Abigail Higham

Political Science 328

Professor Goodliffe

Section 006

Aryanna Hyde

Problem Set 10: Part 3

Esteemed Governor,

To determine whether concealed weapons laws reduce crime, I was given data from different states about their violent crime rates, concealed weapons laws, incarceration rates, population density, average income, race, and gender. My findings are that from the data I was given, there is not conclusive evidence that concealed weapon laws reduce crime.

For my methodology, I ran statistical tests that analyze the relationships between having gun laws that the effect that it has on crime. I ran different tests that included different factors that could contribute to reducing crime, and this helped me explore different possibilities of relationships between crime and concealed weapon laws. This method was most appropriate, because violence and crime are caused by many different socioeconomic factors. From my methodology, I was able to look at different types of relationships that concealed weapon laws and violent crime rates may have. This is important, because violent crime rates is complex and influenced by a lot of different factors.

From the different tests that I ran, I found concealed weapons laws do not strongly influence violent crimes. Some tests that I ran showed that concealed weapons laws possibly could slightly reduce violent crimes, but the impact of concealed weapons laws was so small that it doesn’t make a difference. Other tests that I ran indicated that concealed weapons laws possibly could slightly increase violent crimes, but again, the impact of concealed weapon laws was so small that it does not make a big difference. From all of the tests, it seems as though concealed weapons laws do not influence violent crime rates.

Based off of the data I was given, my recommendations are that violent crime rates should not influence the decision of concealed weapons laws, because concealed weapon laws do not affect the violent crime rates. Other statisticians may argue that concealed weapon laws decrease or increase violent crime rates, because they focus on small details instead of the overall picture. When the conclusion by most statisticians is different, it usually is because what they are looking at does not strongly cause the phenomena. I would recommend that reduction of crime rates should not aid any decisions concerning concealed weapons laws. Based off of my findings, I would predict that states that pass concealed weapons laws should not affect the violent crimes rate.

There are some limitations to my findings. As I said earlier, violence and crime are very complex. Crime rates could be caused by a lot of different factors that I did not include. It could be caused many different things, such poverty, culture, geographic region, existing state policies, education level, etc. To fully assess all of these things, it would be very expensive, and the data would be limited. If I did have these factors, there would be more validity in the statistical tests, but I have doubts that the results would be more different than the results I have now. However, my tests tell us that we can conclude that concealed weapons laws do not impact violent crime rates significantly

In conclusion, I found that concealed weapons laws do not strongly influence violence crime rates. When considering legislation of concealed weapons laws, the increase or decrease of crime rates should not be strongly weighted into decisions.

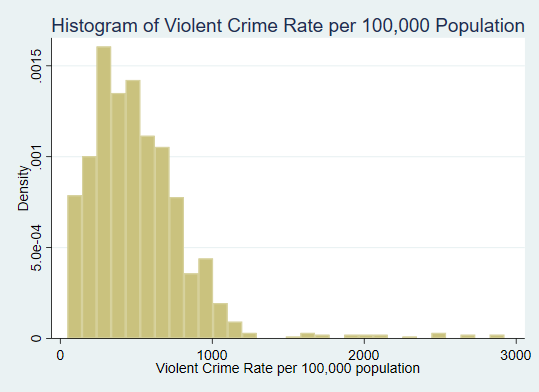
**APPENDIX**

*\*I ran different statistical tests to control for hetereoskedasticity, omitted variables, and outliers. I did find one outlier; however, it did not significantly change my regression. I did not have a good reason to remove the outlier, so I did not remove any data.*

State Assumptions: [Goodliffe PP 3/22]

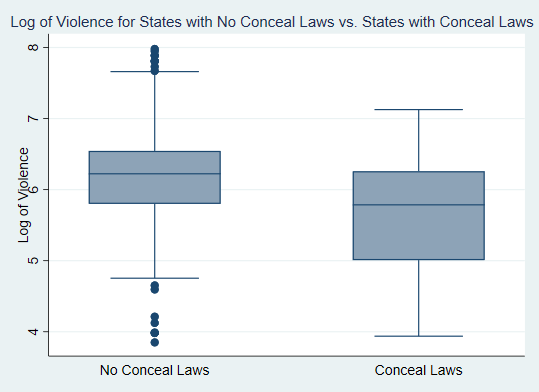
1. has a mean zero, given that the state fixed effect and the entire history of the Xs for that state.
2. are i.i.d.
3. have finite fourth moments
4. There is no perfect multicollinearity.

**Histogram of Violent Crime Rate per 100,000 Population**



***Histogram of Violent Crime Rate per 100,000 Population:*** *The distribution is not normal and extremely right skewed. Because of this, I decided to log the dependent variable, Violent Crime Rate.*

**Graph Box for Log of Violence vs. Conceal Laws**



***Graph Box for Log of Violence vs. Conceal Laws:*** *From this box plot, the median of violence in a state with no conceal laws is higher than a state with no conceal laws, but notably, there are many outliers for states with no conceal laws.*

**Table 1: The Effect of Concealed Handgun Laws on Violent Crime**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **(1)** | **(2)** | **(3)** | **(4)** |
| Coefficient on  *Concealed Handgun Law* | -.471\*\*  (.159) | -.369\*\*  (.114) | -.0108  (.0378) | .00956  (.0354) |
| State characteristic control  variablesa? | no | yes | yes | yes |
| State fixed effects? | no | no | yes | yes |
| Year fixed effects? | no | no | no | yes |
| *F*-statistic testing the  hypothesis that the state  fixed effects are zero | – | – | 222.14  (.000) | 319.18  (.000) |
| *F*-statistic testing the  hypothesis that the year  fixed effects are zero | – | – | – | 17.26  (.000) |
| with (without) state fixed effects | .619  (.1013) | .432  (.563) | .945  (.18) | .958  (.392) |
| Number of observations | 1,020 | 1,020 | 1,020 | 1,020 |
| Number of states | 51 | 51 | 51 | 51 |

**Interpretations**

**Regression 1**

The effect of concealed handgun laws has **an associated 47.1% decrease** in violent crimes per 100,000 members of the population.

The coefficient of conceal has real world implications. 47.1 percent decrease means that **concealed handgun laws almost cut violent crime in half.**

The p-value for the concealed handgun laws, **.005**, is smaller than .05, because it is smaller, we **can reject the null hypothesis that our coefficient is zero.**

**Regression 2**

The effect of concealed handgun laws has **an associated 36.9% decrease** in violent crimes per 100,000 members of the population.

The coefficient of conceal has real world implications. 36.9 percent decrease **means that concealed handgun laws reduce violent crimes by more than a third.**

The P-value is **less than .001**, because it is less than .05, **we can reject the null hypothesis that our coefficient is zero.**

**Regression 3**

The effect of having concealed handgun laws has an **associated 1.08% decrease** in violent crimes. Statistically, the p-value is greater than .05, so **we fail to reject the null hypothesis that the coefficient equals zero.**

Substantively, this means that if a state were to adapt a concealed handgun law, they should expect to see a 1% decrease in the number of violent crimes. To me, **this matters, because it is a simple solution to reduce social problems that can prevent 1 out of 100 violent crimes.**

The **third regression** is the best model, because the R-squared increases so much. Although the coefficient, conceal, is no longer significant, the regression more accurately explains the relationship between concealed handgun laws and violent crimes per 100,000 members of the population.

**Regression 4**

The effect of having concealed handgun laws has an **associated .956% decrease** in violent crimes. Statistically, the p-value is greater than .05, so **we fail to reject the null hypothesis that the coefficient equals zero.**

Substantively, this means that if a state were to adapt a concealed handgun law, we predict to see a 1% decrease in the number of violent crimes. To me, **this matters, because it is a simple solution to reduce social problems that can prevent 1 out of 100 violent crimes.**

The **4th regression** is the best model, because the R-squared is the highest. Although the coefficient, conceal, is not significant for 3 & 4, the regressions more accurately explains the relationship between concealed handgun laws and violent crimes per 100,000 members of the population. I would choose **model 4 over model 3**, because the year fixed effects are jointly significant, and the R-Squared does become larger.

**Grader’s Appendix**

**Do File**

sum

sum violence, d

hist violence

gen lnviolence = ln(violence)

reg lnviolence conceal, cluster(stateid)

display e(r2\_a)

display e(rmse)

tab stateid

reg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale, cluster(stateid)

display e(r2\_a)

//model 3

xtreg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale, fe i(stateid) cluster(stateid)

display e(r2\_a)

display e(rmse)

reg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale i.stateid, r

display e(r2\_a)

testparm i.stateid

reg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale, cluster(stateid)

testparm i.stateid

//model 4

xtreg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale i.year, i(stateid) fe

hettest

ovtest

rvfplot

predict d, cooksd

testparm i.year

xtreg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale i.stateid, r

log close

**Log File**

  \_\_\_  \_\_\_\_  \_\_\_\_  \_\_\_\_  \_\_\_\_ (R)

 /\_\_    /   \_\_\_\_/   /   \_\_\_\_/

\_\_\_/   /   /\_\_\_/   /   /\_\_\_/   15.1   Copyright 1985-2017 StataCorp LLC

  Statistics/Data Analysis            StataCorp

                                      4905 Lakeway Drive

     Special Edition                  College Station, Texas 77845 USA

                                      800-STATA-PC        [http://www.stata.com](http://www.stata.com/)

[979-696-4600](tel:(979)%20696-4600)        [stata@stata.com](mailto:stata@stata.com)

[979-696-4601](tel:(979)%20696-4601) (fax)

154-user Stata network license expires  4 Feb 2019:

       Serial number:  401509206196

         Licensed to:  Brigham Young University

                       Brigham Young University

Notes:

      1.  Unicode is supported; see help unicode\_advice.

      2.  Maximum number of variables is set to 5000; see help set\_maxvar.

. use "C:\Users\swktstud\Downloads\conceal.dta"

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. sum

    Variable |        Obs        Mean    Std. Dev.       Min        Max

-------------+---------------------------------------------------------

        year |      1,020        89.5     5.76911         80         99

    violence |      1,020    515.5415    344.1283         47     2921.8

      prison |      1,020    243.8637    184.2297         19       1913

    pctblack |      1,020    5.410574    4.835446   .2973519   26.97957

    pctwhite |      1,020    62.79768    9.698829   21.78043   76.52575

-------------+---------------------------------------------------------

     pctmale |      1,020    15.73552    1.546744   12.21368   21.55065

         pop |      1,020    4.885437    5.344946    .405315   33.14512

      avginc |      1,020    13.95984    2.560677   8.554884   23.64671

     density |      1,020    .3503763    1.331697     .00071   10.13149

     stateid |      1,020    28.96078    15.68453          1         56

-------------+---------------------------------------------------------

     conceal |      1,020    .2676471    .4429497          0          1

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. hist violence

(bin=30, start=47, width=95.826668)

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. gen lnviolence = ln(violence)

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. reg lnviolence conceal, cluster(stateid)

Linear regression                               Number of obs     =      1,020

                                                F(1, 50)          =       8.76

                                                Prob > F          =     0.0047

                                                R-squared         =     0.1022

                                                Root MSE          =     .61904

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

------------------------------------------------------------------------------

             |               Robust

  lnviolence |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

     conceal |  -.4712901   .1592534    -2.96   0.005      -.79116   -.1514202

       \_cons |   6.174868   .0789491    78.21   0.000     6.016294    6.333442

------------------------------------------------------------------------------

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. reg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale, c

> luster(stateid)

Linear regression                               Number of obs     =      1,020

                                                F(8, 50)          =      67.84

                                                Prob > F          =     0.0000

                                                R-squared         =     0.5666

                                                Root MSE          =      .4316

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

------------------------------------------------------------------------------

             |               Robust

  lnviolence |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

     conceal |  -.3687919   .1142942    -3.23   0.002    -.5983586   -.1392251

      prison |   .0016273   .0006021     2.70   0.009      .000418    .0028366

     density |   .0129502   .0441005     0.29   0.770    -.0756282    .1015286

      avginc |   .0049046   .0246934     0.20   0.843    -.0446936    .0545028

         pop |   .0415084   .0120015     3.46   0.001     .0174026    .0656142

    pctblack |   .0649546   .0721341     0.90   0.372     -.079931    .2098402

    pctwhite |   .0233799   .0343145     0.68   0.499    -.0455428    .0923027

     pctmale |    .016301   .0372114     0.44   0.663    -.0584403    .0910423

       \_cons |   3.398652   2.222565     1.53   0.133    -1.065501    7.862806

------------------------------------------------------------------------------

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. display e(r2\_a)

.56314602

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. xtreg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale,

>  fe i(stateid) cluster(stateid)

Fixed-effects (within) regression               Number of obs     =      1,020

Group variable: stateid                         Number of groups  =         51

R-sq:                                           Obs per group:

     within  = 0.1841                                         min =         20

     between = 0.2282                                         avg =       20.0

     overall = 0.1592                                         max =         20

                                                F(8,50)           =       7.97

corr(u\_i, Xb)  = -0.6311                        Prob > F          =     0.0000

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

------------------------------------------------------------------------------

             |               Robust

  lnviolence |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

     conceal |  -.0107978   .0378475    -0.29   0.777    -.0868168    .0652211

      prison |  -.0001442   .0002616    -0.55   0.584    -.0006697    .0003814

     density |  -.0445533   .1953888    -0.23   0.821    -.4370033    .3478967

      avginc |  -.0130427   .0132531    -0.98   0.330    -.0396624     .013577

         pop |    .004603   .0145179     0.32   0.753     -.024557    .0337631

    pctblack |   .0622635   .0430703     1.45   0.155    -.0242456    .1487726

    pctwhite |   .0438335   .0131726     3.33   0.002     .0173756    .0702914

     pctmale |  -.0589871   .0227676    -2.59   0.013    -.1047171    -.013257

       \_cons |   4.100636   .7049345     5.82   0.000     2.684734    5.516539

-------------+----------------------------------------------------------------

     sigma\_u |   .7546102

     sigma\_e |  .15366086

         rho |  .96018593   (fraction of variance due to u\_i)

------------------------------------------------------------------------------

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. display e(r2\_a)

.1776151

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. display e(rmse)

.14981296

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. reg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale i.

> stateid, r

Linear regression                               Number of obs     =      1,020

                                                F(58, 961)        =     363.11

                                                Prob > F          =     0.0000

                                                R-squared         =     0.9478

                                                Root MSE          =     .15366

------------------------------------------------------------------------------

             |               Robust

  lnviolence |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

     conceal |  -.0107978   .0194015    -0.56   0.578     -.048872    .0272763

      prison |  -.0001442   .0001065    -1.35   0.176    -.0003531    .0000648

     density |  -.0445533   .1459969    -0.31   0.760    -.3310628    .2419562

      avginc |  -.0130427    .008449    -1.54   0.123    -.0296234     .003538

         pop |    .004603   .0107174     0.43   0.668    -.0164292    .0256352

    pctblack |   .0622635    .023037     2.70   0.007     .0170548    .1074722

    pctwhite |   .0438335   .0052537     8.34   0.000     .0335235    .0541436

     pctmale |  -.0589871   .0104913    -5.62   0.000    -.0795755   -.0383986

             |

     stateid |

          2  |   .0213566    .084133     0.25   0.800     -.143749    .1864621

       \_cons |   4.491275   .4238765    10.60   0.000     3.659444    5.323105

------------------------------------------------------------------------------

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. testparm i.stateid

 ( 1)  2.stateid = 0

       F( 50,   961) =  222.14

            Prob > F =    0.0000

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. reg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale, c

> luster(stateid)

Linear regression                               Number of obs     =      1,020

                                                F(8, 50)          =      67.84

                                                Prob > F          =     0.0000

                                                R-squared         =     0.5666

                                                Root MSE          =      .4316

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

------------------------------------------------------------------------------

             |               Robust

  lnviolence |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

     conceal |  -.3687919   .1142942    -3.23   0.002    -.5983586   -.1392251

      prison |   .0016273   .0006021     2.70   0.009      .000418    .0028366

     density |   .0129502   .0441005     0.29   0.770    -.0756282    .1015286

      avginc |   .0049046   .0246934     0.20   0.843    -.0446936    .0545028

         pop |   .0415084   .0120015     3.46   0.001     .0174026    .0656142

    pctblack |   .0649546   .0721341     0.90   0.372     -.079931    .2098402

    pctwhite |   .0233799   .0343145     0.68   0.499    -.0455428    .0923027

     pctmale |    .016301   .0372114     0.44   0.663    -.0584403    .0910423

       \_cons |   3.398652   2.222565     1.53   0.133    -1.065501    7.862806

------------------------------------------------------------------------------

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. testparm i.stateid

no such variables;

the specified varlist does not identify any testable coefficients

r(111);

end of do-file

r(111);

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. xtreg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale

> i.year, i(stateid) fe

Fixed-effects (within) regression               Number of obs     =      1,020

Group variable: stateid                         Number of groups  =         51

R-sq:                                           Obs per group:

     within  = 0.3915                                         min =         20

     between = 0.3262                                         avg =       20.0

     overall = 0.1162                                         max =         20

                                                F(27,942)         =      22.45

corr(u\_i, Xb)  = -0.5467                        Prob > F          =     0.0000

------------------------------------------------------------------------------

  lnviolence |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

     conceal |   .0095564   .0172909     0.55   0.581    -.0243767    .0434894

             |

       \_cons |   4.278531   .5155072     8.30   0.000     3.266856    5.290207

-------------+----------------------------------------------------------------

     sigma\_u |  .72358245

     sigma\_e |  .13402717

         rho |  .96682894   (fraction of variance due to u\_i)

------------------------------------------------------------------------------

F test that all u\_i=0: F(50, 942) = 177.21                   Prob > F = 0.0000

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. testparm i.year

 (19)  99.year = 0

       F( 19,   942) =   16.90

            Prob > F =    0.0000

.

end of do-file

. do "C:\Users\swktstud\AppData\Local\Temp\STDe64\_000000.tmp"

. xtreg lnviolence conceal prison density avginc pop pctblack pctwhite pctmale

> i.stateid, r

Random-effects GLS regression                   Number of obs     =      1,020

Group variable: stateid                         Number of groups  =         51

R-sq:                                           Obs per group:

     within  = 0.1841                                         min =         20

     between = 1.0000                                         avg =       20.0

     overall = 0.9478                                         max =         20

                                                Wald chi2(8)      =          .

corr(u\_i, X)   = 0 (assumed)                    Prob > chi2       =          .

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

------------------------------------------------------------------------------

             |               Robust

  lnviolence |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

     conceal |  -.0107978   .0388196    -0.28   0.781    -.0868829    .0652872

      prison |  -.0001442   .0002684    -0.54   0.591    -.0006701    .0003818

     density |  -.0445533   .2004073    -0.22   0.824    -.4373444    .3482378

      avginc |  -.0130427   .0135935    -0.96   0.337    -.0396856    .0136002

         pop |    .004603   .0148908     0.31   0.757    -.0245824    .0337884

    pctblack |   .0622635   .0441765     1.41   0.159    -.0243208    .1488478

    pctwhite |   .0438335   .0135109     3.24   0.001     .0173526    .0703144

     pctmale |  -.0589871   .0233524    -2.53   0.012    -.1047569   -.0132173

             |

     stateid |

       \_cons |   4.491275   .7117115     6.31   0.000     3.096346    5.886204

-------------+----------------------------------------------------------------

     sigma\_u |          0

     sigma\_e |  .15366086

         rho |          0   (fraction of variance due to u\_i)

------------------------------------------------------------------------------

.

end of do-file