

RA Student Project

David Holcomb

March 24, 2016

1 Introduction

Gun control is a contentious issue in the US. With shootings making headlines in cities like Chicago, Illinois, or even Kalamazoo, Michigan, the impact and efficacy of gun control is frequently under question. Furthermore, the recent death of US Supreme Court Justice Antonin Scalia puts the future of gun rights in question. For the first half of this project, we test if gun availability and the strength of gun control laws predict gun murder. The null hypothesis assumes that it does not.

There are numerous confounding variables when analyzing gun crime. Most importantly, poverty and unemployment are generally thought to contribute to crime in general. In the second half of this project, we test if economic measures predict gun murder. The null hypothesis assumes that they do not.

2 Methods

We use state values for the gun murder rate, gun ownership levels, registered firearms per 1000 residents, Brady Campaign state scorecard, a measure of gun law strictness, unemployment rate, and the supplemental poverty measure. We used the supplemental poverty measure instead of the typical poverty measure, because the supplemental poverty measure accounts for cost of living differences, which better captures urban poverty. For simplicity, we've converted the Brady Campaign grades into numeric grade point averages. We've also applied the logit transformation to the unemployment rate, supplemental poverty measure, and the gun ownership rate.

Given this data, we regress gun murder on these variables, comparing the full model with the model excluding the gun availability measures.

The full model is

$$Y = A + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5,$$

where Y is the gun murder rate, X_1 is the unemployment rate, X_2 is the supplemental poverty measure, X_3 is the gun ownership rate, X_4 is the number of guns per 100,000 residents, and X_5 is the Brady Campaign state score.

2.1 Testing Gun Availability

In the first half of this project, the testing model assumes that $B_3 = B_4 = B_5 = 0$. This model is

$$Y = A + B_1X_1 + B_2X_2,$$

where Y is the gun murder rate, X_1 is the unemployment rate, X_2 is the supplemental poverty measure.

2.2 Testing Economic Measures

In the second half of this project, the testing model assumes that $B_1 = B_2 = 0$. This model is

$$Y = A + B_3X_3 + B_4X_4 + B_5X_5,$$

where Y is the gun murder rate, X_3 is the gun ownership rate, X_4 is the number of guns per 100,000 residents, and X_5 is the Brady Campaign state score.

3 Results

Our data and regression results are contained in the attached Excel file.

Under the full model, we get

$$Y = 13.758232 + 2.6538614X_1 + 1.628763X_2 + 0.0532618X_3 - 0.0052635X_4 - 0.0751184X_5.$$

We also get $R^2 = 0.627136$, $RegSS = 44.026$, $RSS = 67.914$.

3.1 Testing Gun Availability

Under the testing model, we get

$$Y = 13.45568066 + 2.563082801X_1 + 1.720659568X_2$$

We also get $R_2 = 0.617098$, $RegSS = 42.62791$, $RSS = 69.31209$.

Then, the F-statistic is $F_0 = \frac{n-k-1}{q} \frac{R_1^2 - R_0^2}{1 - R_1^2} = \frac{50-5-1}{3} \frac{0.627136 - 0.617098}{1 - 0.627136} = 0.39484$. The corresponding p-value is 0.757328.

3.2 Testing Economic Measures

Under the testing model, we get

$$Y = 2.612948405 - 0.463215458X_1 - 0.005381943X_2 - 0.244116066X_3.$$

We also get $R_2 = 0.174768$, $RegSS = 3.419073$, $RSS = 108.5209$.

Then, the F-statistic is $F_0 = \frac{n-k-1}{q} \frac{R_1^2 - R_0^2}{1 - R_1^2} = \frac{50-5-1}{2} \frac{0.627136 - 0.174768}{1 - 0.627136} = 26.69$. The corresponding p-value is less than 0.0001.

4 Conclusions

Under the given data, we reject the hypothesis that gun murder is predicted by gun availability, and accept the hypothesis that gun murder is predicted by economic measures such as poverty and unemployment.

There may be additional confounding variables that are worth exploring. For example, neighboring states with weak gun laws are sometimes implicated in Chicago's gun violence. Population density may also be a confounding variable, since it related to the availability of victims. For historical and legal reasons, American gun laws are relatively weak. It may be useful to use data from other countries with much stricter gun control. Furthermore, there are varying local and state gun control laws. These variables would likely require more complex techniques, or data that is more difficult to find.

5 References

The Brady Campaign State Scorecard, Brady Campaign, 2015, <http://crimadvisor.com/data/Brady-State-Scorecard-2014.pdf>.

Crime in the United States 2010, U.S. Federal Bureau of Investigation, 2010, <https://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2010/crime-in-the-u.s.-2010/tables/10tbl20.xls>.

Most Registered Guns per Capita: States, Bloomberg, 2013, <http://www.bloomberg.com/visual-data/best-and-worst/most-registered-guns-per-capita-states>.

Short, Kathleen, The Research SUPPLEMENTAL POVERTY MEASURE: 2012, U.S. Census Bureau, 2012, <https://www.census.gov/prod/2013pubs/p60-247.pdf>.

Unemployment Rates for States, U.S. Bureau of Labor Statistics, 2016, <http://www.bls.gov/web/laus/laumstrk.htm>.

White, Deborah, Gun Owners as a Percentage of Each State's Population, About.com, 2007, <http://usliberals.about.com/od/Election2012Factors/a/Gun-Owners-As-Percentage-Of-Each-States-Population.htm>.