

# ECNS 491

## Guns and Crime

# Guns and Crime

- Relationship between guns and crime is complex and unique.
- In theory, the effects on crime are ambiguous.
  - The use of guns by offenders may lower the cost or increase the probability of carrying out crimes successfully.
  - On the other hand, allowing victims to arm themselves lowers the demand for crime and may raise the probability of conviction by increasing the likelihood that victims apprehend offenders.
- It is difficult to think of another type of good that is as useful to both offenders and victims as the gun.
- In addition, guns aid police in apprehending offenders or may be used by the police excessively.
- The market for crime model suggests that allowing the public to purchase guns can either raise or lower the amount of offending...so, what type of question is this??
  - An empirical one!!!

[insert supply and demand diagram]

# Guns and Crime

- Numerous ways of approaching the relationship between guns and crime.
- Consider the three possible positions regarding the legal status of gun ownership.
  - 1.) Restricting public access to guns (i.e., gun-control legislation that limits the right of citizens to own guns or to take guns out of their homes)
  - 2.) Attachment of extra penalties to any offense committed using a gun.
    - It is possible to increase the sanction for any statutory crime when a gun is involved.
  - 3.) Allow licensed individuals to carry guns concealed on their persons or in their automobiles.
- Obviously, these are not mutually exclusive approaches to gun regulation. These types of regulations can be “packaged” together.

# Guns and Crime

- We have illustrated that it is difficult to theoretically sign the relationship between guns and crime.
  - This discussion considered exogenous variation in the availability of guns (i.e., variation in the stock of guns was coming from outside the model)
- If we think about this from an empirical perspective, is it reasonable to continue to assume that changes in guns are exogenous?
  - No!
  - And, as a consequence, the relationship between guns and crime becomes even more complex!
- So, what do we mean by an endogenous change in guns???

# Guns and Crime

- The number guns used (i.e., demanded by offenders and victims) depends on the level of offending.
  - In this sense, there is an endogeneity issue due to reverse causality.
- To the extent that guns lower the cost of offending, they will be used, like any other tool of the trade, by offenders.
- In turn, victims are more likely to acquire and learn to use guns when the level of offending is high and offenders have guns.
- This all suggests that the relationship between crime and guns has, *at a minimum*, the following level of complexity...

# Guns and Crime

$$C_{it} = a_0 + a_1 G_{it} + a_2 A_{it} + a_3 X_{C, it} + \varepsilon_{it}, \quad (1)$$

$$A_{it} = \beta_0 + \beta_1 G_{it} + \beta_2 C_{it} + \beta_3 X_{A, it} + \nu_{it}, \quad (2)$$

$$G_{it} = \theta_0 + \theta_1 C_{it} + \theta_2 A_{it} + \theta_3 X_{G, it} + \omega_{it}, \quad (3)$$

where  $C$ ,  $G$ , and  $A$  are the crime, gun ownership, and arrest rates in area  $i$  at time  $t$ , respectively;  $X_C$ ,  $X_A$ , and  $X_G$  are arrays of variables reflecting demographic, economic, and other determinants of crime, gun ownership, and arrest, respectively; the  $a$ 's,  $\beta$ 's, and  $\theta$ 's represent parameters to be estimated; and  $\varepsilon$ ,  $\nu$ , and  $\omega$  are error terms.

- In (1),  $a_1$  reflects the direct effect of an exogenous increase in the availability of guns to offenders and victims on the level crime.
- But, a change in  $G$ , also impacts the arrest rate (see eqn. 2)...which impacts crime.
- And, a change in  $C$  impacts  $G$  (see eqn. 3)...the reverse causality issue we mentioned above.
- In sum, this system of equations is a mess!

# Guns and Crime

- The previous slide highlights a major hurdle to estimating the relationship between guns and crime...we need an exogenous source of variation in the stock of guns available.
  - Ideally, we would perform an experiment where we take guns away from randomly chosen neighborhoods and compare changes in crime with control areas that were left untouched.
  - But, this is an infeasible research design...
- A second major hurdle, is that we do not have a reliable measure of the stock of guns in, for instance, state  $s$  during year  $t$ .
- In the absence of a random experiment and reliable data, how might researchers actually study the relationship between guns and crime!?

# Guns and Crime

- Economists have generally relied on well-defined natural experiments in the form of gun laws to estimate the relationship between guns and crime.
  - Does this really tell us about the relationship between guns and crime?
  - Sort of...what we really learn is the “reduced form” relationship between the policy of interest and crime.
- What are the ingredients required for a high-quality gun control policy analysis?
  - Sufficient variation in the policy of interest.
    - A Brady bill analysis (federal law enacted in 1993 that requires a waiting period for handgun purchases and background checks on those who wish to purchase handguns) vs. a child access prevention law analysis (state laws that impose criminal liability on gun owners who allow children unsupervised access to firearms).
  - Sufficient data on the outcome of interest to account for pre-existing trends and lagged effects of the policy.

# Guns and Crime

- What are some of the gun laws we would be interested in researching?
  - Concealed-carry
  - Stand your ground (aka castle doctrine)
  - Child access prevention laws
  - Mandatory handgun purchase delays
  - Minimum possession age to possess a handgun

# Right-to-Carry Laws

- Right-to-carry laws allow individuals to carry concealed weapons
  - Sometimes referred to as “shall-issue” laws because they require local authorities to issue a concealed-weapons permit to any qualified adult who requests one.
    - Qualified adult is one who does not have a significant criminal record or history of mental illness.
    - Definition of a nonqualified adult varies among states but includes adults with prior felony convictions, drug charges, or commitments to mental hospitals.
- Every state allows carry of concealed weapons in some form
  - 42 states generally require a state-issued permit in order to carry concealed weapons in public
    - 9 “May Issue” states...issuing authority has wide discretion to deny a permit to an applicant (e.g., if authority believes the application lacks a good reason for carrying in public)
    - 33 “Shall Issue states...less stringent than “May Issue” laws
  - 8 states generally allow individuals to carry concealed weapons in public without a permit

# Right-to-Carry Laws

- In theory, is it possible to sign the effect of these laws?
  - Proponents argue these laws deter criminals by the knowledge that potential victims may be carrying weapons
    - => Decrease in crime
  - But, laws may also motivate more criminals to carry firearms
    - => Increase in crime
  - May also increase accidental injuries or deaths or increase shootings during arguments
  - Ultimately, whether these laws decrease crime is an empirical question
- Initial work in this literature is by Lott and Mustard (1997), and has been expanded by Lott (2000) and Bronars and Lott (1998)
  - General conclusion is that the adoption of right-to-carry laws substantially reduces the prevalence of violent crime

# Right-to-Carry Laws

- Empirical approach taken by Lott follows a standard state-level panel analysis approach (difference-in-differences model) of the form:

$$Y_{st} = a + \beta_1 Law_{st} + \mathbf{X}'_{st} \boldsymbol{\beta}_{st} + v_s + w_t + \varepsilon_{st}$$

where  $Y$  is the crime rate in state  $s$  during year  $t$ ,  $Law$  is an indicator for whether a right-to-carry law was in place in state  $s$  during year  $t$ ,  $\mathbf{X}$  is a vector of state-level controls (e.g., economic conditions and demographics), and  $v$  and  $w$  are state and year fixed effects, respectively.

- Subsequent studies have yielded very mixed results
  - Violent crime effect is very sensitive to model specification (Black and Nagin; Moody; Duggan)
  - Effects on property crime are often positive in sign, but not always (e.g., Ayers and Donohue, Plassman and Whitley)

# Right-to-Carry Laws

- A review of the literature concluded that, “The initial model specification [by Lott], when extended to new data, does not show evidence that passage of right-to-carry laws reduces crime. The estimated effects are highly sensitive to seemingly minor changes in the model specification and control variables....Finally, some of the point estimates are imprecise. Thus, the committee concludes that with the current evidence it is not possible to determine that there is a causal link between the passage of right-to-carry laws and crime rates.”

-National Research Council (2005)

# Child Access Prevention (CAP) Laws

- CAP laws impose criminal liability on gun owners who allow children unsupervised access to firearms
  - Negligent Storage CAP Laws
    - Impose criminal liability when a minor gains access to a firearm that has been stored negligently.
  - Reckless Endangerment CAP Laws
    - Impose a weaker standard for criminal liability and forbid persons from “intentionally, knowingly, and/or recklessly providing some or all firearms to children.”
- Laws bind for households with children under the age of 18 (and some CAP law states impose lower age thresholds)
- Fines and punishment for CAP law violations vary across states

**Table 1. Child Access Prevention Laws**

	Effective Date	Type of CAP Law
<b>California</b>	January 1, 1992	Negligent Storage
<b>Colorado</b>	October 13, 2000	Reckless Endangerment
<b>Connecticut</b>	October 1, 1990	Negligent Storage
<b>Delaware</b>	July 2, 1998	Reckless Endangerment
<b>D.C.</b>	January 28, 2009	Negligent Storage
<b>Florida</b>	October 1, 1989	Negligent Storage
<b>Georgia</b>	May 1, 1994	Reckless Endangerment
<b>Hawaii</b>	July 1, 1992	Negligent Storage
<b>Illinois</b>	January 1, 2000	Negligent Storage
<b>Indiana</b>	March 7, 1994	Reckless Endangerment
<b>Iowa</b>	April 5, 1990	Negligent Storage
<b>Kentucky</b>	July 15, 1994	Reckless Endangerment
<b>Maryland</b>	April 1, 1992	Negligent Storage
<b>Massachusetts</b>	October 21, 1998	Negligent Storage
<b>Minnesota</b>	May 20, 1993	Negligent Storage
<b>Mississippi</b>	July 2, 1994	Reckless Endangerment
<b>Missouri</b>	September 28, 1981	Reckless Endangerment
<b>Nevada</b>	July 1, 1995	Reckless Endangerment
<b>New Hampshire</b>	January 1, 2001	Negligent Storage
<b>New Jersey</b>	January 17, 1992	Negligent Storage
<b>North Carolina</b>	December 1, 1993	Negligent Storage
<b>Oklahoma</b>	July 7, 1993	Reckless Endangerment
<b>Rhode Island</b>	July 1, 1995	Negligent Storage
<b>Tennessee</b>	July 1, 1994	Reckless Endangerment
<b>Texas</b>	September 1, 1995	Negligent Storage
<b>Utah</b>	October 21, 1993	Reckless Endangerment
<b>Virginia</b>	July 1, 1992	Reckless Endangerment
<b>Wisconsin</b>	March 1, 1992	Reckless Endangerment

# Literature on CAP Laws

- Are these laws effective? What “first-stage” outcomes would you ideally like to see?
  - Are people actually charged with CAP law violations? Do we reasonably expect these laws to influence gun storage behavior?
    - Unfortunately, there is little data on the gun storage behavior of households.
    - And, there is only anecdotal evidence on individuals being charged with unsafe gun storage in CAP law states.
- Any analysis of CAP laws is going to have to be “reduced form”
  - What might be some outcomes of interest?
- Cummings et al. (1997)
  - Decrease in accidental shooting deaths among children 14 years of age and younger
- Webster and Starnes (2000) found results similar to Cummings et al. (1997), but their results were driven entirely by Florida.
- Webster et al. (2004) found CAP laws were associated with an 11 percent decrease in gun-related suicides among 14- to 17-year-olds
  - Found similar decrease in gun-related suicides among 18- to 20-year-olds. What does this mean???

# Literature on CAP Laws

- Lott and Whitley (2001) found little evidence to suggest that CAP laws were associated with accidental gun deaths or suicides among teens. But, they did find that there were consistently associated with increases in rape, robbery, and burglary.
  - Lott (2003) found similar results
  - Pepper (2005) showed that the estimates in Lott are sensitive to model specification
- Using annual hospital discharge data for the period 1988-2003, DeSimone et al. (2013) found that CAP laws were associated with 26 and 5 percent decreases in self-inflicted and non-self-inflicted gun injuries among individuals under the age of 18.
  - Found no effects on self-inflicted gun injuries among adults or on self-inflicted injuries without a gun. What does this mean???

## CAP Laws, Youth Gun Carrying, and School Shootings (Anderson and Sabia 2018)

- We use data from the Youth Risk Behavior Surveys for the period 1993-2013, and estimate the relationship between CAP laws and the following self-reported binary outcomes among high school students:
  - *Carry Gun* (= 1 if respondent carried a gun in past 30 days, = 0 o.w.)
  - *Carry Any Weapon* (= 1 if respondent carried a weapon such as a gun, knife, or club in the past 30 days, = 0 o.w.)
  - *Carry Any Weapon at School* (= 1 if respondent carried a weapon such as a gun, knife, or club on school property in the past 12 months, = 0 o.w.)
  - *Weapon Threat at School* (= 1 if respondent was threatened or injured with a weapon such as a gun, knife, or club on school property in the past 12 months, = 0 o.w.)
  - *Missed School Due to Safety* (= 1 if respondent missed school in past 30 days due to feeling unsafe at school or on the way to or from school, = 0 o.w.)

**Table 3. CAP Laws, Gun Carrying, and School Safety**

	Carry Gun	Carry Any Weapon	Carry Any Weapon at School	Weapon Threat at School	Missed School Due to Safety
	Panel I: Students under age 18				
<b>CAP Law</b>	-.009*	-.018*	-.003	-.014***	-.007
	(.005)	(.011)	(.004)	(.005)	(.006)
<b>N</b>	672,373	799,904	889,523	892,550	916,544
	Panel II: Students ages 18+				
<b>CAP Law</b>	.002	.005	-.003	.008	.019
	(.006)	(.020)	(.013)	(.011)	(.012)
<b>N</b>	104,263	119,320	130,534	131,751	133,970

\* Statistically significant at 10% level; \*\* at 5% level; \*\*\* at 1% level.

Notes: Each cell represents a marginal effect from a probit regression based on data from the YRBS for the period 1993-2013. All models control for the covariates listed in Table 2, state fixed effects, year fixed effects, and state-specific linear time trends. Regressions are weighted using population estimates from the National Cancer Institute's Surveillance Epidemiology and End Results Program. Standard errors, corrected for clustering at the state level, are in parentheses.

**Table 4. Examining Heterogeneous Effects by Type of CAP Law**

	Carry Gun	Carry Any Weapon	Carry Any Weapon at School	Weapon Threat at School	Missed School Due to Safety
Panel I: Students under age 18					
<b>Negligent Storage</b>	-.013** (.006)	-.026** (.012)	-.002 (.006)	-.009* (.005)	-.009 (.007)
<b>Reckless Endangerment</b>	-.005 (.007)	-.007 (.014)	-.005 (.007)	-.022** (.009)	-.003 (.009)
<b>N</b>	672,373	799,904	889,523	892,550	916,544
Panel II: Students ages 18+					
<b>Negligent Storage</b>	.002 (.009)	.005 (.027)	-.011 (.018)	.017 (.012)	.028** (.012)
<b>Reckless Endangerment</b>	.002 (.010)	.004 (.025)	.006 (.014)	-.004 (.012)	.005 (.012)
<b>N</b>	104,263	119,320	130,534	131,751	133,970

\* Statistically significant at 10% level; \*\* at 5% level; \*\*\* at 1% level.

Notes: Each column within each panel represents marginal effects from a probit regression based on data from the YRBS for the period 1993-2013. All models control for the covariates listed in Table 2, state fixed effects, year fixed effects, and state-specific linear time trends. Regressions are weighted using population estimates from the National Cancer Institute's Surveillance Epidemiology and End Results Program. Standard errors, corrected for clustering at the state level, are in parentheses.

**Table 9. CAP Laws and the Probability of a School Shooting**

<b>Panel I</b>	Shooting Involving Any Death (Shooters Under Age 18)	Shooting Involving Suicide (Shooters Under Age 18)	Shooting Involving Homicide (Shooters Under Age 18)
<b>CAP Law</b>	.049 (.138)	.053 (.078)	.005 (.099)
<b>Panel II</b>	Shooting Involving Any Death (Shooters Ages 18+)	Shooting Involving Suicide (Shooters Ages 18+)	Shooting Involving Homicide (Shooters Ages 18+)
<b>CAP Law</b>	.063 (.129)	.070 (.073)	-.021 (.084)
<b>N</b>	1,173	1,173	1,173

\* Statistically significant at 10% level; \*\* at 5% level; \*\*\* at 1% level.

Notes: Each cell represents an estimate from an OLS regression based on data on school-associated shooting deaths for the period 1991-2013. All models control for the covariates listed in Appendix Table 7, state fixed effects, year fixed effects, and state-specific linear time trends. Regressions are weighted using state populations. Standard errors, corrected for clustering at the state level, are in parentheses.

# Extension to Juvenile Homicides

# Gun Buyback Programs

- Q. In theory, what is the direction of the effect on crime (and violent deaths)?
- Ans. Relationship b/w buybacks and crime is ambiguous
  - Positive: More guns in the hands of criminals increase the probability that an assault will end in death, while the presence of guns in a home raises that chance that a suicide attempt will be successful
  - Negative: More guns in the hands of law-abiding citizens may have a deterrent effect, which might in turn reduce the overall incidence of violence

# Gun Buyback Programs

- Original research focuses on U.S. buybacks
  - 1992 Seattle buyback (Callahan et al. 1994)
  - 1991 and 1994 buybacks in St. Louis (Rosenfeld 1995)
- These original studies exploit only time-series variation.  
What does this mean in terms of causal identification?
  - The control group must be inferred from past time trends (i.e., this is just a pre vs. post difference approach)
  - If a time-specific shock affected homicide and suicide rates at the same point as the firearms buyback, it would be impossible for time-series approaches to disentangle the policy change from the shock.

# Gun Buyback Programs

- Leigh and Neill (2010) study the 1997 buyback in Australia
  - Large in scale...reduced stock of firearms by around one-fifth (and nearly halved the number of gun-owning households).
    - As part of the National Firearms Agreement (NFA), it became illegal to hold particular types of firearms, in particular certain long guns.
    - Guns that were no longer legal were subject to a gov't buyback, with owners being compensated for their newly illegal firearms at market prices.
    - More than 650,000 firearms bought back
    - Buyback ranks as the largest destruction of civilian firearms in any country over the period 1991-2006.

# Gun Buyback Programs

- Empirical approach exploits variation both across Australian states and over time.
  - Cross-state variation arises from different rates of firearm buyback in the six different Australian states.
  - Specifically, the authors ask the question: Did firearm death rates decrease more substantially in states where more guns were bought back?

# Gun Buyback Programs

- They estimate the following regression:

$$\text{Firearm Deaths}_{st} = \alpha + \beta \Delta G_s * \text{post97}_t + S_s + Y_t + \varepsilon_{st}$$

where  $\Delta G_s * \text{post97}_t$  is the number of guns bought back per 100,000 population in the state.

# Gun Buyback Programs

- Leigh and Neill (2010) results:
  - Buybacks led to a drop in the firearm suicide rate of almost 80%, with no significant effect on non-firearm death rates
  - Effect on firearm suicides is of similar magnitude but is less precise.
- Q. What are some strengths of this study?
- Q. What are some weaknesses of this study?