Gun Control and Violent Crime: an Associative Study

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Outline

Previous Studies

Gun Availability and Violent Crime: New Evidence from the National Incident-Based Reporting System

Lisa Stolzenberg, Stewart J. D'Alessio

Studied the relationship between gun ownership and violent crime.

Two-way fixed-effects model (ANOVA).

Results:

Legal gun ownership did not affect violent crime rates.
Illegal gun ownership increased violent crime rates.

Previous Studies

Does Gun Control Reduce Crime or Does Crime Increase Gun Control?

John C. Moorhouse, Brent Wanner

- Used state-level data and a quantified level of gun control.
- Analyzed different types of violent crimes using linear regression.
- Results:
  - Gun control does not reduce violent crime within 3 years.
  - Violent crime drives support for gun control laws.

Previous Studies

The Effectiveness of Legislation Controlling Gun Usage: A Holistic Measure of Gun Control Legislation.

IkWhan G. Kwon, Daniel W. Baack

Used state-level data and a quantified level of gun control.

Analyzed using multiple linear regression.

Results:

Gun control drastically reduces the number of gun deaths in a state. Did not find a meaningful link between gun control and violent crime.

Study Goals

What affect does the level of gun control have on the amount of violent crime?

- How does the level of gun control affect specific types of violent crime?

Is median income a stronger predictor for violent crime than the level of gun control?

Is violent crime different between metropolitan and non-metropolitan areas?

Data

The Brady State Score

- Quantified measure of gun control level.
- Based on specific state gun control laws.
- Higher scores indicate more strict gun control laws.
- Scores are assigned by the Brady Campaign Against Gun Violence.

Data

The Brady State Score

Example:

- California state score: 76
- Florida state score: -20.5

Data

Dependent Variables

Number of overall violent crimes by county.

Offset by population.

County level violent crime broken down by type of crime:

- Murder.
- Arson.
- Aggravated assault.
- Robbery.
- Larceny.
- Burglary.
- Property crime.
- Motor vehicle theft.

Data

Independent Variables

Brady Campaign State Score.

Median income by county.

Racial majority by county (white, black, other).

Metropolitan and non-metropolitan county binary variable.

Number of police officers per county.

Type of Analysis

Negative Binomial Regression

To model per-capita crime rates, used negative binomial regression.

Offset term of ln(n), where n is county population.

Negative binomial regression was used over Poisson regression due to overdispersion.

Type of Analysis

Negative Binomial Model

$$f(k) = \frac{\Gamma(k+r)}{k!\Gamma(r)} \cdot (1-p)^r p^k \qquad k \in 0, 1, 2, 3, ...$$

Regression Model With Offset Term

$$\log\left(\frac{\mu}{n}\right) = \mathbf{X}\beta$$
$$\log(\mu) - \log(n) = \mathbf{X}\beta$$
$$\log(\mu) = \mathbf{X}\beta + \log(n)$$

Type of Analysis

Incidence Rate Ratio

Measures the factor of increase or decrease in the incidence of the dependent variable caused by a one-unit increase in an independent variable.

Example: Incidence rate ratio of 1.3 for X shows that Y will change by a factor of 1.3 for a one-unit increase in X.

Analysis Results

First Model: Violent Crime

Parameter	**Level**	**IRR (95% CI)**	**p-value**
Median Income		0.973 (0.972, 0.973)	< 0.0001
Metropolitan Area		1.163 (1.147, 1.179)	< 0.0001
Brady Score		0.957 (0.940, 0.973)	< 0.0001
Race Majority	B	0.588 (0.564, 0.613)	< 0.0001
Race Majority	O	0.334 (0.285, 0.391)	< 0.0001
Number of Police		1.340 (1.336, 1.343)	< 0.0001

Analysis Results

Specific crimes

Crime	**IRR (95% CI)**	**p-value**
Aggravated Assault	0.953 (0.935, 0.970)	< 0.0001
Arson	0.946 (0.921, 0.971)	< 0.0001
Burglary	0.971 (0.954, 0.988)	0.0011
Car Theft	0.880 (0.862, 0.898)	< 0.0001
Larceny	0.938 (0.922, 0.954)	< 0.0001
Murder	0.943 (0.913, 0.973)	0.0003
Property Crime	0.945 (0.929, 0.961)	< 0.0001
Robbery	0.984 (0.960, 1.009)	0.2101
Violent Crime	0.957 (0.940, 0.973)	< 0.0001

Analysis Results

Income vs. Brady

Parameter	**p-value**
Median Income	1.9001526679785112E-20
Brady Score	5.1006134920366957E-7

Median income has a much lower p-value, indicating that median income is a stronger predictor of violent crime.

Analysis Results

Metropolitan vs Non-metropolitan

Crime	**IRR(95% CI)**	**p-value**
Aggravated Assault	1.011 (0.903, 1.131)	0.8526
Arson	0.778 (0.666, 0.91)	0.0016
Burglary	1.028 (0.933, 1.132)	0.5763
Car Theft	1.019 (0.921, 1.127)	0.7140
Larceny	1.086 (0.984, 1.198)	0.1006
Murder	0.866 (0.714, 1.05)	0.1432
Property Crime	1.056 (0.96, 1.161)	0.2607
Robbery	1.666 (1.413, 1.965)	< 0.0001
Violent Crime	1.022 (0.92, 1.135)	0.6828

Conclusion

Increasing the level of gun control does correlate with statistically lower violent crime rates, but not by a very large amount.

All crimes except robbery are lower with higher levels of gun control.

Only auto theft might be lower by a significant amount, all other crimes show insignificant changes.

Analysis Results

Median income has a lower p-value than Brady score, so it is a better predictor of violent crime.

P-value for arson and robbery are significant, but no other crime.

Incidence rate ratio for arson indicates significantly lower rates for metropolitan areas.

Robbery is drastically increased in metropolitan areas.

Thank you!

Thank you for your time.

Any questions?