-.2212807
1992	-.3323497	.0176096	-18.87	0.000	-.3669131	-.2977863
1993	-.3029031	.0184107	-16.45	0.000	-.3390387	-.2667675
1994	-.3024628	.018346	-16.49	0.000	-.3384715	-.2664541
1995	-.2866623	.0182836	-15.68	0.000	-.3225486	-.2507761
1996	-.3026957	.0185996	-16.27	0.000	-.3392021	-.2661893
1997	-.3021214	.0185431	-16.29	0.000	-.338517	-.2657259
1998	-.3270152	.0189969	-17.21	0.000	-.3643015	-.2897289
1999	-.3241551	.0189426	-17.11	0.000	-.3613348	-.2869753
2000	-.3282362	.0198264	-16.56	0.000	-.3671506	-.2893219
2001	-.341557	.0197713	-17.28	0.000	-.3803633	-.3027508
2002	-.30742	.019996	-15.37	0.000	-.3466673	-.2681728
2003	-.3289171	.0199794	-16.46	0.000	-.3681317	-.2897025
_cons	-1.1686	.0234874	-49.75	0.000	-1.2147	-1.1225

532

533

534 // 2) Get $\hat{\tau}$

```

535 // 2a) Compute \hat{y(0)} = in omega_1 population
536 predict yhat, xb

537 // 2b) Compute \hat{\tau} = y - \hat{y(0)}
538 gen tau_hat_it = ln_fat_pc - yhat if primary == 1 //
    (922 missing values generated)

539
540 // 3) Estimate tau_w by a weighted sum over omega_g
541 // For weights, w_it, I follow Liu et al. (2022) AJPS who use a regular average
542 gen h = year - cohort if cohort != 999
    (690 missing values generated)

543 byso h (cohort) : egen ATT_h_Liu = mean(tau_hat_it) // get horizon specific ATT
    (922 missing values generated)

544 label var ATT_h_Liu "ATT_h Liu et al (Imputation ATTs by horizon weighted regularly)
> "

545
546 egen ATT_Liu = mean(tau_hat_it) // tau_w (tau given weights)

547 label var ATT_Liu "ATT Liu et al (Imputation ATT weighted regularly)"

548 qui sum ATT_Liu

549 global att_est_3c1 = round(`r(mean)', 0.001)

550
551
552 preserve

553         keep h ATT_h_Liu ATT_Liu

554         keep if ATT_h_Liu != .
    (922 observations deleted)

555         duplicates drop

    Duplicates in terms of all variables

    (162 observations deleted)

556
557         // save
558         compress
    variable h was float now byte
    (60 bytes saved)

559         save "$dta_loc\q3c ATTs", replace
    file //Client/C$/Users/yfkas/Dropbox (Personal)/ARE213/Pset2/data\q3c_ATTs.dta saved

560 restore

561
562
563
564 // 4) Estimate standard error (conservative estimate)
565 // Following Theorem 3 in BJS (2023), the plug-in estimator (eqn (7))
566 // Approach 1: Pool multiple cohorts for simplicity

```

```

567 gen cohort_coarse = 999 if cohort == 999 // decade cohort
    (414 missing values generated)

568 replace cohort_coarse = 1980 if inrange(cohort, 1980, 1989)
    (138 real changes made)

569 replace cohort_coarse = 1990 if inrange(cohort, 1990, 1999)
    (161 real changes made)

570 replace cohort_coarse = 2000 if inrange(cohort, 2000, 2009)
    (115 real changes made)

571
572 // get eps_it = tau_hat_{it} - tau_hat_{Et}
573 byso cohort_coarse (h) : egen tau_hat_coarset = mean(tau_hat_it)
    (690 missing values generated)

574 replace tau_hat_coarset = . if primary != 1
    (232 real changes made, 232 to missing)

575 gen eps_it = tau_hat_it - tau_hat_coarset
    (922 missing values generated)

```

```
576 sum eps_it
```

Variable	Obs	Mean	Std. Dev.	Min	Max
eps_it	182	-2.74e-09	.1370698	-.2923916	.3408962

```

577
578 // let v_it = w_it = size of omega_1
579 count if primary == 1
    182

580 local treat_n `r(N)'

581 gen v_it = 1/`treat_n'

582 gen v_e_it = v_it * eps_it
    (922 missing values generated)

583
584 // var(tau_it) = sum_i (sum_t v_it eps_it)^2
585 byso state : egen sumt_v_e = total(v_e_it) // sum over time within state, i

586 gen sumt_v_e_sq = sumt_v_e^2

587
588 preserve

589     keep state sumt_v_e_sq

590     duplicates drop

    Duplicates in terms of all variables
    (1,056 observations deleted)

591     egen sumi_sumt_v_e_sq = total(sumt_v_e_sq)

```

```

592         gen se = sqrt(sumi_sumt_v_e_sq)
593         qui sum se
594         global se_est_3c1 = round(`r(mean)', 0.001)
595 restore
596
597
598
599
600
601 // Weighting approach 2: weight in averaging step to address HTE by it
602 egen pop_tot = total(population) if primary == 1
603             (922 missing values generated)
604
605 gen pop_w_it = population/pop_tot
606             (922 missing values generated)
607
608 gen weighted_tau_it = tau_hat_it * pop_w_it
609             (922 missing values generated)
610
611 egen ATT_popw = sum(weighted_tau_it)
612
613 qui sum ATT_popw
614
615 global att_est_3c2 = round(`r(mean)', 0.001)
616
617
618
619
620 // 4) Estimate standard error (conservative estimate)
621 // Following Theorem 3 in BJS (2023), the plug-in estimator (eqn (7))
622 // Approach 1: Pool multiple cohorts for simplicity
623 // let v_it = new weight = pop weights omega_1
624 gen popw_e_it = pop_w_it * eps_it
625             (922 missing values generated)
626
627
628
629 // var(tau_it) = sum_i (sum_t v_it eps_it)^2
630 byso state: egen sumt_popw_e = total(popw_e_it) // sum over time within state, i
631
632 gen sumt_popw_e_sq = sumt_popw_e^2
633
634
635 preserve
636
637 keep state sumt_popw_e_sq
638
639 duplicates drop
640
641 Duplicates in terms of all variables
642             (1,056 observations deleted)
643
644 egen sumi_sumt_popw_e_sq = total(sumt_popw_e_sq)
645
646 gen se = sqrt(sumi_sumt_popw_e_sq)

```

```

626
627     qui sum se
628     global se_est_3c2 = round(`r(mean)', 0.001)
629 restore
630
631
632
633
634 dis "Weighting method 1 gives ""
    Weighting method 1 gives
635 dis "    ATT = $att_est_3c1"
    ATT = -.098
636 dis "    SE = $se_est_3c1"
    SE = .033
637
638 dis "Weighting method 2 gives "
    Weighting method 2 gives
639 dis "    ATT = $att_est_3c2"
    ATT = -.142
640 dis "    SE = $se_est_3c2"
    SE = .044
641
642
643     end of do-file
644 do "$do_loc/Code/02_analysis_q3d.do"
645 /*
    > Title:          02_analysis_q3d.do
    > Outline:        Question 3, PSet 2
    >
    > Q3 DinD estimation
    >
    > 3. Now proceed with the DiD estimation.
    >
    > (d) How sensitive are the estimates to including state-specific linear trends into y
    > our
    > model of untreated potential outcomes?
    >
    > */
646
647 use "$dta_loc/pset2_q1", clear
648 isid state year
649
650 sort state year primary secondary
651 drop college beer unemploy totalvmt precip snow32 rural_speed urban_speed

```



```

652
653 // 1) Get predictions for alpha_i and beta_t by OLS in omega_0
654 // using state specific time trends atop state and time trends
655 // reg ln_fat_pc i.state##i.year if primary == 0
656 gen state_yr = state*year
657 tab state, gen(state_)

```

state	Freq.	Percent	Cum.
AL	23	2.08	2.08
AR	23	2.08	4.17
AZ	23	2.08	6.25
CA	23	2.08	8.33
CO	23	2.08	10.42
CT	23	2.08	12.50
DE	23	2.08	14.58
FL	23	2.08	16.67
GA	23	2.08	18.75
IA	23	2.08	20.83
ID	23	2.08	22.92
IL	23	2.08	25.00
IN	23	2.08	27.08
KS	23	2.08	29.17
KY	23	2.08	31.25
LA	23	2.08	33.33
MA	23	2.08	35.42
MD	23	2.08	37.50
ME	23	2.08	39.58
MI	23	2.08	41.67
MN	23	2.08	43.75
MO	23	2.08	45.83
MS	23	2.08	47.92
MT	23	2.08	50.00
NC	23	2.08	52.08
ND	23	2.08	54.17
NE	23	2.08	56.25
NH	23	2.08	58.33
NJ	23	2.08	60.42
NM	23	2.08	62.50
NV	23	2.08	64.58
NY	23	2.08	66.67
OH	23	2.08	68.75
OK	23	2.08	70.83
OR	23	2.08	72.92
PA	23	2.08	75.00
RI	23	2.08	77.08
SC	23	2.08	79.17
SD	23	2.08	81.25
TN	23	2.08	83.33
TX	23	2.08	85.42
UT	23	2.08	87.50
VA	23	2.08	89.58
VT	23	2.08	91.67
WA	23	2.08	93.75
WI	23	2.08	95.83
WV	23	2.08	97.92
WY	23	2.08	100.00
Total	1,104	100.00	

```

658 foreach var of varlist state_* {
      2.      gen `var'_yr = `var'*year
      3. }

```

```

659 reg ln_fat_pc i.state i.year state_*_yr if primary == 0
note: state_48_yr omitted because of collinearity

```

Source	SS	df	MS	Number of obs	=	922
Model	94.0633664	117	.803960397	F(117, 804)	=	110.60
Residual	5.84450977	804	.007269291	Prob > F	=	0.0000
				R-squared	=	0.9415
				Adj R-squared	=	0.9330
Total	99.9078762	921	.108477607	Root MSE	=	.08526

ln_fat_pc	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state						
AR	48.96881	22.81741	2.15	0.032	4.180084	93.75754
AZ	112.2704	44.04238	2.55	0.011	25.81883	198.7221
CA	149.8659	69.75859	2.15	0.032	12.93544	286.7963
CO	166.3448	87.84234	1.89	0.059	-6.082639	338.7722
CT	208.8586	125.797	1.66	0.097	-38.07069	455.788
DE	223.9196	132.182	1.69	0.091	-35.54286	483.3821
FL	263.505	154.0356	1.71	0.088	-38.8545	565.8644
GA	272.4701	177.8553	1.53	0.126	-76.64554	621.5857
IA	356.4303	208.3445	1.71	0.088	-52.533	765.3936
ID	344.0352	220.3468	1.56	0.119	-88.48784	776.5582
IL	370.5491	242.4601	1.53	0.127	-105.3803	846.4786
IN	387.5745	265.5375	1.46	0.145	-133.6541	908.8032
KS	416.084	286.6942	1.45	0.147	-146.6734	978.8414
KY	432.7424	308.814	1.40	0.162	-173.4344	1038.919
LA	479.8401	331.9409	1.45	0.149	-171.733	1131.413
MA	558.7316	353.0566	1.58	0.114	-134.2898	1251.753
MD	556.4788	375.7865	1.48	0.139	-181.1597	1294.117
ME	575.8995	397.3042	1.45	0.148	-203.9764	1355.775
MI	594.3768	419.743	1.42	0.157	-229.5447	1418.298
MN	626.3205	441.5536	1.42	0.156	-240.4133	1493.054
MO	634.8939	463.679	1.37	0.171	-275.2704	1545.058
MS	657.9198	485.8048	1.35	0.176	-295.6758	1611.515
MT	719.7109	507.931	1.42	0.157	-277.3165	1716.738
NC	681.554	531.6586	1.28	0.200	-362.0487	1725.157
ND	776.0523	552.1842	1.41	0.160	-307.8406	1859.945
NE	798.3354	574.3112	1.39	0.165	-328.9908	1925.662
NH	885.0697	596.4383	1.48	0.138	-285.6903	2055.83
NJ	902.0602	618.473	1.46	0.145	-311.9521	2116.072
NM	906.007	642.0076	1.41	0.159	-354.2019	2166.216
NV	971.481	662.8209	1.47	0.143	-329.5826	2272.545
NY	993.2382	694.0043	1.43	0.153	-369.0359	2355.512
OH	999.4689	707.0766	1.41	0.158	-388.4651	2387.403
OK	1024.039	728.7188	1.41	0.160	-406.3767	2454.455
OR	1023.455	750.187	1.36	0.173	-449.101	2496.012
PA	1084.304	773.461	1.40	0.161	-433.937	2602.545
RI	1125.671	795.5893	1.41	0.157	-436.0066	2687.348
SC	1128.535	817.7177	1.38	0.168	-476.5787	2733.648
SD	1140.275	839.8461	1.36	0.175	-508.2753	2788.824
TN	1186.93	861.9747	1.38	0.169	-505.0565	2878.916
TX	1308.976	882.6304	1.48	0.138	-423.5563	3041.507
UT	1267.509	906.2319	1.40	0.162	-511.3504	3046.369
VA	1301.539	928.3605	1.40	0.161	-520.7572	3123.836
VT	1345.846	950.4893	1.42	0.157	-519.887	3211.58
WA	1379.634	972.2108	1.42	0.156	-528.7369	3288.005
WI	1373.078	994.7469	1.38	0.168	-579.5297	3325.685
WV	1393.608	1016.876	1.37	0.171	-602.4369	3389.653
WY	1422.634	1039.005	1.37	0.171	-616.8482	3462.116
year						
1982	-1.542473	1.063712	-1.45	0.147	-3.630454	.5455083
1983	-2.999989	2.127479	-1.41	0.159	-7.176057	1.176079
1984	-4.414161	3.191565	-1.38	0.167	-10.67894	1.850622
1985	-5.852798	4.255933	-1.38	0.169	-14.20685	2.501253
1986	-7.223272	5.320591	-1.36	0.175	-17.66716	3.220616

1987	-8.652941	6.385514	-1.36	0.176	-21.18719	3.881304
1988	-10.0662	7.450718	-1.35	0.177	-24.69135	4.558959
1989	-11.55239	8.516195	-1.36	0.175	-28.26899	5.164211
1990	-12.99304	9.58195	-1.36	0.175	-31.80163	5.815556
1991	-14.487	10.64794	-1.36	0.174	-35.38805	6.414049
1992	-15.96797	11.71423	-1.36	0.173	-38.96206	7.026113
1993	-17.39695	12.78087	-1.36	0.174	-42.48476	7.690865
1994	-18.82577	13.84774	-1.36	0.174	-46.00776	8.356224
1995	-20.23081	14.91488	-1.36	0.175	-49.50751	9.045897
1996	-21.67072	15.98247	-1.36	0.176	-53.04301	9.701574
1997	-23.07836	17.05023	-1.35	0.176	-56.54657	10.38986
1998	-24.5265	18.11838	-1.35	0.176	-60.0914	11.03841
1999	-25.951	19.18674	-1.35	0.177	-63.61301	11.71101
2000	-27.3975	20.25572	-1.35	0.177	-67.15784	12.36285
2001	-28.82936	21.32476	-1.35	0.177	-70.68814	13.02942
2002	-30.22882	22.39382	-1.35	0.177	-74.18608	13.72844
2003	-31.67667	23.4637	-1.35	0.177	-77.73402	14.38067
state_yr_yr	7.50e-06	5.58e-06	1.34	0.179	-3.45e-06	.0000184
state_1_yr	1.416101	1.043727	1.36	0.175	-.6326505	3.464852
state_2_yr	1.376554	1.022075	1.35	0.178	-.6296963	3.382803
state_3_yr	1.329812	.999856	1.33	0.184	-.6328239	3.292449
state_4_yr	1.295815	.9763268	1.33	0.185	-.6206356	3.212265
state_5_yr	1.272635	.9554186	1.33	0.183	-.6027741	3.148044
state_6_yr	1.2362	.9316624	1.33	0.185	-.5925775	3.064978
state_7_yr	1.213882	.910872	1.33	0.183	-.5740863	3.00185
state_8_yr	1.17916	.8887626	1.33	0.185	-.5654092	2.923729
state_9_yr	1.159746	.8657931	1.34	0.181	-.5397355	2.859228
state_10_yr	1.102374	.8432308	1.31	0.191	-.55282	2.757567
state_11_yr	1.093974	.8221067	1.33	0.184	-.5197548	2.707703
state_12_yr	1.065431	.799888	1.33	0.183	-.5046847	2.635546
state_13_yr	1.042095	.7772321	1.34	0.180	-.4835481	2.567739
state_14_yr	1.012878	.7554509	1.34	0.180	-.4700105	2.495767
state_15_yr	.9896548	.7332323	1.35	0.177	-.4496208	2.42893
state_16_yr	.9510538	.7105776	1.34	0.181	-.4437525	2.34586
state_17_yr	.8960925	.6887955	1.30	0.194	-.4559573	2.248142
state_18_yr	.8825124	.6663078	1.32	0.186	-.4253958	2.190421
state_19_yr	.8579048	.6443582	1.33	0.183	-.4069181	2.122728
state_20_yr	.8336676	.6219989	1.34	0.181	-.3872658	2.054601
state_21_yr	.8026111	.5999213	1.34	0.181	-.3749857	1.980208
state_22_yr	.7835835	.5777029	1.36	0.175	-.3504005	1.917567
state_23_yr	.7572751	.5554845	1.36	0.173	-.3330959	1.847646
state_24_yr	.7112749	.5332662	1.33	0.183	-.3354834	1.758033
state_25_yr	.7155205	.5114299	1.40	0.162	-.2883749	1.719416
state_26_yr	.6528354	.4888297	1.34	0.182	-.3066977	1.612368
state_27_yr	.6267665	.4666115	1.34	0.180	-.2891541	1.542687
state_28_yr	.5681568	.4443934	1.28	0.201	-.3041515	1.440465
state_29_yr	.5445865	.4222376	1.29	0.198	-.2842316	1.373405
state_30_yr	.5282539	.4013526	1.32	0.188	-.2595687	1.316077
state_31_yr	.4802262	.3777397	1.27	0.204	-.2612462	1.221699
state_32_yr	.4539389	.3614488	1.26	0.210	-.2555557	1.163434
state_33_yr	.4360663	.3333045	1.31	0.191	-.2181835	1.090316
state_34_yr	.4090241	.3113637	1.31	0.189	-.2021576	1.020206
state_35_yr	.3943797	.2896996	1.36	0.174	-.1742772	.9630365
state_36_yr	.3486651	.2666533	1.31	0.191	-.1747538	.872084
state_37_yr	.312736	.2444369	1.28	0.201	-.1670739	.7925458
state_38_yr	.296907	.222221	1.34	0.182	-.1392948	.7331088
state_39_yr	.275985	.2000057	1.38	0.168	-.11661	.66858
state_40_yr	.237657	.1777913	1.34	0.182	-.111333	.586647
state_41_yr	.1612748	.1594742	1.01	0.312	-.1517602	.4743097
state_42_yr	.1671701	.1333671	1.25	0.210	-.0946187	.4289589
state_43_yr	.1350956	.111159	1.22	0.225	-.0831005	.3532917
state_44_yr	.0979903	.0889563	1.10	0.271	-.0766236	.2726043
state_45_yr	.065976	.0669885	0.98	0.325	-.065517	.1974691
state_46_yr	.0543808	.0445991	1.22	0.223	-.0331636	.1419253
state_47_yr	.0293335	.0225399	1.30	0.193	-.0149105	.0735774
state_48_yr	0	(omitted)				
_cons	-2836.09	2089.516	-1.36	0.175	-6937.64	1265.46

```

660
661
662 // 2) Get \hat{\tau}
663 // 2a) Compute \hat{y}(0) = in omega_1 population
664 predict yhat, xb

665 // 2b) Compute \hat{\tau} = y - \hat{y}(0)
666 gen tau_hat_it = ln_fat_pc - yhat if primary == 1 //
    (922 missing values generated)

667
668 // 3) Estimate tau_w by a weighted sum over omega_q
669 // For weights, w_it, I follow Liu et al. (2022) AJPS who use a regular average
670 gen h = year - cohort if cohort != 999
    (690 missing values generated)

671 byso h (cohort) : egen ATT_h_Liu = mean(tau_hat_it) // get horizon specific ATT
    (922 missing values generated)

672
673 // to confirm: Are my tau_hats right? What about my weights/averaging method?
674
675 label var h "Horizon"

676 label var ATT_h_Liu "ATT_h Liu et al (Imputation ATTs by horizon weighted regularly)
> "

677
678 egen ATT_Liu = mean(tau_hat_it) // tau_w (tau given weights)

679 label var ATT_Liu "ATT Liu et al (Imputation ATT weighted regularly)"

680
681
682 preserve

683         keep h ATT_h_Liu ATT_Liu

684         keep if ATT_h_Liu != .
    (922 observations deleted)

685         duplicates drop

    Duplicates in terms of all variables

    (162 observations deleted)

686
687         qui sum ATT_Liu

688         global att_est_3d = round(`r(mean)', 0.001)

689
690         // save
691         compress
    variable h was float now byte
    (60 bytes saved)

692         save "$dta_loc\q3d_ATTs", replace
    file //Client/C$/Users/yfkas/Dropbox (Personal)/ARE213/Pset2/data\q3d_ATTs.dta saved

```

693 restore

694

695

696 // 4) Estimate standard error (conservative estimate)

697 // Following Theorem 3 in BJS (2023), the plug-in estimator (eqn (7))

698 // Approach 1: Pool multiple cohorts for simplicity

699 gen cohort_coarse = 999 if cohort == 999 // decade cohort
(414 missing values generated)

700 replace cohort_coarse = 1980 if inrange(cohort, 1980, 1989)
(138 real changes made)

701 replace cohort_coarse = 1990 if inrange(cohort, 1990, 1999)
(161 real changes made)

702 replace cohort_coarse = 2000 if inrange(cohort, 2000, 2009)
(115 real changes made)

703

704 // get $\epsilon_{it} = \tau_{hat_it} - \tau_{hat_Et}$

705 byso cohort_coarse (h) : egen tau_hat_coarset = mean(tau_hat_it)
(690 missing values generated)

706 replace tau_hat_coarset = . if primary != 1
(232 real changes made, 232 to missing)

707 gen $\epsilon_{it} = \tau_{hat_it} - \tau_{hat_coarset}$
(922 missing values generated)

708 sum ϵ_{it}

Variable	Obs	Mean	Std. Dev.	Min	Max
ϵ_{it}	182	-1.40e-09	.2523583	-.7702122	.5465338

709

710 // let $v_{it} = w_{it}$ = size of ω_1

711 count if primary == 1
182

712 gen $v_{it} = 1/\text{'r(N) '}$

713 gen $v_{e_it} = v_{it} * \epsilon_{it}$
(922 missing values generated)

714

715 // $\text{var}(\tau_{it}) = \sum_i (\sum_t v_{it} \epsilon_{it})^2$

716 byso state : egen sumt_v_e = total(v_{e_it}) // sum over time within state, i

717 gen sumt_v_e_sq = sumt_v_e^2

718 keep state sumt_v_e_sq

719 duplicates drop

Duplicates in terms of all variables

(1,056 observations deleted)

```

720 egen sumi_sumt_v_e_sq = total(sumt_v_e_sq)
721 gen se = sqrt(sumi_sumt_v_e_sq)
722
723 qui sum se
724 global se_est_3d = round(`r(mean)', 0.001)
725
726
727 // results very sensitive to including state-specific linear trends
728
729 dis "ATT = $att_est_3d"
    ATT = -.048
730 dis "SE = $se_est_3d"
    SE = .066
731
732 end of do-file
733 do "$do_loc/Code/02_analysis_q3e.do"
734 /*
    > Title:          02_analysis_q3e.do
    > Outline:        Question 3, PSet 2
    >
    > Q3 DiD estimation
    >
    > 3. Now proceed with the DiD estimation.
    >
    > (e) The dataset includes several covariates measuring, e.g., weather, percent of col
    > lege
    > graduates, and vehicle miles traveled. Illustrate some ways how covariates can be
    > correctly incorporated in your analysis. Describe the procedures you follow and
    > argue why they are potentially useful.
    >
    > */
735
736 use "$dta_loc/pset2_q1", clear
737 isid state year
738
739 sort state year primary secondary
740
741 // 1) Get predictions for alpha_i and beta_t by OLS in omega_0
742 // using state specific time trends atop state and time trends
743 reg ln_fat_pc i.state i.year if primary == 0

```

Source	SS	df	MS	Number of obs	=	922
Model	90.1782575	69	1.30693127	F(69, 852)	=	114.44
Residual	9.72961864	852	.01141974	Prob > F	=	0.0000
				R-squared	=	0.9026
				Adj R-squared	=	0.8947
Total	99.9078762	921	.108477607	Root MSE	=	.10686

ln_fat_pc	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state						
AR	-.0162001	.0331796	-0.49	0.625	-.0813235	.0489233
AZ	-.068485	.0331796	-2.06	0.039	-.1336084	-.0033616
CA	-.3846694	.0395199	-9.73	0.000	-.4622371	-.3071017
CO	-.3826142	.0331796	-11.53	0.000	-.4477376	-.3174908
CT	-.6053001	.0540901	-11.19	0.000	-.7114656	-.4991345
DE	-.3341957	.0335068	-9.97	0.000	-.3999612	-.2684302
FL	-.1625973	.0331796	-4.90	0.000	-.2277207	-.0974739
GA	-.1255506	.0369693	-3.40	0.001	-.1981123	-.0529889

IA	-.4685753	.0540901	-8.66	0.000	-.5747408	-.3624097
ID	-.0594742	.0331796	-1.79	0.073	-.1245976	.0056492
IL	-.6493499	.0331796	-19.57	0.000	-.7144733	-.5842265
IN	-.3668006	.0357045	-10.27	0.000	-.4368796	-.2967216
KS	-.2902963	.0331796	-8.75	0.000	-.3554197	-.2251729
KY	-.1388279	.0331796	-4.18	0.000	-.2039513	-.0737045
LA	-.1926516	.0369693	-5.21	0.000	-.2652133	-.12009
MA	-1.016931	.0331796	-30.65	0.000	-1.082055	-.9518079
MD	-.5501205	.0357045	-15.41	0.000	-.6201996	-.4800415
ME	-.4103948	.0331796	-12.37	0.000	-.4755182	-.3452714
MI	-.4697366	.034671	-13.55	0.000	-.5377872	-.4016861
MN	-.6256298	.0331796	-18.86	0.000	-.6907532	-.5605064
MO	-.2010471	.0331796	-6.06	0.000	-.2661705	-.1359238
MS	.1729473	.0331796	5.21	0.000	.107824	.2380707
MT	.0858541	.0331796	2.59	0.010	.0207307	.1509775
NC	-.1706971	.050361	-3.39	0.001	-.2695434	-.0718509
ND	-.4756038	.0331796	-14.33	0.000	-.5407272	-.4104804
NE	-.3672645	.0331796	-11.07	0.000	-.4323879	-.3021411
NH	-.6292035	.0331796	-18.96	0.000	-.6943268	-.5640801
NJ	-.8072599	.034671	-23.28	0.000	-.8753105	-.7392093
NM	.3435514	.0540901	6.35	0.000	.2373859	.449717
NV	-.1127945	.0331796	-3.40	0.001	-.1779179	-.0476711
NY	-.8041455	.0669386	-12.01	0.000	-.9355293	-.6727617
OH	-.5828151	.0331796	-17.57	0.000	-.6479385	-.5176917
OK	-.1240088	.0357045	-3.47	0.001	-.1940878	-.0539298
OR	-.2197645	.0419141	-5.24	0.000	-.3020315	-.1374975
PA	-.5876597	.0331796	-17.71	0.000	-.6527831	-.5225363
RI	-1.037679	.0331796	-31.27	0.000	-1.102802	-.9725552
SC	.0494	.0331796	1.49	0.137	-.0157234	.1145234
SD	-.1332017	.0331796	-4.01	0.000	-.198325	-.0680783
TN	-.0729816	.0331796	-2.20	0.028	-.138105	-.0078582
TX	-.0642178	.0540901	-1.19	0.235	-.1703834	.0419477
UT	-.3947249	.0331796	-11.90	0.000	-.4598483	-.3296016
VA	-.5028121	.0331796	-15.15	0.000	-.5679354	-.4376887
VT	-.3550252	.0331796	-10.70	0.000	-.4201486	-.2899018
WA	-.570901	.0338619	-16.86	0.000	-.6373635	-.5044386
WI	-.4850967	.0331796	-14.62	0.000	-.5502201	-.4199733
WV	-.0951201	.0331796	-2.87	0.004	-.1602435	-.0299968
WY	.2530209	.0331796	7.63	0.000	.1878975	.3181443
year						
1982	-.1216089	.0218134	-5.57	0.000	-.1644231	-.0787947
1983	-.1579019	.0218134	-7.24	0.000	-.2007161	-.1150877
1984	-.1498036	.0219675	-6.82	0.000	-.1929204	-.1066868
1985	-.1661469	.0219675	-7.56	0.000	-.2092637	-.1230301
1986	-.1089457	.0225764	-4.83	0.000	-.1532576	-.0646338
1987	-.1168819	.0227392	-5.14	0.000	-.1615134	-.0722505
1988	-.1059111	.0227392	-4.66	0.000	-.1505425	-.0612797
1989	-.1675115	.0227392	-7.37	0.000	-.2121429	-.1228801
1990	-.1831926	.0227392	-8.06	0.000	-.227824	-.1385612
1991	-.2536254	.022899	-11.08	0.000	-.2985705	-.2086802
1992	-.3092342	.022899	-13.50	0.000	-.3541794	-.2642891
1993	-.3109858	.0230632	-13.48	0.000	-.3562531	-.2657185
1994	-.3134476	.0230632	-13.59	0.000	-.3587149	-.2681803
1995	-.291764	.0230632	-12.65	0.000	-.3370313	-.2464967
1996	-.3059367	.0234081	-13.07	0.000	-.3518809	-.2599924
1997	-.2862229	.0234081	-12.23	0.000	-.3321671	-.2402787
1998	-.3062277	.0239836	-12.77	0.000	-.3533015	-.2591539
1999	-.3025445	.0239836	-12.61	0.000	-.3496183	-.2554707
2000	-.3236965	.0246457	-13.13	0.000	-.3720699	-.2753232
2001	-.3268277	.0246457	-13.26	0.000	-.3752011	-.2784543
2002	-.2920869	.0248892	-11.74	0.000	-.3409381	-.2432356
2003	-.3085507	.0251457	-12.27	0.000	-.3579055	-.2591959
_cons	-1.169429	.0288583	-40.52	0.000	-1.22607	-1.112787

744 local covars college beer totalvmt precip snow32 rural_speed urban_speed

745 reg ln_fat_pc i.state i.year `covars' if primary == 0

Source	SS	df	MS	Number of obs	=	922
Model	93.3013544	76	1.2276494	F(76, 845)	=	157.02
Residual	6.60652177	845	.007818369	Prob > F	=	0.0000
				R-squared	=	0.9339
				Adj R-squared	=	0.9279
Total	99.9078762	921	.108477607	Root MSE	=	.08842

ln_fat_pc	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state						
AR	-.0199329	.0299805	-0.66	0.506	-.0787779	.038912
AZ	-.5007942	.0481959	-10.39	0.000	-.5953919	-.4061966
CA	-.6525377	.0908617	-7.18	0.000	-.8308788	-.4741966
CO	-.6249117	.0582889	-10.72	0.000	-.7393198	-.5105036
CT	-.4782419	.0582229	-8.21	0.000	-.5925205	-.3639634
DE	-.5554954	.0416343	-13.34	0.000	-.6372142	-.4737767
FL	-.4622164	.0463587	-9.97	0.000	-.5532081	-.3712247
GA	-.1816814	.0348983	-5.21	0.000	-.2501789	-.1131838
IA	-.6650447	.0508186	-13.09	0.000	-.7647902	-.5652993
ID	-.2412231	.0440756	-5.47	0.000	-.3277336	-.1547125
IL	-.8633133	.0417301	-20.69	0.000	-.9452202	-.7814065
IN	-.4900015	.0337476	-14.52	0.000	-.5562405	-.4237626
KS	-.3233567	.0417402	-7.75	0.000	-.4052834	-.24143
KY	-.1366266	.0288345	-4.74	0.000	-.1932223	-.080031
LA	-.4516888	.0349797	-12.91	0.000	-.520346	-.3830316
MA	-1.039418	.0476094	-21.83	0.000	-1.132865	-.9459715
MD	-.5720453	.0446859	-12.80	0.000	-.6597536	-.484337
ME	-.4902376	.0425828	-11.51	0.000	-.573818	-.4066571
MI	-.6613616	.0407724	-16.22	0.000	-.7413887	-.5813345
MN	-.7769	.0433123	-17.94	0.000	-.8619123	-.6918878
MO	-.4197178	.0341389	-12.29	0.000	-.4867247	-.3527108
MS	-.0013335	.0301878	-0.04	0.965	-.0605853	.0579183
MT	-.353106	.0517146	-6.83	0.000	-.4546101	-.2516019
NC	-.1357279	.043411	-3.13	0.002	-.220934	-.0505219
ND	-.7736574	.0467594	-16.55	0.000	-.8654356	-.6818792
NE	-.652309	.0431309	-15.12	0.000	-.7369653	-.5676526
NH	-1.176181	.0564958	-20.82	0.000	-1.28707	-1.065293
NJ	-.7684185	.0402904	-19.07	0.000	-.8474995	-.6893374
NM	-.129449	.0634028	-2.04	0.041	-.2538943	-.0050036
NV	-.874419	.0579544	-15.09	0.000	-.9881704	-.7606676
NY	-.8790078	.0647691	-13.57	0.000	-1.006135	-.7518805
OH	-.8175857	.0398547	-20.51	0.000	-.8958115	-.7393599
OK	-.1220902	.0351364	-3.47	0.001	-.1910552	-.0531253
OR	-.3362549	.047792	-7.04	0.000	-.4300598	-.24245
PA	-.79972	.0399786	-20.00	0.000	-.878189	-.721251
RI	-1.126606	.041233	-27.32	0.000	-1.207537	-1.045675
SC	-.1760835	.0311512	-5.65	0.000	-.2372263	-.1149408
SD	-.3763007	.0439637	-8.56	0.000	-.4625916	-.2900099
TN	-.14897	.0281539	-5.29	0.000	-.2042298	-.0937102
TX	-.6334394	.0715686	-8.85	0.000	-.7739125	-.4929662
UT	-.1863005	.0529225	-3.52	0.000	-.2901754	-.0824256
VA	-.6118001	.0398648	-15.35	0.000	-.6900458	-.5335543
VT	-.528828	.0507553	-10.42	0.000	-.6284492	-.4292067
WA	-.6308299	.0423048	-14.91	0.000	-.7138647	-.547795
WI	-.9794268	.0446473	-21.94	0.000	-1.06706	-.8917941
WV	-.1769761	.0335382	-5.28	0.000	-.242804	-.1111482
WY	-.1066887	.0496996	-2.15	0.032	-.2042379	-.0091395
year						
1982	-.0981667	.018435	-5.33	0.000	-.1343505	-.0619828
1983	-.1217196	.0188632	-6.45	0.000	-.1587438	-.0846955
1984	-.0970205	.0187548	-5.17	0.000	-.133832	-.0602089
1985	-.1047062	.0189762	-5.52	0.000	-.1419523	-.0674601
1986	-.0553878	.0195285	-2.84	0.005	-.0937178	-.0170578
1987	-.0540411	.0201192	-2.69	0.007	-.0935304	-.0145517
1988	-.0675041	.0241136	-2.80	0.005	-.1148338	-.0201744
1989	-.1124198	.0242513	-4.64	0.000	-.1600196	-.06482

1990	-.1566814	.0239085	-6.55	0.000	-.2036085	-.1097543
1991	-.1982461	.0243983	-8.13	0.000	-.2461346	-.1503577
1992	-.2410331	.0249979	-9.64	0.000	-.2900984	-.1919678
1993	-.2336443	.0255189	-9.16	0.000	-.2837322	-.1835565
1994	-.2256729	.0260818	-8.65	0.000	-.2768657	-.1744802
1995	-.1832571	.026909	-6.81	0.000	-.2360735	-.1304407
1996	-.1956467	.0318459	-6.14	0.000	-.2581532	-.1331403
1997	-.1746603	.0332748	-5.25	0.000	-.2399713	-.1093493
1998	-.1965091	.0351915	-5.58	0.000	-.2655821	-.1274362
1999	-.2088717	.03553	-5.88	0.000	-.278609	-.1391343
2000	-.2263181	.0362895	-6.24	0.000	-.2975461	-.15509
2001	-.2334015	.0368589	-6.33	0.000	-.3057472	-.1610558
2002	-.2131501	.0377233	-5.65	0.000	-.2871923	-.1391078
2003	-.2091892	.0390953	-5.35	0.000	-.2859244	-.1324539
college	-.6425966	.2705931	-2.37	0.018	-1.17371	-.1114832
beer	.8149708	.0427513	19.06	0.000	.7310597	.8988819
totalvmt	5.52e-07	4.51e-07	1.22	0.222	-3.34e-07	1.44e-06
precip	-.0207855	.0072146	-2.88	0.004	-.0349461	-.006625
snow32	-.0100672	.0159747	-0.63	0.529	-.041422	.0212876
rural_speed	.0024342	.0014309	1.70	0.089	-.0003743	.0052426
urban_speed	.0005411	.0010748	0.50	0.615	-.0015685	.0026507
_cons	-2.122241	.1154685	-18.38	0.000	-2.34888	-1.895602

```

746
747
748 // 2) Get \hat{\tau}
749 // 2a) Compute \hat{y}(0) = in omega_1 population
750 predict yhat, xb

751 // 2b) Compute \hat{\tau} = y - \hat{y}(0)
752 gen tau_hat_it = ln_fat_pc - yhat if primary == 1 //
    (922 missing values generated)

753
754 // 3) Estimate tau_w by a weighted sum over omega_g
755 // For weights, w_it, I follow Liu et al. (2022) AJPS who use a regular average
756 gen h = year - cohort if cohort != 999
    (690 missing values generated)

757 byso h (cohort) : egen ATT_h_Liu = mean(tau_hat_it) // get horizon specific ATT
    (922 missing values generated)

758
759 // why are these ATTs much larger than ATT dCDH?
760 // Are my tau hats right? What about my weights/averaging method?
761 label var h "Horizon"

762 label var ATT_h_Liu "ATT_h Liu et al (Imputation ATTs by horizon weighted regularly)
> "

763
764 egen ATT_Liu = mean(ATT_h_Liu) // tau_w (tau given weights)

765 label var ATT_Liu "ATT Liu et al (Imputation ATT weighted regularly)"

766
767
768 preserve

```

```

769         keep h ATT_h_Liu ATT_Liu

770         keep if ATT_h_Liu != .
(922 observations deleted)

771         duplicates drop

        Duplicates in terms of all variables

        (162 observations deleted)

772
773         // save
774         compress
        variable h was float now byte
        (60 bytes saved)

775         save "$dta_loc\q3e ATTs", replace
        file //Client/C$/Users/yfkas/Dropbox (Personal)/ARE213/Pset2/data\q3e_ATTs.dta saved

776
777
778         // get overall mean
779         qui sum ATT_Liu

780         global att_est_3e = round(`r(mean)', 0.001)

781 restore

782
783
784
785 // 4) Estimate standard error (conservative estimate)
786 // Following Theorem 3 in BJS (2023), the plug-in estimator (eqn (7))
787 // Approach 1: Pool multiple cohorts for simplicity
788 gen cohort_coarse = 999 if cohort == 999 // decade cohort
(414 missing values generated)

789 replace cohort_coarse = 1980 if inrange(cohort, 1980, 1989)
(138 real changes made)

790 replace cohort_coarse = 1990 if inrange(cohort, 1990, 1999)
(161 real changes made)

791 replace cohort_coarse = 2000 if inrange(cohort, 2000, 2009)
(115 real changes made)

792
793 // get eps_it = tau_hat_{it} - tau_hat_{Et}
794 byso cohort_coarse (h) : egen tau_hat_coarset = mean(tau_hat_it)
(690 missing values generated)

795 replace tau_hat_coarset = . if primary != 1
(232 real changes made, 232 to missing)

796 gen eps_it = tau_hat_it - tau_hat_coarset
(922 missing values generated)

797 sum eps_it

```

Variable	Obs	Mean	Std. Dev.	Min	Max
eps_it	182	2.27e-09	.1198755	-.2908311	.3260227

```

798
799 // let v_it = w_it = size of omega_1
800 count if primary == 1
    182

801 gen v_it = 1/`r(N)'

802 gen v_e_it = v_it * eps_it
    (922 missing values generated)

803
804 // var(tau_it) = sum_i (sum_t v_it eps_it)^2
805 byso state: egen sumt_v_e = total(v_e_it) // sum over time within state, i

806 gen sumt_v_e_sq = sumt_v_e^2

807 keep state sumt_v_e_sq

808 duplicates drop

    Duplicates in terms of all variables

    (1,056 observations deleted)

809 egen sumi_sumt_v_e_sq = total(sumt_v_e_sq)

810 gen se = sqrt(sumi_sumt_v_e_sq)

811 qui sum se

812 local se_est_3e = round(`r(mean)', 0.001)

813
814
815
816 dis "ATT = $att_est_3e"
    ATT = -.095

817 dis "SE = $se_est_3e"
    SE =

818
819
820
821
    end of do-file

822 do "$do_loc/Code/02_analysis_q3f.do"

823 /*
    > Title:          02_analysis_q3f.do
    > Outline:        Question 3, PSet 2
    >
    > Q3 DiD estimation
    >
    > 3. Now proceed with the DiD estimation.
    >
    > (f) Estimate the static two-way fixed-effect regression (without covariates or
    > population weights).
    >
    > Then estimate and plot the total weight this regression places on treated
    > observations at each horizon. In what way are these weights informative?
    >
    > Compare them to the sample weights of each horizon.
    >
    > In your view, does the static regression coefficient provide a useful summary of cau
    > sal effects in this setting? Discuss.
    >
    > */

```

```

824
825 set graphics off

826
827 use "$dta_loc/pset2_q1", clear

828 isid state year

829
830 sort state year primary secondary

831 drop college beer unemploy totalvmt precip snow32 rural_speed urban_speed prim_ever

832
833 // 1) Run static TWFE
834 reg ln_fat_pc primary i.state i.year

```

Source	SS	df	MS	Number of obs	=	1,104
Model	114.49612	70	1.63565886	F(70, 1033)	=	144.58
Residual	11.6865682	1,033	.011313232	Prob > F	=	0.0000
				R-squared	=	0.9074
				Adj R-squared	=	0.9011
Total	126.182688	1,103	.114399536	Root MSE	=	.10636

ln_fat_pc	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
primary	-.086313	.0141786	-6.09	0.000	-.1141352	-.0584908
state						
AR	-.0293379	.0314617	-0.93	0.351	-.091074	.0323983
AZ	-.0816228	.0314617	-2.59	0.010	-.1433589	-.0198866
CA	-.4860733	.0316604	-15.35	0.000	-.5481994	-.4239473
CO	-.395752	.0314617	-12.58	0.000	-.4574882	-.3340159
CT	-.7363915	.0325307	-22.64	0.000	-.8002252	-.6725578
DE	-.3409133	.0314194	-10.85	0.000	-.4025664	-.2792601
FL	-.1757351	.0314617	-5.59	0.000	-.2374712	-.1139989
GA	-.1248669	.0314617	-3.97	0.000	-.1866031	-.0631308
IA	-.3448144	.0325307	-10.60	0.000	-.4086481	-.2809807
ID	-.072612	.0314617	-2.31	0.021	-.1343482	-.0108758
IL	-.6624876	.0314617	-21.06	0.000	-.7242238	-.6007515
IN	-.3755149	.0313892	-11.96	0.000	-.4371087	-.3139211
KS	-.3034341	.0314617	-9.64	0.000	-.3651703	-.2416979
KY	-.1519657	.0314617	-4.83	0.000	-.2137019	-.0902295
LA	-.1449804	.0314617	-4.61	0.000	-.2067166	-.0832442
MA	-1.030069	.0314617	-32.74	0.000	-1.091805	-.9683329
MD	-.5715891	.0313892	-18.21	0.000	-.6331829	-.5099953
ME	-.4235325	.0314617	-13.46	0.000	-.4852687	-.3617964
MI	-.481306	.0313649	-15.35	0.000	-.5428523	-.4197598
MN	-.6387676	.0314617	-20.30	0.000	-.7005037	-.5770314
MO	-.2141849	.0314617	-6.81	0.000	-.2759211	-.1524488
MS	.1598096	.0314617	5.08	0.000	.0980734	.2215457
MT	.0727163	.0314617	2.31	0.021	.0109801	.1344525
NC	-.1203648	.0323726	-3.72	0.000	-.1838883	-.0568412
ND	-.4887416	.0314617	-15.53	0.000	-.5504778	-.4270054
NE	-.3804023	.0314617	-12.09	0.000	-.4421384	-.3186661
NH	-.6423412	.0314617	-20.42	0.000	-.7040774	-.5806051
NJ	-.8303667	.0313649	-26.47	0.000	-.891913	-.7688205
NM	.2558049	.0325307	7.86	0.000	.1919712	.3196387
NV	-.1259323	.0314617	-4.00	0.000	-.1876685	-.0641961
NY	-.8314321	.0328793	-25.29	0.000	-.8959499	-.7669143
OH	-.5959529	.0314617	-18.94	0.000	-.6576891	-.5342167
OK	-.1119326	.0313892	-3.57	0.000	-.1735264	-.0503389
OR	-.2979461	.0318519	-9.35	0.000	-.3604479	-.2354444
PA	-.6007975	.0314617	-19.10	0.000	-.6625337	-.5390613
RI	-1.050816	.0314617	-33.40	0.000	-1.112553	-.9890802
SC	.0362623	.0314617	1.15	0.249	-.0254739	.0979984
SD	-.1463394	.0314617	-4.65	0.000	-.2080756	-.0846033
TN	-.0861194	.0314617	-2.74	0.006	-.1478556	-.0243832
TX	-.1799467	.0325307	-5.53	0.000	-.2437804	-.1161129
UT	-.4078627	.0314617	-12.96	0.000	-.4695989	-.3461266
VA	-.5159498	.0314617	-16.40	0.000	-.577686	-.4542137

VT	-.368163	.0314617	-11.70	0.000	-.4298992	-.3064268
WA	-.5966504	.0313892	-19.01	0.000	-.6582442	-.5350566
WI	-.4982345	.0314617	-15.84	0.000	-.5599706	-.4364983
WV	-.1082579	.0314617	-3.44	0.001	-.1699941	-.0465218
WY	.2398832	.0314617	7.62	0.000	.178147	.3016193
year						
1982	-.1216089	.0217114	-5.60	0.000	-.1642124	-.0790055
1983	-.1579019	.0217114	-7.27	0.000	-.2005054	-.1152985
1984	-.1486924	.0217134	-6.85	0.000	-.1912998	-.106085
1985	-.1652729	.0217134	-7.61	0.000	-.2078803	-.1226655
1986	-.1117621	.0217616	-5.14	0.000	-.154464	-.0690602
1987	-.1110629	.0217836	-5.10	0.000	-.153808	-.0683177
1988	-.101228	.0217836	-4.65	0.000	-.1439732	-.0584828
1989	-.1607602	.0217836	-7.38	0.000	-.2035054	-.1180151
1990	-.1827416	.0217836	-8.39	0.000	-.2254868	-.1399965
1991	-.2554708	.0218096	-11.71	0.000	-.298267	-.2126746
1992	-.3133145	.0218096	-14.37	0.000	-.3561107	-.2705182
1993	-.3119167	.0218396	-14.28	0.000	-.3547718	-.2690616
1994	-.3176142	.0218396	-14.54	0.000	-.3604693	-.2747591
1995	-.2940335	.0218396	-13.46	0.000	-.3368885	-.2511784
1996	-.304645	.0219114	-13.90	0.000	-.347641	-.2616491
1997	-.29207	.0219114	-13.33	0.000	-.3350659	-.249074
1998	-.3093021	.0220484	-14.03	0.000	-.3525668	-.2660374
1999	-.3142163	.0220484	-14.25	0.000	-.357481	-.2709516
2000	-.3347495	.0222198	-15.07	0.000	-.3783507	-.2911484
2001	-.3305344	.0222198	-14.88	0.000	-.3741356	-.2869332
2002	-.3195161	.0222845	-14.34	0.000	-.3632442	-.2757879
2003	-.331026	.022353	-14.81	0.000	-.3748884	-.2871636
_cons	-1.152796	.0267832	-43.04	0.000	-1.205351	-1.10024

```
835 mat A = r(table)
```

```
836 mat att = A[1, "primary"] // get att_est
```

```
837 mat se = A[2, "primary"] // get se_est
```

```
838 global att_est_3f = round(att[1,1], 0.001)
```

```
839 global se_est_3f = round(se[1,1], 0.001)
```

```
840
```

```
841
```

```
842 // 2) Get weights using auxiliary reg via FWL: reg D on i and t FEs
```

```
843 // from proof of proposition 2 in BJS
```

```
844 reg primary i.state i.year
```

Source	SS	df	MS	Number of obs	=	1,104
Model	95.7210145	69	1.38726108	F(69, 1034)	=	25.49
Residual	56.2753623	1,034	.054424915	Prob > F	=	0.0000
				R-squared	=	0.6298
				Adj R-squared	=	0.6051
Total	151.996377	1,103	.137802699	Root MSE	=	.23329

primary	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
state						
AR	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
AZ	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
CA	.3043478	.0687939	4.42	0.000	.1693562	.4393394
CO	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
CT	.6086957	.0687939	8.85	0.000	.4737041	.7436872
DE	-.1304348	.0687939	-1.90	0.058	-.2654264	.0045568
FL	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
GA	.173913	.0687939	2.53	0.012	.0389215	.3089046
IA	.6086957	.0687939	8.85	0.000	.4737041	.7436872
ID	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
IL	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
IN	.0869565	.0687939	1.26	0.207	-.0480351	.2219481

KS	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
KY	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
LA	.173913	.0687939	2.53	0.012	.0389215	.3089046
MA	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
MD	.0869565	.0687939	1.26	0.207	-.0480351	.2219481
ME	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
MI	2.79e-15	.0687939	0.00	1.000	-.1349916	.1349916
MN	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
MO	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
MS	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
MT	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
NC	.5652174	.0687939	8.22	0.000	.4302258	.700209
ND	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
NE	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
NH	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
NJ	2.79e-15	.0687939	0.00	1.000	-.1349916	.1349916
NM	.6086957	.0687939	8.85	0.000	.4737041	.7436872
NV	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
NY	.6956522	.0687939	10.11	0.000	.5606606	.8306438
OH	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
OK	.0869565	.0687939	1.26	0.207	-.0480351	.2219481
OR	.3913043	.0687939	5.69	0.000	.2563128	.5262959
PA	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
RI	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
SC	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
SD	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
TN	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
TX	.6086957	.0687939	8.85	0.000	.4737041	.7436872
UT	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
VA	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
VT	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
WA	-.0869565	.0687939	-1.26	0.207	-.2219481	.0480351
WI	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
WV	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
WY	-.173913	.0687939	-2.53	0.012	-.3089046	-.0389215
year						
1982	-6.88e-16	.0476204	-0.00	1.000	-.0934437	.0934437
1983	-7.09e-16	.0476204	-0.00	1.000	-.0934437	.0934437
1984	.0208333	.0476204	0.44	0.662	-.0726104	.114277
1985	.0208333	.0476204	0.44	0.662	-.0726104	.114277
1986	.1041667	.0476204	2.19	0.029	.010723	.1976104
1987	.125	.0476204	2.62	0.009	.0315563	.2184437
1988	.125	.0476204	2.62	0.009	.0315563	.2184437
1989	.125	.0476204	2.62	0.009	.0315563	.2184437
1990	.125	.0476204	2.62	0.009	.0315563	.2184437
1991	.1458333	.0476204	3.06	0.002	.0523896	.239277
1992	.1458333	.0476204	3.06	0.002	.0523896	.239277
1993	.1666667	.0476204	3.50	0.000	.073223	.2601104
1994	.1666667	.0476204	3.50	0.000	.073223	.2601104
1995	.1666667	.0476204	3.50	0.000	.073223	.2601104
1996	.2083333	.0476204	4.37	0.000	.1148896	.301777
1997	.2083333	.0476204	4.37	0.000	.1148896	.301777
1998	.2708333	.0476204	5.69	0.000	.1773896	.364277
1999	.2708333	.0476204	5.69	0.000	.1773896	.364277
2000	.3333333	.0476204	7.00	0.000	.2398896	.426777
2001	.3333333	.0476204	7.00	0.000	.2398896	.426777
2002	.3541667	.0476204	7.44	0.000	.260723	.4476104
2003	.375	.0476204	7.87	0.000	.2815563	.4684437
_cons	.009058	.058744	0.15	0.877	-.106213	.124329

```
845 predict dres, residuals
```

```
846
```

```
847 // Two ways to get denominator in weights
```

```
848 // method 1
```

```
849 gen dres_sq = dres^2
```

```
850 egen tot_dres_sq = total(dres_sq)
```

```
851
```

```
852 // method 2
```

```
853 gen dres_treat = dres if primary == 1
```

```
(922 missing values generated)
```

```
854 egen tot_dres_treat = total(dres_treat)
```

```
855 // assert tot_dres_treat == tot_dres_sq // equivalent
```

```
856 drop tot_dres_treat // drop method 2
```

```
857
```

```
858 gen w_it_static = dres/tot_dres_sq
```

```
859 egen tot_w_it = total(w_it_static)
```

```
860 sum tot_w_it // this sums to zero because it's on both omega_0 and _1
```

Variable	Obs	Mean	Std. Dev.	Min	Max
tot_w_it	1,104	-5.77e-09	0	-5.77e-09	-5.77e-09

```
861
```

```
862 gen h = year - cohort if cohort != 999
```

```
(690 missing values generated)
```

```
863 byso h (cohort) : egen w_h = mean(w_it_static) // get horizon specific w_it_static
```

```
864 scatter w_h h if primary == 1
```

```
865 scatter w_it_static h if primary == 1
```

```
866 // ANS: distant horizons get negative weights, yet total weights sum to 1.
```

```
867 // These are the forbidden comparisons?
```

```
868
```

```
869 gen w_it_d = w_it_static if primary == 1
```

```
(922 missing values generated)
```

```
870 egen tot_w_d = total(w_it_d)
```

```
871 sum tot_w_d // this sums to one because it's on omega_1 only as proven in Prop. 3
```

Variable	Obs	Mean	Std. Dev.	Min	Max
tot_w_d	1,104	1	0	1	1

```
872
```

```
873
```

```
874 // Q: Compare them to the sample weights of each horizon.
```

```
875 // generate population weights at each horizon
```

```
876 gen pop_d = population if primary == 1
```

```
(922 missing values generated)
```

```

877 egen tot_pop_d = total(pop_d) if primary == 1
    (922 missing values generated)

878 gen w_sample = population/tot_pop_d
    (922 missing values generated)

879 egen w_s_tot = total (w_sample)

880
881 label var h "Horizon"

882 byso h (cohort) : egen w_h_pop = mean(w_sample) // get horizon specific w_it_static
    (922 missing values generated)

883 twoway (scatter w_h_pop h if primary == 1) ///
    >         (scatter w_h h if primary == 1 ), ///
    >         legend(label(1 "Population weights") ///
    >                 label(2 "Static TWFE weight")) ///
    >         yline(0) ///
    >         ytitle("Weights") ///
    >         saving("$do_loc/Graphs/BJS_weights_h", replace)
    (file //Client/C$/Users/yfkas/Documents/GitHub/ARE213_Fall2023/PSet 2/Stata/Graphs/BJS
    > _weights_h.gph saved)

884
885
886 graph export "$do_loc/Graphs/BJS_weights_h.png", ///
    >         width(1200) height(900) ///
    >         replace
    (file //Client/C$/Users/yfkas/Documents/GitHub/ARE213_Fall2023/PSet 2/Stata/Graphs/BJS
    > _weights_h.png written in PNG format)

887
888
889 // ANS: TWFE weights are decreasing in h while the population weights are
890 // increasing because (1) the sample size increases over time and (2)
891 // because fewer obs exist at longer horizons.
892 preserve

893         collapse (mean) population, by(year)

894         scatter population year

895 restore

896
897 // In your view, does the static regression coefficient provide a useful
898 // summary of causal effects in this setting? Discuss.
899
900 // ANS: if the BJS paper provides any conclusion, it is that the static TWFE
901 // is exactly wrong because, if treatment effects are heterogeneous, then the
902 // later horizons will be weighted negatively as we see in the horizon specific
903 // weights, w_h.
904
905
906
907
908
909
    end of do-file

```



```

910 do "$do_loc/Code/02_analysis_q3z.do" // stack results
911 /*
912 > Title:          02_analysis_q3z.do
913 > Outline:        Question 3, PSet 2
914 >
915 > Q3 DinD estimation
916 >
917 > 3. Stack estimates in latex table
918 >
919 > */
912
913
914
915 local table_loc table_3_all
916 local table_title "ATT and SE by estimation method"
917 local note_local "This table shows the ATT and, where feasible, the SE estimated using the different methods listed in question 3."
918
919 // print table of selected vars
920 cap file close fh
921 file open fh using "$do_loc/Tables/`table_loc'.tex", replace write
922
923     file write fh "\begin{center}" _n
924     file write fh "\begin{tabular}{lccl}" _n
925     file write fh "\hline\hline" _n
926     file write fh "Question & ATT & SE & Estimation note \\\ [0.5ex]" _n
927     file write fh "\hline" _n
928     file write fh "Q3a                & $att_est_3a  & -                & d
929 > CDH (2023) \\\ " _n
929     file write fh "Q3b                & $att_est_3b  & $se_est_3b  & BJS (2023) \\\
930 > " _n
930     file write fh "Q3c.i            & $att_est_3c1 & $se_est_3c1 & Population weight 1 \
931 > \ " _n
931     file write fh "Q3c.ii           & $att_est_3c2 & $se_est_3c2 & Population weight 2 \
932 > \ " _n
932     file write fh "Q3d                & $att_est_3d  & $se_est_3d  & Including sta
933 > te-specific linear trends \\\ " _n
933     file write fh "Q3e                & $att_est_3e  & $se_est_3e  & Including sev
934 > eral covariates \\\ " _n
934     file write fh "Q3f                & $att_est_3f  & $se_est_3f  & Static TWFE \
935 > \ " _n
935     file write fh "\hline\hline" _n

```

```
936         file write fh "\end{tabular}" _n
937         file write fh "\end{center}" _n
938
939 file close fh
940
941
942     end of do-file
943
944
945
946 log close
      name: <unnamed>
      log:  //Client/C$/Users/yfkas/Documents/GitHub/ARE213_Fall2023/PSet 2/Stata/pse
> t2_logfile.smcl
      log type: smcl
      closed on: 30 Oct 2023, 12:49:02
```
