ECON 717A: Problem Set 3

Alex von Hafften

March 15, 2022

1 Write-Up

Problem 1 - Use `xtset state year`

Problem 2 - Define Treatment Variable

I define the treatment indicator as one for state-years if `mlda == 21` and zero otherwise. This results in 96 zeros and 555 ones.

Problem 3 - Naive Treatment Estimate

Below is a simple OLS regression of `rate18_20ht` on `mlda21`. The coefficient estimate on `mlda21` is negative but statistically insignificant, so this regression suggests that a minimum legal drinking age of 21 has no effect on the traffic fatality rate in the 18-20 age group. Thus, the estimate of the constant align relatively well with the unconditional mean of `mlda21` at 42.64. We do not want to take this estimate as the treatment effect too seriously. On the time dimension, `rate18_20ht` is generally decreasing over time and `mlda21` is generally increasing over time, and this estimate of the treatment effect do not control for time trends. Cross sectionally across states, the persistence of the both `rate18_20ht` and `mlda21` are quite high with average AR(1) coefficient around 0.5 and 0.95, respectively. Also we should be concerned about selection effects; for example, state with higher fatality rate may raise the drinking age to try to lower it. This estimate does not control for constant state-level effects.

	(1)
VARIABLES	rate18_20ht
mlda21	-3.150
	(1.975)
Constant	45.32***
	(1.845)
Observations	651
R-squared	0.004
Fixed Effects	None
Clusters	None

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Problem 4 - State or Year Fixed Effects

Below is the same regression as in (3) with state fixed effects and the same regression as in (2) with year fixed effects. The estimate of the treatment effect is now statistically significant, but with opposite signs. With state fixed effects, it is negative and, with year fixed effects, it is positive. The magnitude for both is about 9 percent. These findings makes sense. As mentioned in (3), `rate18_20ht` is generally decreasing over time and `mlda21` is generally increasing over time, so the coefficient on `mlda21` capture the time trend when controlling for state fixed effect. If you interpreted the results from the regression with the year fixed effects as treatment effects, it would suggest that a higher drinking age raises fatalities. This may be the selection effect at work. The state choose to have higher drinking ages because their fatality rates are high. Again, we should include both state-level and year-level fixed effects to get a better estimate of the treatment effect.

	(1)
VARIABLES	rate18_20ht
mlda21	-9.293***
	(1.323)
5.state	-17.63***
	(2.279)
6.state	-18.00***
	(1.722)
9.state	-41.95***
	(2.521)
12.state	-28.89***
	(2.290)
15.state	-14.43***
	(1.848)
17.state	-10.34***
	(2.055)
18.state	-4.168***
	(1.565)
19.state	-11.45***
	(1.753)
21.state	-23.68***
	(1.704)
23.state	-19.98***
	(1.694)
25.state	-1.037
	(2.268)
26.state	-3.568**
	(1.783)
29.state	2.199
	(4.571)
32.state	16.47***
	(4.081)
35.state	-14.20***
	(3.218)
38.state	-8.028***
	(3.010)
39.state	-19.78***
	(1.763)
45.state	-17.64***
	(2.362)
46.state	-4.781
	(3.384)
48.state	-15.42***
	(2.662)
Constant	62.77***
	(1.833)
Observations	651
R-squared	0.500
Fixed Effects	State
Clusters	None

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	(1) rate18_20ht
mlda21	8.886***
	(2.328)
1976.year	1.587
	(5.517)
1977.year	4.472
	(6.312)
1978.year	6.943
	(6.015)
1979.year	5.010
	(6.146)
1980.year	3.764
	(5.903)
1981.year	-2.729
	(5.136)
1982.year	-1.369
	(6.111)
1983.year	-8.660
	(5.374)
1984.year	-6.015
	(5.364)
1985.year	-7.919
	(5.167)
1986.year	-4.639
	(5.655)
1987.year	-8.371
	(5.591)
1988.year	-7.790
	(5.366)
1989.year	-12.08**
	(5.110)
1990.year	-9.555*
	(5.477)
1991.year	-13.10**
	(5.372)
1992.year	-20.75***
	(4.866)
1993.year	-19.22***
	(5.259)
1994.year	-15.54***
	(5.138)
1995.year	-14.23***
	(5.359)
1996.year	-17.85***
	(5.377)
1997.year	-18.86***
	(5.010)
1998.year	-18.60***
	(5.291)
1999.year	-20.99***
	(5.085)
2000.year	-20.19***
	(5.130)
2001.year	-21.78***
	(5.050)
2002.year	-19.71***
	(5.441)
2003.year	-20.24***
	(4.872)
2004.year	-20.53***
	(5.667)
2005.year	-22.09***
	(5.420)
Constant	45.74***
	(4.539)
Observations	651
R-squared	0.238
Fixed Effects	Year
Clusters	None

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Problem 5 - State and Year Fixed Effects with Clustered Standard Errors

Below is the regression with state and year fixed effects (suppressed due to space) with standard errors clustered at the state level. The coefficient is positive but statistically insignificant. This suggests that a higher drinking age has no effect on the fatality rate. This estimate is probably the most reasonable so far; however, we have not attempted to validate the parallel pre-trends assumption. I think I would be more convinced by a plausible natural experiment finding that exogenously changed the drinking age.

	(1)
VARIABLES	rate18_20ht
mlda21	5.755
	(4.764)
Observations	651
R-squared	0.691
Fixed Effects	State and Year
Clusters	States

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Problem 6 - State and Year Fixed Effects with Unclustered Standard Errors

Clearly, the unclustered standard errors are much lower than the clustered standard errors. This is the bias-variance trade-off. By clustering the standard errors we allow for more flexible estimation. This increased flexibility lowers the bias of our estimates, but increases the variance and thus the standard error.

	(1)
VARIABLES	rate18_20ht
mlda21	5.755***
	(1.669)
Observations	651
R-squared	0.691
Fixed Effects	State and Year
Clusters	None

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Problem 7 - Omitting after 1990

Below are estimates with data before and including 1990. The coefficient is much smaller (and still statistically insignificant). A larger estimate with the longer panel and a smaller estimate with the shorter panel may occur because the treatment effect takes awhile to materialize. For example, the law may not have been immediately enforced.

	(1)
VARIABLES	rate18_20ht
mlda21	1.165
	(2.990)
Observations	336
R-squared	0.769
Fixed Effects	State and Year
Clusters	States
Period	Before 1990

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Problem 8 - Placebo Test

This placebo test tests whether there was an effect on traffic fatalities in 1982 in the states that subsequently raised their minimum drinking age in 1987 relative to the state with drinking ages at 21 for the entire sample period. We find a positive and statistically significant coefficient on the placebo indicator. This indicates that traffic fatality may have been rising in these state which then led them to increase the drinking age 5 years later.

	(1)
VARIABLES	rate18_20ht
placebo82	10.71***
	(3.560)
Observations	204
R-squared	0.814
Fixed Effects	State and Year
Clusters	States

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Problem 9 - Michigan and Maryland

Below is a test of the treatment effect for early movers - Michigan and Maryland - relative to the sample of state with drinking ages at 21 for the entire sample period. The insignificant coefficient estimate for Michigan is in line with the zero impact for the larger sample. For Maryland, we find a slightly statistically significant increase in traffic fatality. If we take the estimate as statistically significant here, I think this increase could be driven by increased traffic fatalities from 18-20 year olds drinking and back driving from neighboring states like Virginia, DC, Pennsylvania, Delaware and West Virginia.

	(1)	(2)	(3)
VARIABLES	Michigan	Maryland	Maryland
mlda21_mi	-1.006		
	(3.746)		
mlda21_md		7.652*	7.652*
		(3.915)	(3.915)
Observations	403	403	403
R-squared	0.716	0.719	0.719
Fixed Effects	State and Year	State and Year	State and Year

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Problem 10 - Early and Late Treatment Effects

Below is the regression breaking apart the treatment indicator into the first four years after treatment and the rest of the sample period. Both estimates are statistically indistinguishable from zero, but the late treatment estimate is much larger. This supports the discussion in (7) that the effects of this policy may be slow to materialize.

	(1)
VARIABLES	rate18_20ht
mlda21_14	1.705
	(3.252)
mlda_later	7.260
	(5.415)
Observations	651
R-squared	0.695
Fixed Effects	State and Year

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

2 Stata Log File

```
------------------------------------------------------------------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/vonhafften/Documents/UW Madison/problem_sets/econ_717a/ps3/analysis.smcl
  log type:  smcl
 opened on:  15 Mar 2022, 10:08:39

. 
. * ECON 717A: Applied Econometrics

. * Problem Set 3

. * Professor: Jeff Smith

. * Alex von Hafften

. * Diff-in-diff

. 
. * clear workspace

. clear

. 
. * install user defined functions (if needed)

. ssc install outreg2
checking outreg2 consistency and verifying not already installed...
all files already exist and are up to date.

. ssc install asreg
checking asreg consistency and verifying not already installed...
all files already exist and are up to date.

. 
. 
. * change working directory
```

```
. cd "/Users/vonhafften/Documents/UW Madison/problem_sets/econ_717a/ps3/"
/Users/vonhafften/Documents/UW Madison/problem_sets/econ_717a/ps3

.
. * open dataset

. use "Economics 717 Miron and Tetelbaum Data"

.
. ********************************************************************************

. * problem #1 - create panel

. ********************************************************************************

.
. xtset state year

Panel variable: state (strongly balanced)
 Time variable: year, 1975 to 2005
         Delta: 1 unit

.
. ********************************************************************************

. * problem #2 - create treatment indicator

. ********************************************************************************

.
. gen mlda21 = (mlda == 21)

. tab mlda21

     mlda21 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         96       14.75       14.75
          1 |        555       85.25      100.00
------------+-----------------------------------
```

```
      Total |        651      100.00

.
. ******************************************************************************

. * problem #3 - naive treatment estimate

. ******************************************************************************

.
. regress rate18_20ht mlda21, robust

Linear regression                               Number of obs     =        651
                                                F(1, 649)         =       2.54
                                                Prob > F          =     0.1111
                                                R-squared         =     0.0044
                                                Root MSE          =     16.802

------------------------------------------------------------------------------
             |               Robust
 rate18_20ht | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      mlda21 |  -3.150429   1.974831    -1.60   0.111     -7.02826    .7274009
       _cons |   45.32411   1.845321    24.56   0.000     41.70059    48.94763
------------------------------------------------------------------------------

. outreg2 using table_3, addtext(Fixed Effects, None, Clusters, None) tex(frag) replace
table_3.tex
dir : seeout

.
. * summary statistics by year

. tab year, sum(rate18_20ht)

            |  Summary of Total TFR per 100,000
            |           18-20 year olds
       year |        Mean   Std. dev.       Freq.
------------+------------------------------------
```

```
       1975 |   50.818062   20.707453          21
       1976 |   52.404836   17.196789          21
       1977 |       55.29   22.491982          21
       1978 |   57.760944   20.614483          21
       1979 |   56.251402   20.889067          21
       1980 |   55.005035   19.566773          21
       1981 |   48.512411   12.776335          21
       1982 |   49.872219   19.871372          21
       1983 |   43.004066   14.330768          21
       1984 |   45.649467   13.269491          21
       1985 |   43.744915   12.479557          21
       1986 |    47.44816   17.405369          21
       1987 |   45.831965    16.21545          21
       1988 |   46.836771   14.144787          21
       1989 |   42.544014   11.999172          21
       1990 |    45.07175   15.013165          21
       1991 |    41.53127   14.192476          21
       1992 |   33.879187   9.6341663          21
       1993 |   35.403993   13.276247          21
       1994 |   39.090837   12.248997          21
       1995 |    40.39688   14.091257          21
       1996 |   36.780595   14.239405          21
       1997 |   35.766272   11.082532          21
       1998 |    36.03141   13.541888          21
       1999 |   33.634857   11.772848          21
       2000 |   34.435184    12.17759          21
       2001 |   32.841452   11.452997          21
       2002 |   34.921019   14.736202          21
       2003 |   34.388073   9.6995214          21
       2004 |   34.097601   16.424139          21
       2005 |   32.541424   14.573919          21
------------+------------------------------------
      Total |    42.63826   16.826073         651

. tab year, sum( mlda21)

            |          Summary of mlda21
       year |        Mean   Std. dev.       Freq.
------------+------------------------------------
```

```
       1975 |   .57142857   .50709255          21
       1976 |   .57142857   .50709255          21
       1977 |   .57142857   .50709255          21
       1978 |   .57142857   .50709255          21
       1979 |   .61904762   .49761335          21
       1980 |   .61904762   .49761335          21
       1981 |   .61904762   .49761335          21
       1982 |   .61904762   .49761335          21
       1983 |   .66666667   .48304589          21
       1984 |   .66666667   .48304589          21
       1985 |   .66666667   .48304589          21
       1986 |   .71428571   .46291005          21
       1987 |   .95238095   .21821789          21
       1988 |          1           0          21
       1989 |          1           0          21
       1990 |          1           0          21
       1991 |          1           0          21
       1992 |          1           0          21
       1993 |          1           0          21
       1994 |          1           0          21
       1995 |          1           0          21
       1996 |          1           0          21
       1997 |          1           0          21
       1998 |          1           0          21
       1999 |          1           0          21
       2000 |          1           0          21
       2001 |          1           0          21
       2002 |          1           0          21
       2003 |          1           0          21
       2004 |          1           0          21
       2005 |          1           0          21
------------+------------------------------------
      Total |   .85253456   .35484193         651

.
. * run ar regression by state

. gen rate18_20ht_ar = .
(651 missing values generated)
```

```
. gen mlda21_ar = .
(651 missing values generated)

.
. sort state year

. by state: gen rate18_20ht_lag = rate18_20ht[_n-1]
(21 missing values generated)

. by state: gen mlda21_lag = mlda21[_n-1]
(21 missing values generated)

.
. egen group = group(state)

. summ group

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
       group |        651          11    6.059957          1         21

.
. forvalues i = 1/`r(max)' {
  2. reg rate18_20ht rate18_20ht_lag if `i'==group
  3. replace rate18_20ht_ar = _b[rate18_20ht_lag] if `i'==group
  4.
. reg mlda21 mlda21_lag if `i'==group
  5. replace mlda21_ar = _b[mlda21_lag] if `i'==group
  6. }

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =      0.99
       Model |  50.8910411         1  50.8910411   Prob > F        =    0.3275
    Residual |  1434.47443        28  51.2312295   R-squared       =    0.0343
-------------+----------------------------------   Adj R-squared   =   -0.0002
       Total |  1485.36547        29  51.2194988   Root MSE        =    7.1576

------------------------------------------------------------------------------
```

```
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+----------------------------------------------------------------
rate18_20ht_lag |    .185344   .1859625     1.00   0.327    -.1955828    .5662709
          _cons |   43.64718   10.05279     4.34   0.000     23.05497    64.23939
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =    192.98
       Model |  2876.35219         1  2876.35219   Prob > F        =    0.0000
    Residual |  417.346485        28  14.9052316   R-squared       =    0.8733
-------------+----------------------------------   Adj R-squared   =    0.8688
       Total |  3293.69868        29  113.575816   Root MSE        =    3.8607

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+----------------------------------------------------------------
rate18_20ht_lag |   .9447954   .0680121    13.89   0.000      .805479    1.084112
          _cons |   1.467115   2.559468     0.57   0.571    -3.775718    6.709948
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.
```

```
      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     21.64
       Model |  951.879576         1  951.879576   Prob > F        =    0.0001
    Residual |  1231.75417        28  43.9912203   R-squared       =    0.4359
-------------+----------------------------------   Adj R-squared   =    0.4158
       Total |  2183.63375        29  75.2977154   Root MSE        =    6.6326

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .6690986   .1438408     4.65   0.000      .374454    .9637431
          _cons |   12.74533   5.828401     2.19   0.037     .8063903    24.68427
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =    190.40
       Model |  6.27692308         1  6.27692308   Prob > F        =    0.0000
    Residual |  .923076923        28  .032967033   R-squared       =    0.8718
-------------+----------------------------------   Adj R-squared   =    0.8672
       Total |         7.2        29  .248275862   Root MSE        =    .18157

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
```

```
-------------+----------------------------------------------------------------
  mlda21_lag |   .9230769   .0668967    13.80   0.000     .7860453    1.060109
       _cons |   .0769231    .050358     1.53   0.138    -.0262306    .1800767
-------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =      1.33
       Model |  114.631166         1  114.631166   Prob > F        =    0.2592
    Residual |  2419.83615        28  86.4227195   R-squared       =    0.0452
-------------+----------------------------------   Adj R-squared   =    0.0111
       Total |  2534.46731        29  87.3954246   Root MSE        =    9.2964

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .2098069   .1821723     1.15   0.259    -.1633561    .5829698
          _cons |   12.21977   3.248335     3.76   0.001     5.565856    18.87368
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =    184.80
       Model |        6.05         1        6.05   Prob > F        =    0.0000
    Residual |  .916666667        28  .032738095   R-squared       =    0.8684
-------------+----------------------------------   Adj R-squared   =    0.8637
       Total |  6.96666667        29  .240229885   Root MSE        =    .18094

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |   .9166667   .0674311    13.59   0.000     .7785403    1.054793
       _cons |   .0833333   .0522319     1.60   0.122    -.0236589    .1903256
-------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =      1.83
       Model |  257.018472         1  257.018472   Prob > F        =    0.1868
```

```
    Residual |  3929.59712        28  140.342754   R-squared       =    0.0614
-------------+----------------------------------   Adj R-squared   =    0.0279
       Total |  4186.61559        29  144.366055   Root MSE        =    11.847

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .2541491   .1878025     1.35   0.187    -.1305469    .6388452
          _cons |    20.7189   5.805045     3.57   0.001     8.827801    32.60999
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =    184.80
       Model |        6.05         1        6.05   Prob > F        =    0.0000
    Residual |  .916666667        28  .032738095   R-squared       =    0.8684
-------------+----------------------------------   Adj R-squared   =    0.8637
       Total |  6.96666667        29  .240229885   Root MSE        =    .18094

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |   .9166667   .0674311    13.59   0.000     .7785403    1.054793
       _cons |   .0833333   .0522319     1.60   0.122    -.0236589    .1903256
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     15.41
       Model |  557.913904         1  557.913904   Prob > F        =    0.0005
    Residual |  1013.66921        28  36.2024719   R-squared       =    0.3550
-------------+----------------------------------   Adj R-squared   =    0.3320
       Total |  1571.58312        29  54.1925213   Root MSE        =    6.0168

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .5971387    .152111     3.93   0.001     .2855534     .908724
          _cons |   15.18936   6.090247     2.49   0.019     2.714051    27.66466
```

```
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =      7.84
       Model |  644.528657         1  644.528657   Prob > F        =    0.0091
    Residual |  2301.13766        28  82.1834878   R-squared       =    0.2188
-------------+----------------------------------   Adj R-squared   =    0.1909
       Total |  2945.66632        29  101.574701   Root MSE        =    9.0655

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .4991763   .1782482     2.80   0.009     .1340514    .8643011
          _cons |   23.02791   8.549602     2.69   0.012      5.51484    40.54097
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =    177.33
       Model |  5.75757576         1  5.75757576   Prob > F        =    0.0000
    Residual |  .909090909        28  .032467532   R-squared       =    0.8636
-------------+----------------------------------   Adj R-squared   =    0.8588
```

```
       Total |  6.66666667        29  .229885057   Root MSE        =    .18019

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |   .9090909   .0682672    13.32   0.000     .7692519     1.04893
       _cons |   .0909091   .0543286     1.67   0.105    -.0203779    .2021961
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =      0.00
       Model |   .11027627         1   .11027627   Prob > F        =    0.9501
    Residual |  774.128609        28  27.6474503   R-squared       =    0.0001
-------------+----------------------------------   Adj R-squared   =   -0.0356
       Total |  774.238885        29  26.6978926   Root MSE        =    5.2581

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |  -.0119019   .1884536    -0.06   0.950    -.3979316    .3741277
          _cons |   49.82445   9.342207     5.33   0.000     30.68781     68.9611
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------
```

```
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     10.18
       Model |  550.719155         1  550.719155   Prob > F        =    0.0035
    Residual |  1515.36243        28  54.1200868   R-squared       =    0.2666
-------------+----------------------------------   Adj R-squared   =    0.2404
       Total |  2066.08159        29  71.2441926   Root MSE        =    7.3566

------------------------------------------------------------------------------
   rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
---------------+--------------------------------------------------------------
rate18_20ht_lag |   .5260287   .1649011     3.19   0.003     .1882441    .8638132
          _cons |   21.44179   7.687575     2.79   0.009     5.694512    37.18908
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =    184.80
       Model |        6.05         1        6.05   Prob > F        =    0.0000
    Residual |  .916666667        28  .032738095   R-squared       =    0.8684
-------------+----------------------------------   Adj R-squared   =    0.8637
       Total |  6.96666667        29  .240229885   Root MSE        =    .18094

------------------------------------------------------------------------------
     mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
------------+-----------------------------------------------------------------
  mlda21_lag |   .9166667   .0674311    13.59   0.000     .7785403    1.054793
       _cons |   .0833333   .0522319     1.60   0.122    -.0236589    .1903256
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     16.90
       Model |  628.320704         1  628.320704   Prob > F        =    0.0003
    Residual |  1041.26082        28  37.1878864   R-squared       =    0.3763
-------------+----------------------------------   Adj R-squared   =    0.3541
       Total |  1669.58152        29  57.5717767   Root MSE        =    6.0982
```

```
------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .6413244   .1560227     4.11   0.000     .3217263    .9609224
          _cons |   11.11797   5.208105     2.13   0.042     .4496501    21.78629
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =    143.73
       Model |  4.49166667         1  4.49166667   Prob > F        =    0.0000
    Residual |        .875        28      .03125   R-squared       =    0.8370
-------------+----------------------------------   Adj R-squared   =    0.8311
       Total |  5.36666667        29  .185057471   Root MSE        =    .17678

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |       .875   .0729843    11.99   0.000     .7254985    1.024502
       _cons |       .125      .0625     2.00   0.055    -.0030254    .2530254
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     70.67
       Model |  1309.76588         1  1309.76588   Prob > F        =    0.0000
    Residual |  518.955397        28  18.5341213   R-squared       =    0.7162
-------------+----------------------------------   Adj R-squared   =    0.7061
       Total |  1828.72128        29  63.0593545   Root MSE        =    4.3051

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |    .800356   .0952078     8.41   0.000     .6053317    .9953803
          _cons |   6.347582   3.405383     1.86   0.073    -.6280293    13.32319
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
```

```
-------------+----------------------------------   F(1, 28)        =     72.80
       Model |        1.95         1        1.95   Prob > F        =    0.0000
    Residual |         .75        28  .026785714   R-squared       =    0.7222
-------------+----------------------------------   Adj R-squared   =    0.7123
       Total |         2.7        29  .093103448   Root MSE        =    .16366

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |         .75   .0879014     8.53   0.000     .5699422    .9300578
       _cons |         .25   .0818317     3.06   0.005     .0823753    .4176247
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =      0.03
       Model |  1.53655217         1  1.53655217   Prob > F        =    0.8678
    Residual |  1525.26228        28  54.4736529   R-squared       =    0.0010
-------------+----------------------------------   Adj R-squared   =   -0.0347
       Total |  1526.79883        29  52.6482356   Root MSE        =    7.3806

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   -.030577     .18206    -0.17   0.868    -.4035099    .3423559
          _cons |   58.24621   10.22354     5.70   0.000     37.30425    79.18818
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =    184.80
       Model |        6.05         1        6.05   Prob > F        =    0.0000
    Residual |  .916666667        28  .032738095   R-squared       =    0.8684
-------------+----------------------------------   Adj R-squared   =    0.8637
       Total |  6.96666667        29  .240229885   Root MSE        =    .18094

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
```

```
  mlda21_lag |   .9166667   .0674311    13.59   0.000     .7785403    1.054793
       _cons |   .0833333   .0522319     1.60   0.122    -.0236589    .1903256
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =      1.33
       Model |  65.8488274         1  65.8488274   Prob > F        =    0.2585
    Residual |  1385.98041        28  49.4993005   R-squared       =    0.0454
-------------+----------------------------------   Adj R-squared   =    0.0113
       Total |  1451.82924        29  50.0630772   Root MSE        =    7.0356

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |  -.2129115    .184597    -1.15   0.259    -.5910414    .1652183
          _cons |   60.46621   9.293029     6.51   0.000      41.4303    79.50211
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     41.56
       Model |  10152.2733         1  10152.2733   Prob > F        =    0.0000
```

```
    Residual |  6839.14891        28  244.255318   R-squared       =    0.5975
-------------+----------------------------------   Adj R-squared   =    0.5831
       Total |  16991.4222        29  585.911111   Root MSE        =    15.629

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .7612829   .1180827     6.45   0.000     .5194014    1.003164
          _cons |   11.81063    7.23613     1.63   0.114    -3.011912    26.63317
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     24.80
       Model |  6106.58482         1  6106.58482   Prob > F        =    0.0000
    Residual |  6894.56356        28  246.234413   R-squared       =    0.4697
-------------+----------------------------------   Adj R-squared   =    0.4508
       Total |  13001.1484        29  448.315461   Root MSE        =    15.692

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .6681955   .1341772     4.98   0.000      .393346     .943045
```

```
         _cons |   21.81069   9.884604     2.21   0.036     1.562997    42.05839
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     13.27
       Model |  2374.41032         1  2374.41032   Prob > F        =    0.0011
    Residual |  5008.37239        28  178.870442   R-squared       =    0.3216
-------------+----------------------------------   Adj R-squared   =    0.2974
       Total |   7382.7827        29  254.578714   Root MSE        =    13.374

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |      .5414   .1485969     3.64   0.001     .2370131    .8457868
          _cons |    17.0394   6.346977     2.68   0.012     4.038211     30.0406
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
```

```
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     37.56
       Model |  3882.76723         1  3882.76723   Prob > F        =    0.0000
    Residual |  2894.57842        28  103.377801   R-squared       =    0.5729
-------------+----------------------------------   Adj R-squared   =    0.5577
       Total |  6777.34565        29  233.701574   Root MSE        =    10.167

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .7691456   .1255023     6.13   0.000     .5120659    1.026225
          _cons |   9.632915   6.071371     1.59   0.124    -2.803724    22.06955
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
```

```
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------

(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     48.05
       Model |   855.31834         1   855.31834   Prob > F        =    0.0000
    Residual |  498.437111        28  17.8013254   R-squared       =    0.6318
-------------+----------------------------------   Adj R-squared   =    0.6187
       Total |  1353.75545        29  46.6812224   Root MSE        =    4.2192

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .7953728   .1147448     6.93   0.000     .5603287    1.030417
          _cons |   6.534121   3.964868     1.65   0.111    -1.587543    14.65579
------------------------------------------------------------------------------

(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------

(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     19.69
       Model |  1519.60253         1  1519.60253   Prob > F        =    0.0001
    Residual |  2160.62801        28   77.165286   R-squared       =    0.4129
```

```
-------------+----------------------------------   Adj R-squared   =    0.3919
       Total |  3680.23054        29  126.904501   Root MSE        =    8.7844

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .6968599   .1570332     4.44   0.000      .375192    1.018528
          _cons |   10.38513   5.967755     1.74   0.093    -1.839259    22.60952
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     12.28
       Model |  3193.91674         1  3193.91674   Prob > F        =    0.0016
    Residual |  7281.68317        28  260.060113   R-squared       =    0.3049
-------------+----------------------------------   Adj R-squared   =    0.2801
       Total |  10475.5999        29  361.227583   Root MSE        =    16.126

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .5328112   .1520367     3.50   0.002     .2213782    .8442443
          _cons |   22.78523   8.592281     2.65   0.013     5.184737    40.38572
```

```
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =    184.80
       Model |        6.05         1        6.05   Prob > F        =    0.0000
    Residual |  .916666667        28  .032738095   R-squared       =    0.8684
-------------+----------------------------------   Adj R-squared   =    0.8637
       Total |  6.96666667        29  .240229885   Root MSE        =    .18094

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |   .9166667   .0674311    13.59   0.000      .7785403    1.054793
       _cons |   .0833333   .0522319     1.60   0.122    -.0236589    .1903256
------------------------------------------------------------------------------
(31 real changes made)

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(1, 28)        =     93.00
       Model |  3745.92859         1  3745.92859   Prob > F        =    0.0000
    Residual |  1127.80373        28  40.2787046   R-squared       =    0.7686
-------------+----------------------------------   Adj R-squared   =    0.7603
       Total |  4873.73232        29  168.059735   Root MSE        =    6.3466

------------------------------------------------------------------------------
    rate18_20ht | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------+-------------------------------------------------------------
rate18_20ht_lag |   .8909771   .0923899     9.64   0.000      .7017249    1.080229
          _cons |   3.111875   3.757227     0.83   0.415    -4.584456    10.80821
------------------------------------------------------------------------------
(31 real changes made)
note: mlda21_lag omitted because of collinearity.

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(0, 29)        =      0.00
       Model |           0         0           .   Prob > F        =         .
    Residual |           0        29           0   R-squared       =         .
-------------+----------------------------------   Adj R-squared   =         .
```

```
       Total |           0        29           0   Root MSE        =         0

------------------------------------------------------------------------------
      mlda21 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  mlda21_lag |          0  (omitted)
       _cons |          1          .        .       .            .           .
------------------------------------------------------------------------------
(31 real changes made)

.
. * if mlda never changes, then set ar coefficient to 1.

. replace mlda21_ar = 1 if mldayr == 0
(372 real changes made)

.
. summ rate18_20ht_ar

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
rate18_20h~r |        651    .5108511     .315745  -.2129115   .9447954

. summ mlda21_ar

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
   mlda21_ar |        651    .9543096    .0629879        .75          1

.
. ******************************************************************************

. * problem #4 - naive treatment estimate with state or year fes

. ******************************************************************************

.
. regress rate18_20ht mlda21 i.state, robust
```

```
Linear regression                               Number of obs     =        651
                                                F(21, 629)        =      38.72
                                                Prob > F          =     0.0000
                                                R-squared         =     0.5003
                                                Root MSE          =     12.091

------------------------------------------------------------------------------
             |               Robust
 rate18_20ht | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      mlda21 |  -9.293325   1.322639    -7.03   0.000    -11.89065   -6.696002
             |
       state |
           5 |  -17.63309   2.279453    -7.74   0.000    -22.10934   -13.15683
           6 |  -18.00307   1.721575   -10.46   0.000     -21.3838   -14.62234
           9 |  -41.94561   2.520803   -16.64   0.000    -46.89581    -36.9954
          12 |  -28.88859   2.290481   -12.61   0.000     -33.3865   -24.39067
          15 |  -14.43497   1.847908    -7.81   0.000    -18.06379   -10.80616
          17 |  -10.34093   2.054942    -5.03   0.000    -14.37631   -6.305552
          18 |  -4.167683   1.565229    -2.66   0.008     -7.24139   -1.093976
          19 |  -11.45499   1.752748    -6.54   0.000    -14.89693   -8.013039
          21 |   -23.6835   1.704102   -13.90   0.000    -27.02991   -20.33708
          23 |  -19.97684   1.693737   -11.79   0.000     -23.3029   -16.65078
          25 |  -1.037205   2.268139    -0.46   0.648    -5.491246    3.416836
          26 |  -3.567835   1.782715    -2.00   0.046    -7.068628   -.0670416
          29 |   2.198612    4.57074     0.48   0.631    -6.777145    11.17437
          32 |   16.47085   4.081429     4.04   0.000     8.455978    24.48573
          35 |  -14.19745   3.218416    -4.41   0.000    -20.51759   -7.877306
          38 |  -8.028192   3.009831    -2.67   0.008    -13.93873   -2.117659
          39 |  -19.78079   1.763229   -11.22   0.000    -23.24332   -16.31826
          45 |  -17.64001   2.361935    -7.47   0.000    -22.27824   -13.00178
          46 |   -4.78062   3.383739    -1.41   0.158    -11.42541    1.864173
          48 |  -15.41629   2.662471    -5.79   0.000     -20.6447   -10.18788
             |
       _cons |   62.76629   1.833272    34.24   0.000     59.16622    66.36637
------------------------------------------------------------------------------

. outreg2 using table_4_state, addtext(Fixed Effects, State, Clusters, None) tex(frag) replace
table_4_state.tex
```

```
dir : seeout

.
. regress rate18_20ht mlda21 i.year, robust

Linear regression                               Number of obs     =        651
                                                F(31, 619)        =       6.06
                                                Prob > F          =     0.0000
                                                R-squared         =     0.2382
                                                Root MSE          =     15.049

------------------------------------------------------------------------------
             |               Robust
 rate18_20ht | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      mlda21 |    8.88623   2.327919     3.82   0.000     4.314654    13.45781
             |
        year |
        1976 |   1.586774   5.516733     0.29   0.774    -9.247007    12.42055
        1977 |   4.471938   6.311562     0.71   0.479    -7.922732    16.86661
        1978 |   6.942881   6.015238     1.15   0.249    -4.869867    18.75563
        1979 |   5.010186   6.146383     0.82   0.415    -7.060104    17.08047
        1980 |   3.763819   5.903032     0.64   0.524    -7.828577    15.35621
        1981 |  -2.728805    5.13647    -0.53   0.595    -12.81582    7.358213
        1982 |  -1.368997   6.110785    -0.22   0.823    -13.36938    10.63139
        1983 |  -8.660304   5.374272    -1.61   0.108    -19.21432    1.893711
        1984 |  -6.014903   5.364249    -1.12   0.263    -16.54923    4.519429
        1985 |  -7.919455   5.167422    -1.53   0.126    -18.06726    2.228348
        1986 |  -4.639364   5.654572    -0.82   0.412    -15.74383    6.465106
        1987 |  -8.371328   5.591144    -1.50   0.135    -19.35124    2.608581
        1988 |  -7.789676    5.36555    -1.45   0.147    -18.32656     2.74721
        1989 |  -12.08243   5.110149    -2.36   0.018    -22.11776   -2.047103
        1990 |  -9.554697   5.476933    -1.74   0.082    -20.31032    1.200924
        1991 |  -13.09518   5.371553    -2.44   0.015    -23.64385   -2.546502
        1992 |  -20.74726   4.865527    -4.26   0.000     -30.3022   -11.19232
        1993 |  -19.22245   5.258629    -3.66   0.000    -29.54937   -8.895537
        1994 |  -15.53561   5.138342    -3.02   0.003    -25.62631   -5.444915
        1995 |  -14.22957   5.358827    -2.66   0.008    -24.75325   -3.705882
        1996 |  -17.84585   5.377473    -3.32   0.001    -28.40615    -7.28555
```

```
       1997  |  -18.86017   5.010438    -3.76   0.000    -28.69969   -9.020657
       1998  |  -18.59504   5.290838    -3.51   0.000     -28.9852   -8.204869
       1999  |  -20.99159   5.084979    -4.13   0.000    -30.97749   -11.00569
       2000  |  -20.19126    5.13024    -3.94   0.000    -30.26605   -10.11648
       2001  |    -21.785   5.050018    -4.31   0.000    -31.70224   -11.86775
       2002  |  -19.70543   5.440937    -3.62   0.000    -30.39036   -9.020494
       2003  |  -20.23837   4.871717    -4.15   0.000    -29.80547   -10.67128
       2004  |  -20.52885   5.666785    -3.62   0.000     -31.6573   -9.400393
       2005  |  -22.08502   5.420049    -4.07   0.000    -32.72894   -11.44111
             |
       _cons |   45.74022   4.539007    10.08   0.000      36.8265    54.65393
------------------------------------------------------------------------------

. outreg2 using table_4_year, addtext(Fixed Effects, Year, Clusters, None) tex(frag) replace
table_4_year.tex
dir : seeout

.
. *******************************************************************************

. * problem #5 - naive treatment estimate

. * with state and year fes and clustered ses

. *******************************************************************************

.
. regress rate18_20ht mlda21 i.year i.state, robust cluster(state)

Linear regression                               Number of obs     =        651
                                                F(19, 20)         =          .
                                                Prob > F          =          .
                                                R-squared         =     0.6914
                                                Root MSE          =     9.7375

                                  (Std. err. adjusted for 21 clusters in state)
------------------------------------------------------------------------------
             |               Robust
 rate18_20ht | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
```

mlda21	5.755264	4.764454	1.21	0.241	-4.183213	15.69374
year						
1976	1.586774	2.074697	0.76	0.453	-2.740968	5.914516
1977	4.471938	2.212946	2.02	0.057	-.1441867	9.088062
1978	6.942881	2.423455	2.86	0.010	1.887642	11.99812
1979	5.159279	2.291585	2.25	0.036	.3791171	9.939441
1980	3.912912	2.523114	1.55	0.137	-1.350212	9.176037
1981	-2.579711	3.524938	-0.73	0.473	-9.932604	4.773181
1982	-1.219903	2.025216	-0.60	0.554	-5.44443	3.004623
1983	-8.362117	2.877852	-2.91	0.009	-14.36521	-2.359023
1984	-5.716716	3.685785	-1.55	0.137	-13.40513	1.971698
1985	-7.621268	3.288115	-2.32	0.031	-14.48016	-.7623797
1986	-4.192083	3.448021	-1.22	0.238	-11.38453	3.000363
1987	-7.178579	3.857767	-1.86	0.078	-15.22574	.8685828
1988	-6.447833	3.883399	-1.66	0.112	-14.54846	1.652795
1989	-10.74059	3.983096	-2.70	0.014	-19.04918	-2.431999
1990	-8.212854	3.135324	-2.62	0.016	-14.75302	-1.672683
1991	-11.75333	3.834787	-3.06	0.006	-19.75256	-3.754109
1992	-19.40542	4.517521	-4.30	0.000	-28.8288	-9.982033
1993	-17.88061	4.811318	-3.72	0.001	-27.91684	-7.844378
1994	-14.19377	4.9687	-2.86	0.010	-24.55829	-3.82924
1995	-12.88772	4.097612	-3.15	0.005	-21.43519	-4.340255
1996	-16.50401	4.355753	-3.79	0.001	-25.58995	-7.418067
1997	-17.51833	4.417279	-3.97	0.001	-26.73261	-8.30405
1998	-17.25319	4.725276	-3.65	0.002	-27.10995	-7.396441
1999	-19.64975	4.916104	-4.00	0.001	-29.90456	-9.394934
2000	-18.84942	4.81127	-3.92	0.001	-28.88555	-8.813287
2001	-20.44315	5.869097	-3.48	0.002	-32.68587	-8.200431
2002	-18.36358	4.861316	-3.78	0.001	-28.50411	-8.223058
2003	-18.89653	4.613319	-4.10	0.001	-28.51975	-9.273316
2004	-19.187	4.939236	-3.88	0.001	-29.49007	-8.883937
2005	-20.74318	4.590038	-4.52	0.000	-30.31783	-11.16853
state						
5	-17.63309	9.75e-14	-1.8e+14	0.000	-17.63309	-17.63309
6	-11.69237	1.997997	-5.85	0.000	-15.86012	-7.524622
9	-36.12035	1.844305	-19.58	0.000	-39.9675	-32.27319

```
          12  |  -23.06333   1.844305   -12.51   0.000    -26.91048   -19.21618
          15  |  -14.43497   9.75e-14 -1.5e+14   0.000    -14.43497   -14.43497
          17  |  -5.001109   1.690613    -2.96   0.008    -8.527665   -1.474552
          18  |  -4.167683   9.75e-14 -4.3e+13   0.000    -4.167683   -4.167683
          19  |  -5.629725   1.844305    -3.05   0.006    -9.476877   -1.782573
          21  |  -19.79999   1.229536   -16.10   0.000    -22.36476   -17.23522
          23  |  -18.03509   .6147682   -29.34   0.000    -19.31747    -16.7527
          25  |   4.788055   1.844305     2.60   0.017     .9409026    8.635207
          26  |  -3.567835   9.75e-14 -3.7e+13   0.000    -3.567835   -3.567835
          29  |   2.198612   9.79e-14  2.2e+13   0.000     2.198612    2.198612
          32  |   16.47085   9.78e-14  1.7e+14   0.000     16.47085    16.47085
          35  |  -14.19745   9.75e-14 -1.5e+14   0.000    -14.19745   -14.19745
          38  |  -8.028192   9.77e-14 -8.2e+13   0.000    -8.028192   -8.028192
          39  |  -19.78079   9.76e-14 -2.0e+14   0.000    -19.78079   -19.78079
          45  |  -17.64001   9.76e-14 -1.8e+14   0.000    -17.64001   -17.64001
          46  |    1.04464   1.844305     0.57   0.577    -2.802512    4.891792
          48  |  -15.41629   9.76e-14 -1.6e+14   0.000    -15.41629   -15.41629
              |
       _cons  |   57.51535   4.778858    12.04   0.000     47.54682    67.48387
------------------------------------------------------------------------------

. outreg2 using table_5, keep(mlda21) addtext(Fixed Effects, State and Year, Clusters, States) nocons tex(frag) replace
table_5.tex
dir : seeout

.
. ********************************************************************************

. * problem #6 - treatment estimate

. * with state and year fes and unclustered ses

. ********************************************************************************

.
. regress rate18_20ht mlda21 i.year i.state, robust

Linear regression                               Number of obs     =        651
                                                F(51, 599)        =      25.04
```

```
                                                Prob > F          =     0.0000
                                                R-squared         =     0.6914
                                                Root MSE          =     9.7375

------------------------------------------------------------------------------
             |               Robust
 rate18_20ht | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      mlda21 |   5.755264   1.668881     3.45   0.001     2.477694    9.032833
             |
        year |
        1976 |   1.586774   3.550686     0.45   0.655    -5.386533    8.560081
        1977 |   4.471938   4.322481     1.03   0.301    -4.017121      12.961
        1978 |   6.942881   3.678828     1.89   0.060    -.2820875    14.16785
        1979 |   5.159279   4.149023     1.24   0.214    -2.989121    13.30768
        1980 |   3.912912   3.888638     1.01   0.315    -3.724109    11.54993
        1981 |  -2.579711   3.497186    -0.74   0.461    -9.447947    4.288525
        1982 |  -1.219903   4.101644    -0.30   0.766    -9.275254    6.835448
        1983 |  -8.362117   3.350342    -2.50   0.013    -14.94196   -1.782271
        1984 |  -5.716716   3.585548    -1.59   0.111    -12.75849    1.325059
        1985 |  -7.621268   3.300416    -2.31   0.021    -14.10306   -1.139475
        1986 |  -4.192083   3.362003    -1.25   0.213    -10.79483    2.410663
        1987 |  -7.178579   3.462968    -2.07   0.039    -13.97961   -.3775437
        1988 |  -6.447833    3.46534    -1.86   0.063    -13.25353    .3578594
        1989 |  -10.74059   3.345871    -3.21   0.001    -17.31166   -4.169526
        1990 |  -8.212854   3.323583    -2.47   0.014    -14.74014   -1.685563
        1991 |  -11.75333     3.1375    -3.75   0.000    -17.91517   -5.591497
        1992 |  -19.40542   3.331777    -5.82   0.000     -25.9488   -12.86203
        1993 |  -17.88061   3.576713    -5.00   0.000    -24.90503   -10.85619
        1994 |  -14.19377   3.779159    -3.76   0.000    -21.61578   -6.771754
        1995 |  -12.88772   3.436375    -3.75   0.000    -19.63653   -6.138917
        1996 |  -16.50401   3.416089    -4.83   0.000    -23.21298   -9.795041
        1997 |  -17.51833   3.498008    -5.01   0.000    -24.38818   -10.64848
        1998 |  -17.25319   3.556255    -4.85   0.000    -24.23744   -10.26895
        1999 |  -19.64975   3.771412    -5.21   0.000    -27.05654   -12.24295
        2000 |  -18.84942   3.410245    -5.53   0.000    -25.54691   -12.15193
        2001 |  -20.44315   3.962487    -5.16   0.000    -28.22521    -12.6611
        2002 |  -18.36358    3.61721    -5.08   0.000    -25.46754   -11.25963
        2003 |  -18.89653   3.633407    -5.20   0.000     -26.0323   -11.76077
```

```
        2004  |    -19.187    3.71457    -5.17   0.000    -26.48217   -11.89184
        2005  |  -20.74318   3.556779    -5.83   0.000    -27.72845   -13.75791
              |
        state |
           5  |  -17.63309   1.666067   -10.58   0.000    -20.90513   -14.36104
           6  |  -11.69237   1.951735    -5.99   0.000    -15.52545   -7.859295
           9  |  -36.12035   2.996451   -12.05   0.000    -42.00517   -30.23552
          12  |  -23.06333   2.330228    -9.90   0.000    -27.63974   -18.48692
          15  |  -14.43497   1.720481    -8.39   0.000    -17.81388   -11.05607
          17  |  -5.001109   2.063429    -2.42   0.016    -9.053544   -.9486732
          18  |  -4.167683   2.078342    -2.01   0.045    -8.249405   -.0859611
          19  |  -5.629725   2.008666    -2.80   0.005    -9.574609   -1.684841
          21  |  -19.79999    1.81642   -10.90   0.000    -23.36732   -16.23266
          23  |  -18.03509   1.824432    -9.89   0.000    -21.61815   -14.45203
          25  |   4.788055   2.607444     1.84   0.067    -.3327885    9.908898
          26  |  -3.567835   2.239547    -1.59   0.112    -7.966154    .8304842
          29  |   2.198612   3.411899     0.64   0.520    -4.502126    8.899351
          32  |   16.47085   3.071123     5.36   0.000     10.43938    22.50233
          35  |  -14.19745   2.578666    -5.51   0.000    -19.26177    -9.13312
          38  |  -8.028192   2.209552    -3.63   0.000     -12.3676   -3.688781
          39  |  -19.78079   1.840723   -10.75   0.000    -23.39585   -16.16574
          45  |  -17.64001   2.003659    -8.80   0.000    -21.57506   -13.70496
          46  |    1.04464   3.280043     0.32   0.750    -5.397142    7.486423
          48  |  -15.41629   1.848006    -8.34   0.000    -19.04565   -11.78693
              |
        _cons |   57.51535    3.51386    16.37   0.000     50.61436    64.41633
------------------------------------------------------------------------------

. outreg2 using table_6, keep(mlda21) addtext(Fixed Effects, State and Year, Clusters, None) nocons tex(frag) replace
table_6.tex
dir : seeout

.
. ********************************************************************************

. * problem #7 - treatment estimate

. * with state and year fes and unclustered ses
```

```
. * before and including 1990

. ********************************************************************************

.
. regress rate18_20ht mlda21 i.year i.state if year <= 1990, robust cluster(state)

Linear regression                               Number of obs     =        336
                                                F(15, 20)         =          .
                                                Prob > F          =          .
                                                R-squared         =     0.7694
                                                Root MSE          =     8.8637

                                  (Std. err. adjusted for 21 clusters in state)
------------------------------------------------------------------------------
             |               Robust
 rate18_20ht | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      mlda21 |   1.164507   2.989659     0.39   0.701    -5.071813    7.400826
             |
        year |
        1976 |   1.586774   2.108134     0.75   0.460    -2.810717    5.984264
        1977 |   4.471938   2.248611     1.99   0.061    -.2185829    9.162458
        1978 |   6.942881   2.462513     2.82   0.011     1.806169    12.07959
        1979 |   5.377887   2.246382     2.39   0.027     .6920164    10.06376
        1980 |    4.13152    2.51051     1.65   0.115    -1.105312    9.368352
        1981 |  -2.361104   3.525772    -0.67   0.511    -9.715736    4.993529
        1982 |  -1.001296   1.930725    -0.52   0.610    -5.028717    3.026125
        1983 |  -7.924902   2.937378    -2.70   0.014    -14.05216   -1.797639
        1984 |  -5.279501   3.675871    -1.44   0.166    -12.94723    2.388233
        1985 |  -7.184053   3.398726    -2.11   0.047    -14.27367   -.0944344
        1986 |  -3.536261   3.624687    -0.98   0.341    -11.09723    4.024705
        1987 |  -5.429719   3.878214    -1.40   0.177    -13.51953    2.660093
        1988 |  -4.480366   3.667831    -1.22   0.236    -12.13133    3.170595
        1989 |  -8.773123    4.11817    -2.13   0.046    -17.36347   -.1827716
        1990 |  -6.245387   3.153536    -1.98   0.062    -12.82355    .3327748
             |
       state |
           5 |  -11.45413   5.43e-14 -2.1e+14   0.000    -11.45413   -11.45413
```

```
           6  |  -10.65691   2.429098    -4.39   0.000    -15.72392   -5.589897
           9  |  -44.13431   2.242244   -19.68   0.000    -48.81155   -39.45707
          12  |  -20.49993   2.242244    -9.14   0.000    -25.17717   -15.82269
          15  |  -12.36255   5.40e-14 -2.3e+14   0.000    -12.36255   -12.36255
          17  |  -2.703161   2.055391    -1.32   0.203    -6.990631    1.584308
          18  |  -5.478406   5.43e-14 -1.0e+14   0.000    -5.478406   -5.478406
          19  |  -5.158613   2.242244    -2.30   0.032    -9.835852   -.4813731
          21  |  -18.11521    1.49483   -12.12   0.000    -21.23337   -14.99705
          23  |  -15.61975   .7474148   -20.90   0.000    -17.17883   -14.06067
          25  |  -1.754381   2.242244    -0.78   0.443    -6.431621    2.922858
          26  |   -5.17912   5.42e-14 -9.6e+13   0.000     -5.17912    -5.17912
          29  |   17.42928   6.08e-14  2.9e+14   0.000     17.42928    17.42928
          32  |   29.07168   5.57e-14  5.2e+14   0.000     29.07168    29.07168
          35  |  -8.097558   5.40e-14 -1.5e+14   0.000    -8.097558   -8.097558
          38  |   .8843718   5.39e-14  1.6e+13   0.000     .8843718    .8843718
          39  |  -18.59664   5.39e-14 -3.4e+14   0.000    -18.59664   -18.59664
          45  |  -13.06255   5.42e-14 -2.4e+14   0.000    -13.06255   -13.06255
          46  |   9.841345   2.242244     4.39   0.000     5.164105    14.51858
          48  |  -7.806229   5.40e-14 -1.4e+14   0.000    -7.806229   -7.806229
              |
       _cons  |   56.98371   3.369066    16.91   0.000     49.95597    64.01146
------------------------------------------------------------------------------

. outreg2 using table_7, keep(mlda21)  addtext(Fixed Effects, State and Year, Clusters, States, Period, Before 1990)  nocons tex(frag) rep
table_7.tex
dir : seeout

.
. ********************************************************************************

. * problem #8 - placebo test

. ********************************************************************************

.
. * placebo treatment indicator equals one in states treated in 1987 and in years 1982 or later

. gen placebo82 = (mldayr == 1987) & (year >= 1982)
```

```
.
. * in_placebo82_sample is 1 for states with 21 drinking ages always (mldayr == 0) and that switched in 1987 (mldayr == 1987)

. gen in_placebo82_sample = ((mldayr == 0) | (mldayr == 1987)) & (year < 1987)

.
. regress rate18_20ht placebo82 i.year i.state if in_placebo82_sample == 1, robust cluster(state)

Linear regression                               Number of obs     =        204
                                                F(11, 16)         =          .
                                                Prob > F          =          .
                                                R-squared         =     0.8141
                                                Root MSE          =      9.079

                                  (Std. err. adjusted for 17 clusters in state)
------------------------------------------------------------------------------
             |               Robust
 rate18_20ht | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
   placebo82 |   10.71436   3.559679     3.01   0.008     3.168178    18.26054
             |
        year |
        1976 |   .5042435   2.541749     0.20   0.845    -4.884023     5.89251
        1977 |   3.675133   2.524776     1.46   0.165    -1.677152    9.027419
        1978 |   6.772235   2.973331     2.28   0.037     .4690553    13.07542
        1979 |   6.258322   2.706132     2.31   0.034     .5215786    11.99507
        1980 |   3.968481   2.917742     1.36   0.193    -2.216856    10.15382
        1981 |   -3.53396   4.080142    -0.87   0.399    -12.18347    5.115555
        1982 |  -4.046942   2.420896    -1.67   0.114    -9.179012    1.085127
        1983 |  -11.43139    3.63236    -3.15   0.006    -19.13165   -3.731128
        1984 |  -8.680898   4.479935    -1.94   0.071    -18.17794    .8161407
        1985 |  -11.66481    4.09754    -2.85   0.012     -20.3512   -2.978408
        1986 |  -7.973633   4.744501    -1.68   0.112    -18.03153     2.08426
             |
       state |
           5 |  -9.770672   5.44e-14 -1.8e+14   0.000    -9.770672   -9.770672
           9 |   -49.7497   1.483199   -33.54   0.000    -52.89395   -46.60546
          12 |  -25.00101   1.483199   -16.86   0.000    -28.14525   -21.85677
          15 |   -10.2753   5.41e-14 -1.9e+14   0.000     -10.2753    -10.2753
```

```
          18  |  -4.551913   5.45e-14 -8.4e+13   0.000    -4.551913   -4.551913
          19  |  -7.537435   1.483199    -5.08   0.000    -10.68168   -4.393193
          25  |  -7.779954   1.483199    -5.25   0.000     -10.9242   -4.635712
          26  |  -4.291239   5.40e-14 -7.9e+13   0.000    -4.291239   -4.291239
          29  |   23.76574   5.44e-14  4.4e+14   0.000     23.76574    23.76574
          32  |   32.75593   5.86e-14  5.6e+14   0.000     32.75593    32.75593
          35  |  -3.500052   5.39e-14 -6.5e+13   0.000    -3.500052   -3.500052
          38  |   1.080626   5.49e-14  2.0e+13   0.000     1.080626    1.080626
          39  |  -16.80038   5.48e-14 -3.1e+14   0.000    -16.80038   -16.80038
          45  |  -11.43358   5.48e-14 -2.1e+14   0.000    -11.43358   -11.43358
          46  |   8.397175   1.483199     5.66   0.000     5.252933    11.54142
          48  |  -4.932319   5.40e-14 -9.1e+13   0.000    -4.932319   -4.932319
              |
       _cons  |   57.89408   2.344635    24.69   0.000     52.92368    62.86449
------------------------------------------------------------------------------

. outreg2 using table_8, keep(placebo82) addtext(Fixed Effects, State and Year, Clusters, States) tex(frag) nocons replace
table_8.tex
dir : seeout

.
. ********************************************************************************

. * problem #9 - mi and md

. ********************************************************************************

.
. gen in_mi_sample = (mldayr == 0) | (state == 23)

. gen mlda21_mi = (mlda21 == 1) & (state == 23)

. regress rate18_20ht mlda21_mi i.year i.state if in_mi_sample, robust cluster(state)

Linear regression                               Number of obs     =        403
                                                F(11, 12)         =          .
                                                Prob > F          =          .
                                                R-squared         =     0.7165
                                                Root MSE          =     9.3313
```

(Std. err. adjusted for 13 clusters in state)

rate18_20ht	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
mlda21_mi	-1.006005	3.745579	-0.27	0.793	-9.16692	7.15491
year						
1976	2.031494	2.028091	1.00	0.336	-2.387337	6.450325
1977	6.179146	2.425904	2.55	0.026	.8935549	11.46474
1978	7.255482	2.446089	2.97	0.012	1.925913	12.58505
1979	4.785462	2.272617	2.11	0.057	-.1661456	9.737069
1980	4.211526	3.170428	1.33	0.209	-2.696243	11.1193
1981	-5.841014	4.206005	-1.39	0.190	-15.00511	3.323084
1982	-4.206605	2.199267	-1.91	0.080	-8.998397	.5851867
1983	-11.26196	3.755885	-3.00	0.011	-19.44533	-3.078592
1984	-10.3078	5.092158	-2.02	0.066	-21.40266	.7870569
1985	-11.78031	3.48542	-3.38	0.005	-19.37439	-4.186228
1986	-4.658539	4.106761	-1.13	0.279	-13.6064	4.289325
1987	-7.302451	4.781042	-1.53	0.153	-17.71945	3.114545
1988	-6.359619	4.637228	-1.37	0.195	-16.46327	3.744033
1989	-11.29659	4.761565	-2.37	0.035	-21.67115	-.9220354
1990	-8.347942	2.80854	-2.97	0.012	-14.46723	-2.228659
1991	-12.02875	4.391135	-2.74	0.018	-21.59621	-2.461285
1992	-23.28178	5.303142	-4.39	0.001	-34.83633	-11.72722
1993	-19.69281	6.043486	-3.26	0.007	-32.86044	-6.525188
1994	-17.71542	5.710183	-3.10	0.009	-30.15684	-5.273995
1995	-15.26065	4.969782	-3.07	0.010	-26.08887	-4.432422
1996	-17.40881	4.507592	-3.86	0.002	-27.23001	-7.587607
1997	-17.9841	5.058319	-3.56	0.004	-29.00524	-6.962975
1998	-20.5469	5.733437	-3.58	0.004	-33.03899	-8.054813
1999	-23.78082	5.340904	-4.45	0.001	-35.41765	-12.14399
2000	-20.88136	5.65991	-3.69	0.003	-33.21324	-8.549476
2001	-23.08371	7.180313	-3.21	0.007	-38.72827	-7.439155
2002	-18.70232	4.984972	-3.75	0.003	-29.56365	-7.841003
2003	-20.38625	4.884749	-4.17	0.001	-31.0292	-9.743294
2004	-21.70361	5.808899	-3.74	0.003	-34.36012	-9.047108
2005	-21.57339	5.023058	-4.29	0.001	-32.5177	-10.62909

```
              |
        state |
           5  |  -17.63309   6.91e-14 -2.6e+14   0.000    -17.63309   -17.63309
          15  |  -14.43497   6.91e-14 -2.1e+14   0.000    -14.43497   -14.43497
          18  |  -4.167683   6.92e-14 -6.0e+13   0.000    -4.167683   -4.167683
          23  |  -17.90151   3.262278    -5.49   0.000     -25.0094   -10.79361
          26  |  -3.567835   6.94e-14 -5.1e+13   0.000    -3.567835   -3.567835
          29  |   2.198612   6.91e-14  3.2e+13   0.000     2.198612    2.198612
          32  |   16.47085   8.14e-14  2.0e+14   0.000     16.47085    16.47085
          35  |  -14.19745   6.91e-14 -2.1e+14   0.000    -14.19745   -14.19745
          38  |  -8.028192   6.92e-14 -1.2e+14   0.000    -8.028192   -8.028192
          39  |  -19.78079   6.91e-14 -2.9e+14   0.000    -19.78079   -19.78079
          45  |  -17.64001   6.91e-14 -2.6e+14   0.000    -17.64001   -17.64001
          48  |  -15.41629   6.91e-14 -2.2e+14   0.000    -15.41629   -15.41629
              |
       _cons  |    64.7933   3.618512    17.91   0.000     56.90924    72.67736
------------------------------------------------------------------------------

. outreg2 using table_9, keep(mlda21_mi mlda21_md)  ctitle(Michigan) addtext(Fixed Effects, State and Year)  tex(frag) nocons replace
variable mlda21_md not found
r(111);

.
. gen in_md_sample = (mldayr == 0) | (state == 21)

. gen mlda21_md = (mlda21 == 1) & (state == 21)

. regress rate18_20ht mlda21_md i.year i.state if in_md_sample, robust cluster(state)

Linear regression                               Number of obs     =        403
                                                F(11, 12)         =          .
                                                Prob > F          =          .
                                                R-squared         =     0.7189
                                                Root MSE          =     9.3487

                                (Std. err. adjusted for 13 clusters in state)
------------------------------------------------------------------------------
             |               Robust
 rate18_20ht | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
```

mlda21_md	7.651658	3.915349	1.95	0.074	-.8791561	16.18247
year						
1976	2.390141	2.065784	1.16	0.270	-2.110815	6.891096
1977	5.662221	2.474736	2.29	0.041	.2702347	11.05421
1978	8.198509	2.237057	3.66	0.003	3.324379	13.07264
1979	5.209574	2.053598	2.54	0.026	.7351684	9.683979
1980	5.21733	2.87236	1.82	0.094	-1.041005	11.47567
1981	-4.148287	3.970967	-1.04	0.317	-12.80028	4.503707
1982	-3.133128	1.924821	-1.63	0.130	-7.326953	1.060696
1983	-11.29489	3.763394	-3.00	0.011	-19.49462	-3.095162
1984	-10.77581	5.130771	-2.10	0.058	-21.9548	.4031748
1985	-11.22028	3.570174	-3.14	0.008	-18.99902	-3.441537
1986	-4.73139	4.126421	-1.15	0.274	-13.72209	4.259309
1987	-6.702025	4.815573	-1.39	0.189	-17.19426	3.790209
1988	-6.196403	4.665265	-1.33	0.209	-16.36114	3.968336
1989	-11.28368	4.780289	-2.36	0.036	-21.69904	-.8683259
1990	-7.643565	2.770352	-2.76	0.017	-13.67964	-1.607487
1991	-11.71906	4.400461	-2.66	0.021	-21.30684	-2.131274
1992	-22.5946	5.311574	-4.25	0.001	-34.16752	-11.02167
1993	-19.37074	6.064803	-3.19	0.008	-32.58481	-6.156669
1994	-18.36901	5.710607	-3.22	0.007	-30.81135	-5.926662
1995	-15.22019	4.984877	-3.05	0.010	-26.0813	-4.359071
1996	-17.47879	4.53413	-3.85	0.002	-27.35781	-7.59977
1997	-18.37339	5.049941	-3.64	0.003	-29.37627	-7.370516
1998	-20.37062	5.731796	-3.55	0.004	-32.85913	-7.882104
1999	-22.63834	5.453008	-4.15	0.001	-34.51942	-10.75726
2000	-20.34534	5.713698	-3.56	0.004	-32.79442	-7.896259
2001	-22.67601	7.211	-3.14	0.008	-38.38743	-6.964595
2002	-18.98767	5.012156	-3.79	0.003	-29.90822	-8.06712
2003	-19.90012	4.866201	-4.09	0.002	-30.50266	-9.29758
2004	-21.79337	5.842166	-3.73	0.003	-34.52235	-9.064383
2005	-22.18755	5.022494	-4.42	0.001	-33.13063	-11.24448
state						
5	-17.63309	7.12e-15	-2.5e+15	0.000	-17.63309	-17.63309
15	-14.43497	7.46e-15	-1.9e+15	0.000	-14.43497	-14.43497
18	-4.167683	3.93e-15	-1.1e+15	0.000	-4.167683	-4.167683

```
          21  |  -26.96226   2.904937    -9.28   0.000    -33.29157   -20.63294
          26  |  -3.567835   1.05e-14 -3.4e+14   0.000    -3.567835   -3.567835
          29  |   2.198612   1.64e-14  1.3e+14   0.000     2.198612    2.198612
          32  |   16.47085   2.17e-14  7.6e+14   0.000     16.47085    16.47085
          35  |  -14.19745   1.35e-14 -1.1e+15   0.000    -14.19745   -14.19745
          38  |  -8.028192   1.52e-14 -5.3e+14   0.000    -8.028192   -8.028192
          39  |  -19.78079   9.70e-15 -2.0e+15   0.000    -19.78079   -19.78079
          45  |  -17.64001   1.03e-14 -1.7e+15   0.000    -17.64001   -17.64001
          48  |  -15.41629   1.04e-14 -1.5e+15   0.000    -15.41629   -15.41629
              |
       _cons  |    64.5206   3.581634    18.01   0.000     56.71689    72.32431
------------------------------------------------------------------------------

. outreg2 using table_9, keep(mlda21_mi mlda21_md)  ctitle(Maryland) addtext(Fixed Effects, State and Year)  tex(frag) nocons append
table_9.tex
dir : seeout

.
. *******************************************************************************

. * problem #10 - early vs late treatment

. *******************************************************************************

.
. gen mlda21_14 = mlda21 & (year < mldayr + 4)

. gen mlda_later = mlda21 & (year >= mldayr + 4)

.
. regress rate18_20ht mlda21_14 mlda_later i.year i.state, robust cluster(state)

Linear regression                               Number of obs     =        651
                                                F(19, 20)         =          .
                                                Prob > F          =          .
                                                R-squared         =     0.6950
                                                Root MSE          =     9.6877

                                  (Std. err. adjusted for 21 clusters in state)
```

rate18_20ht	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
mlda21_14	1.704927	3.251781	0.52	0.606	-5.078169	8.488024
mlda_later	7.259914	5.414923	1.34	0.195	-4.035417	18.55524
year						
1976	1.586774	2.076431	0.76	0.454	-2.744585	5.918133
1977	4.471938	2.214796	2.02	0.057	-.1480448	9.09192
1978	6.942881	2.425481	2.86	0.010	1.883417	12.00235
1979	5.352152	2.21569	2.42	0.025	.7303031	9.974002
1980	4.105786	2.468563	1.66	0.112	-1.043548	9.255119
1981	-2.386838	3.462257	-0.69	0.499	-9.608979	4.835303
1982	-1.02703	1.914603	-0.54	0.598	-5.020822	2.966762
1983	-8.240894	2.885021	-2.86	0.010	-14.25894	-2.222844
1984	-5.595492	3.658452	-1.53	0.142	-13.22689	2.035904
1985	-7.500045	3.319304	-2.26	0.035	-14.42399	-.5760985
1986	-3.877987	3.504181	-1.11	0.282	-11.18758	3.431606
1987	-6.16464	3.695778	-1.67	0.111	-13.8739	1.544618
1988	-5.241021	3.599635	-1.46	0.161	-12.74973	2.267685
1989	-9.533778	3.842636	-2.48	0.022	-17.54938	-1.518181
1990	-7.270565	2.986735	-2.43	0.024	-13.50079	-1.040345
1991	-12.13366	3.9676	-3.06	0.006	-20.40993	-3.857393
1992	-20.05027	4.648536	-4.31	0.000	-29.74694	-10.35359
1993	-18.52546	4.93186	-3.76	0.001	-28.81314	-8.23778
1994	-14.83862	5.069159	-2.93	0.008	-25.4127	-4.264538
1995	-13.53257	4.21749	-3.21	0.004	-22.33011	-4.735044
1996	-17.14886	4.457115	-3.85	0.001	-26.44624	-7.85148
1997	-18.16318	4.526362	-4.01	0.001	-27.60501	-8.721356
1998	-17.89804	4.89894	-3.65	0.002	-28.11705	-7.679034
1999	-20.2946	5.000969	-4.06	0.001	-30.72644	-9.862758
2000	-19.49427	4.943825	-3.94	0.001	-29.80691	-9.181633
2001	-21.088	5.991911	-3.52	0.002	-33.58691	-8.589094
2002	-19.00843	5.006649	-3.80	0.001	-29.45212	-8.564748
2003	-19.54138	4.7112	-4.15	0.000	-29.36877	-9.713989
2004	-19.83185	5.060665	-3.92	0.001	-30.38822	-9.275492
2005	-21.38803	4.699788	-4.55	0.000	-31.19162	-11.58444

```
       state |
          5  |  -17.63309   1.43e-13 -1.2e+14   0.000    -17.63309   -17.63309
          6  |  -10.34462   2.611231    -3.96   0.001    -15.79155   -4.897683
          9  |  -34.82113   2.437132   -14.29   0.000     -39.9049   -29.73736
         12  |  -21.76411   2.437132    -8.93   0.000    -26.84788   -16.68034
         15  |  -14.43497   1.43e-13 -1.0e+14   0.000    -14.43497   -14.43497
         17  |  -3.750428   2.263122    -1.66   0.113    -8.471217    .9703616
         18  |  -4.167683   1.44e-13 -2.9e+13   0.000    -4.167683   -4.167683
         19  |  -4.330507   2.437132    -1.78   0.091    -9.414276    .7532611
         21  |  -18.69492   1.741889   -10.73   0.000    -22.32844    -15.0614
         23  |  -17.12417   1.051241   -16.29   0.000    -19.31702   -14.93132
         25  |   6.087273   2.437132     2.50   0.021     1.003504    11.17104
         26  |  -3.567835   1.44e-13 -2.5e+13   0.000    -3.567835   -3.567835
         29  |   2.198612   1.43e-13  1.5e+13   0.000     2.198612    2.198612
         32  |   16.47085   1.43e-13  1.2e+14   0.000     16.47085    16.47085
         35  |  -14.19745   1.43e-13 -9.9e+13   0.000    -14.19745   -14.19745
         38  |  -8.028192   1.43e-13 -5.6e+13   0.000    -8.028192   -8.028192
         39  |  -19.78079   1.43e-13 -1.4e+14   0.000    -19.78079   -19.78079
         45  |  -17.64001   1.43e-13 -1.2e+14   0.000    -17.64001   -17.64001
         46  |   2.343858   2.437132     0.96   0.348    -2.739911    7.427626
         48  |  -15.41629   1.43e-13 -1.1e+14   0.000    -15.41629   -15.41629
             |
       _cons |   56.12647   5.235915    10.72   0.000     45.20455     67.0484
------------------------------------------------------------------------------

. outreg2 using table_10, keep(mlda21_14 mlda_later)  addtext(Fixed Effects, State and Year)  tex(frag) nocons replace
table_10.tex
dir : seeout

.
.
. ********************************************************************************

. * create and translate log file

. ********************************************************************************

.
. log close
```

```
      name:  <unnamed>
       log:  /Users/vonhafften/Documents/UW Madison/problem_sets/econ_717a/ps3/analysis.smcl
  log type:  smcl
 closed on:  15 Mar 2022, 10:08:46
----------------------------------------------------------------------------------------------------------------------------------------------
```