ECON3150/4150 Spring 2015

Seminar 6

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Last updated: March 19, 2015

Data set

- "Shall issue" laws allow citizens in some states to carry concealed weapons.
- Proponents argue: Carrying a weapon will deter criminals from attacking.
- Opponents argue: Crime will increase because of accidental or spontaneous use of the weapons.
- Data from 50 states + district of Colombia for 23 years (1977 to 1999)
- Data is frmo teh paper "shooting Down the 'More guns less crime' hypothesis by John Donohue.

Variables

Variable	Definition
vio	violent crime rate (incidents per 100,000 members of the population)
rob	robbery rate (incidents per 100,000)
mur	murder rate (incidents per 100,000)
shall	= 1 if the state has a shall-carry law in effect in that year = 0 otherwise
incarc_rate	incarceration rate in the state in the previous year (sentenced prisoners per 100,000 residents; value for the previous year)
density	population per square mile of land area, divided by 1000
avginc	real per capita personal income in the state, in thousands of dollars
pop	state population, in millions of people
pm1029	percent of state population that is male, ages 10 to 29
pw1064	percent of state population that is white, ages 10 to 64
pb1064	percent of state population that is black, ages 10 to 64
stateid	ID number of states (Alabama = 1, Alaska = 2, etc.)
year	Year (1977-1999)

Exercise E10.1 a (i)

```
1 . reg lvio shall, vce(cluster stateid)

Linear regression                               Number of obs =       1173
                                                F(  1,    50) =       7.96
                                                Prob > F      =     0.0068
                                                R-squared     =     0.0866
                                                Root MSE      =     .61735

                                   (Std. Err. adjusted for    51 clusters in stateid)
------------------------------------------------------------------------------
             |               Robust
        lvio |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       shall |   -.4429646   .1570184    -2.82   0.007    -.7583452   -.1275839
       _cons |    6.134919   .0790269    77.63   0.000     5.976189    6.293649
------------------------------------------------------------------------------
```

Exercise E10.1 a (i)

```
1 . global basevars "incarc_rate density avginc pop pb1064  pw1064 pm1029"

2 . reg lvio shall $basevars, vce(cluster stateid)

Linear regression                               Number of obs =       1173
                                                F(  8,    50) =      62.13
                                                Prob > F      =     0.0000
                                                R-squared     =     0.5643
                                                Root MSE      =     .42769

                                   (Std. Err. adjusted for    51 clusters in stateid)
```

lvio	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
shall	-.3683869	.113937	-3.23	0.002	-.5972361	-.1395378
incarc_rate	.0016126	.0005999	2.69	0.010	.0004076	.0028177
density	.0266885	.0414909	0.64	0.523	-.0566485	.1100255
avginc	.0012051	.0240808	0.05	0.960	-.0471626	.0495728
pop	.0427098	.011729	3.64	0.001	.0191515	.0662681
pb1064	.0808526	.0713875	1.13	0.263	-.0625334	.2242386
pw1064	.0312005	.03409	0.92	0.364	-.0372713	.0996723
pm1029	.0088709	.0340964	0.26	0.796	-.0596137	.0773554
_cons	2.981738	2.166513	1.38	0.175	-1.369831	7.333307

- The coefficient is -0.368 which suggests that shall-issue laws reduce crime by 36%.

Exercise E10.1 a (ii)

```
1 .
2 . esttab rega1 rega2, se
```

	(1) lvio	(2) lvio
shall	**-0.443****	**-0.368****
	(**0.157**)	(**0.114**)
incarc_rate		**0.00161****
		(**0.000600**)
density		**0.0267**
		(**0.0415**)
avginc		**0.00121**
		(**0.0241**)
pop		**0.0427*****
		(**0.0117**)
pb1064		**0.0809**
		(**0.0714**)
pw1064		**0.0312**
		(**0.0341**)
pm1029		**0.00887**
		(**0.0341**)
_cons	**6.135*****	**2.982**
	(**0.0790**)	(**2.167**)
N	**1173**	**1173**

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

- Adding the control variable results in a small drop in the coefficient.

Exercise E10.1 a (iii)

- Attitudes towards guns and crime.
- Quality of police and other crime-prevention programs.
- Which examples do you have?

Exercise E10.1 b

```
1 . xtreg lvio shall $basevars, fe vce(cluster stateid)

Fixed-effects (within) regression               Number of obs      =         1173
Group variable:  stateid                        Number of groups   =           51

R-sq:  within  =  0.2178                        Obs per group: min =           23
       between =  0.0033                                       avg =         23.0
       overall =  0.0001                                       max =           23

                                                F(8,50)           =        34.10
corr(u_i, Xb)  =  -0.3687                       Prob > F          =       0.0000

                                 (Std. Err. adjusted for    51 clusters in stateid)
```

lvio	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
shall	-.0461415	.0417616	-1.10	0.275	-.1300223	.0377392
incarc_rate	-.000071	.0002504	-0.28	0.778	-.0005739	.0004318
density	-.1722901	.1376129	-1.25	0.216	-.4486936	.1041135
avginc	-.0092037	.0129649	-0.71	0.481	-.0352445	.016837
pop	.0115247	.014224	0.81	0.422	-.0170452	.0400945
pb1064	.1042804	.0326849	3.19	0.002	.0386308	.1699301
pw1064	.0408611	.0134585	3.04	0.004	.0138289	.0678932
pm1029	-.0502725	.0206949	-2.43	0.019	-.0918394	-.0087057
_cons	3.866017	.7701057	5.02	0.000	2.319214	5.412819
sigma_u	.68024951					
sigma_e	.16072287					
rho	.94712779	(fraction of variance due to u_i)				

- The coefficient on shall falls to -0.046, a large reduction in the coefficient from 2.
- The estimate now is not statistically significantly different from zero

Exercise E10.1 c

```
1 . xtreg lvio shall $basevars $yr_vars, fe vce(cluster stateid)

Fixed-effects (within) regression               Number of obs      =         1173
Group variable: stateid                         Number of groups   =           51

R-sq:  within  =  0.4180                        Obs per group: min =           23
       between =  0.0419                                       avg =         23.0
       overall =  0.0009                                       max =           23

                                                F(30,50)           =        56.86
corr(u_i, Xb)  =  -0.2929                       Prob > F           =       0.0000

                                (Std. Err. adjusted for    51 clusters in stateid)
------------------------------------------------------------------------------
             |               Robust
        lvio |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       shall |  -.0279935   .0407168    -0.69   0.495    -.1097757    .0537886
 incarc_rate |    .000076   .0002079     0.37   0.716    -.0003416    .0004935
     density |  -.091555    .1238622    -0.74   0.463    -.3403396    .1572296
      avginc |   .0009587   .0164931     0.06   0.954    -.0321688    .0340861
         pop |  -.0047544   .0152294    -0.31   0.756    -.0353436    .0258347
      pb1064 |   .0291862   .0495407     0.59   0.558    -.0703192    .1286916
      pw1064 |   .0092501   .0237564     0.39   0.699    -.0384659    .0569662
      pm1029 |   .0733254   .0524733     1.40   0.168    -.0320704    .1787211
         yr2 |   .0585261   .0161556     3.62   0.001     .0260767    .0909755
         yr3 |   .1639486   .0244579     6.70   0.000     .1148233    .2130738
         yr4 |   .2170759   .0334184     6.50   0.000     .1499531    .2841987
         yr5 |   .2172551   .0391956     5.54   0.000     .1385284    .2959819
         yr6 |   .1946328   .0465743     4.18   0.000     .1010856     .28818
         yr7 |    .158645   .0593845     2.67   0.010     .0393676    .2779223
         yr8 |   .1929883   .0770021     2.51   0.015     .0383251    .3476515
         yr9 |   .2444764   .0922217     2.65   0.011     .0592438    .4297091
        yr10 |   .3240904   .1089181     2.98   0.004     .1053219    .5428589
        yr11 |    .324365   .1249881     2.60   0.012      .073319    .5754111
        yr12 |   .3867412   .1397074     2.77   0.008     .1061305    .6673518
        yr13 |   .4422143   .1535358     2.88   0.006     .1338286    .7505999
        yr14 |   .5430478   .1960859     2.77   0.008     .1491976     .936898
        yr15 |   .5959456   .2040685     2.92   0.005     .1860618    1.005829
        yr16 |   .6275171   .2170306     2.89   0.006     .1915982    1.063436
        yr17 |   .6497414   .2246177     2.89   0.006     .1985834    1.100899
        yr18 |   .6354187   .2332437     2.72   0.009     .1669349    1.103903
        yr19 |   .6276831   .2423607     2.59   0.013     .1408874    1.114479
        yr20 |   .5713423   .2534067     2.25   0.029      .06236     1.080325
        yr21 |   .5501153   .2613516     2.10   0.040     .0251751    1.075055
        yr22 |   .4932904   .2746546     1.80   0.079    -.0583697     1.04495
        yr23 |   .4328776   .2862197     1.51   0.137    -.1420117    1.007767
       _cons |   3.765525   1.152108     3.27   0.002     1.451448    6.079603
-------------+----------------------------------------------------------------
     sigma_u |   .6663043
     sigma_e |   .1400264
         rho |  .95770338   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

- The coefficient falls further to -0.028.
- The coefficient is insignificantly different from zero.

Exercise E10.1 c

```
1 .  test $yr_vars

   ( 1)  yr2 = 0
   ( 2)  yr3 = 0
   ( 3)  yr4 = 0
   ( 4)  yr5 = 0
   ( 5)  yr6 = 0
   ( 6)  yr7 = 0
   ( 7)  yr8 = 0
   ( 8)  yr9 = 0
   ( 9)  yr10 = 0
   (10)  yr11 = 0
   (11)  yr12 = 0
   (12)  yr13 = 0
   (13)  yr14 = 0
   (14)  yr15 = 0
   (15)  yr16 = 0
   (16)  yr17 = 0
   (17)  yr18 = 0
   (18)  yr19 = 0
   (19)  yr20 = 0
   (20)  yr21 = 0
   (21)  yr22 = 0
   (22)  yr23 = 0

         F( 22,    50) =    21.62
              Prob > F =     0.0000
```

- The coefficients are jointly statistically significant.
- This specification is thus better specified than the previous.

Exercise E10d

```
1 . esttab regd1 regd2 regd3 regd4, se drop(yr*) stats(F_year State_FE Year_FE)
```

	(1) lrob	(2) lrob	(3) lrob	(4) lrob
shall	-0.773**	-0.529**	-0.00782	0.0268
	(0.225)	(0.161)	(0.0552)	(0.0522)
incarc_rate		0.00101	-0.0000763	0.0000314
		(0.000640)	(0.000321)	(0.000348)
density		0.0905	-0.186	-0.0447
		(0.0460)	(0.166)	(0.198)
avginc		0.0407	-0.0175	0.0144
		(0.0282)	(0.0220)	(0.0248)
pop		0.0778**	0.0163	0.0000164
		(0.0225)	(0.0276)	(0.0259)
pb1064		0.102	0.112*	0.0141
		(0.0894)	(0.0512)	(0.0841)
pw1064		0.0275	0.0272	-0.0128
		(0.0450)	(0.0164)	(0.0328)
pm1029		0.0273	0.0112	0.105
		(0.0417)	(0.0291)	(0.0730)
_cons	4.873***	0.904	2.446*	3.279
	(0.116)	(3.061)	(1.013)	(1.677)
F_year				25.86
State_FE	NO	NO	YES	YES
Year_FE	NO	NO	NO	YES

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

```
1 . esttab regmur1 regmur2 regmur3 regmur4, drop(yr*) stats(F_year State_FE Year_FE
```

	(1) lmur	(2) lmur	(3) lmur	(4) lmur
shall	**-0.473****	**-0.313****	**-0.0608**	**-0.0150**
	(-3.18)	**(-3.16)**	**(-1.65)**	**(-0.39)**
incarc_rate		**0.00210*****	**-0.000360**	**-0.000116**
		(4.56)	**(-0.85)**	**(-0.32)**
density		**0.0397**	**-0.671**	**-0.544**
		(0.99)	**(-1.69)**	**(-1.70)**
avginc		**-0.0773****	**0.0243**	**0.0566****
		(-2.86)	**(1.55)**	**(3.42)**
pop		**0.0416****	**-0.0257**	**-0.0321**
		(3.49)	**(-1.26)**	**(-1.53)**
pb1064		**0.131***	**0.0307**	**0.0220**
		(2.14)	**(0.39)**	**(0.29)**
pw1064		**0.0471**	**0.0103**	**-0.000489**
		(1.65)	**(0.80)**	**(-0.02)**
pm1029		**0.0655**	**0.0392**	**0.0692**
		(1.81)	**(1.82)**	**(1.66)**
_cons	**1.898*****	**-2.486**	**0.460**	**0.188**
	(20.37)	**(-1.25)**	**(0.55)**	**(0.18)**
F_year				**19.61**
State_FE	**NO**	**NO**	**YES**	**YES**
Year_FE	**NO**	**NO**	**NO**	**YES**

Exercise E10d

- The quantitative results are similar to the results using violent crimes
- There is a large estimated effect of concealed weapons laws in specification 1 and 2
- This effect is spurious and due to omitted variable bias as specification 3 and 4 shows.

Threats to internal validity

- Omitted variable bias
- Functional form misspecification
- Measurement error
- Sample selection
- Simultaneous causality

$\Big\}$ $E(u_i|x_{1i}) \neq 0$

- Heteroskedasticity and/or correlated error terms $\}$ violation of i.i.d.

Exercise E10e

Potential two-way causality between crime and shall.

- Laws for carrying guns is likely to affect crime rates.
- Crime rates can affect the laws for carrying guns - states with high crime rates are those that will consider actions they believe reduce crime rates.

Exercise E10.2 f

- Regression 4 is the most credible regression as it controls for both time and state fixed effects.
- The estimated effect is not statistically significant, thus there is no evidence that the shall carry law has any effect on crime rates.