Evaluating a National Anti-Firearm Law and Estimating the Causal Effect of Guns on Crime

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Motivation

1. Evaluate a large impact of a large scale, national anti-firearm legislation

   – Most literature on the US, little national legislation evaluation. Shall Issue Laws (state level)

2. Estimate a causal impact of firearms on crime
Motivation

• Are firearms criminogenic?
  – Hotly debated topic, emotions run wild, both in academia and the general public

  – Theory:

    • Lethality hypothesis
      – Violent crime

    • Deterrence hypothesis
      – Property crime, especially those with (potential) face-to-face contact between victim and perpetrator
In a nutshell

• Using data from São Paulo, we find that the ED caused a 6% drop in homicides, which represents 1,810 lives from 2004 through 2007

  – Why São Paulo? Later...

• Structural estimates: firearms are criminogenic
• Cross-section correlations: Lester (1991), Killias (1993)
• McDowall et al. (1995): on the Shall Issue Concealed Weapons debate, no effect
  – Lott and Mustard (1997): violent crime goes down, substitution away from property crime with contact with the victim
  – Duggan (2001) and Dezhbakhsh and Rubin (1998, 1999): small reduction in homicides, but increase in robberies
  – Ludwig (1998): increase in adult homicides
Literature

• Cook and Ludwig (2002): increase in burglaries in places with more guns

• Stolzenberg and D'Alessio (2000): illegal versus legal guns
  – Illegal guns increase youth crime
The roadmap

- The empirical setting
- Data
- The intervention and the mechanisms
- The Empirical Strategy
- Results
- Conclusion
The Empirical Setting

• São Paulo equivalent to a middle-to-high income country
  – High inequality

• Enforcement at the state-level

• Very high crime in the late 1990s (homicides around 50 per 100,000), dropped sharply in the 2000s, reaching 10 in 2011
Graf 1: Homicídios por 100 mil Habitantes, 1991-2011

- Cidade de São Paulo
- Região Metropolitana excluindo São Paulo
Data

• City-level annual data
  – Police report data from the state-level enforcement authority (*Secretaria de Segurança Pública de São Paulo*)
    • Property crimes, car robbery and arms apprehended
  – Hospital data from the Ministry of Health (DATASUS)
    • Homicides and suicides, total and by firearms
The Intervention

- **Estatuto do Desarmamento (Disarmament Act)**
  - Creates a National Registry System
  - Centralizes with the Federal Police the attribution of issuing licenses
  - Article 4: increases the red tape and cost of getting a license. Applicants must:
    - Have no criminal record*, proof of residency, pass a psychological test*, take a class in handling guns*, pay a fee close to U$1,000.00*
    - Registration only for possession at one’s home or place of work. Article 6: Right-to-carry allowed only in very special circumstances
The Intervention

- Estatuto do Desarmamento (Disarmament Act)
  - Article 14: increases from misdemeanor to felony the illegal carry and illegal possession of firearms.
  - Before: penalties 1 to 3 months of incarceration, or fine, typically out on bail. After: 2 to 4 years and fine.
The Intervention

• Enforcement

  – No direct evidence on enforcement

  – In fact, Kahn and Zanetic (2007) document a major effort to crack down on guns since the late 1990s in São Paulo
The Intervention

• Indirect evidence:

  – Anecdotal evidence on price increases
    • According to the lead federal marshall on arms at Polícia Federal reports
      – AK-15 prices jumping from U$2500 to U$10000
      – 9mm pistol from U$400 to U$1250
  
  – Parliamentary Commission on Arms (ALERJ): apprehension of housemade firearms increases from 0.2% in 2000-2003 to 11% in 2007. Handguns dropped ten percentage points from 79% in 2000-2003
The Intervention

- Some graphical time-series evidence
Fig 1: Firearms Apprehended per 100 thousand inhabitants
2001 through 2007

Source: Secretaria de Segurança - Estado de São Paulo

ED passed
Fig. 2: Suicides

Panel A: Suicides by Firearms
1998 through 2007

Panel B: Suicides: Firearms/Other Means
1998 through 2007

Source: Ministério da Saúde
Fig. 3: Homicides by Firearms
1998 through 2007

Source: Ministério da Saúde

[Graph showing the number of homicides by firearms from 1998 to 2007. The graph indicates a steady increase in homicides with a notable dip post-2004, marked by an 'ED passed' annotation.]

ED passed
Fig. 4: Homicides by non-Firearms
1998 through 2007

Source: Ministério da Saúde
Fig 5: Property Crime per 100 thousand inhabitants
2001 through 2007

Source: Ministério da Saúde

ED passed
Fig 6: Vehicle Robbery per 100 thousand inhabitants
2001 through 2007

Source: Ministério da Saúde
Empirical Strategy

• We assume the % effect of the ED is the same across cities

• Thus, the absolute number of crime changes more strongly where crime was higher to start with, if the ED had an impact

• It’s really a baseline strategy, but we make it explicit
Measurement

• The problem of measuring the prevalence of firearms
  – Options:
    • Apprehensions: contaminated with enforcement
    • Fraction of homicides by firearms: amounts to attributing all homicides by firearms to firearms
      – Don’t want to piss the NRA-type guys before showing results!
The Empirical Strategy

• One solution: Suicides by firearms
  – Validated in the literature (Cook and Ludwig, 2002), but normally proportion
  – In our case it is more natural in levels, of course we control for baseline (all) suicides

• Also use apprehension of firearms
Fig. 2: Suicides

Panel A: Suicides by Firearms
1998 through 2007

Panel B: Suicides: Firearms/Other Means
1998 through 2007

Source: Ministério da Saúde
Fig 7: Suicides not by Firearms
1998 through 2007

Source: Ministério da Saúde
The Empirical Strategy

- In summary, two objects:
  
  - The reduced form:
    
    \[ \Delta C_{it} = \theta + \rho \text{guns}_{ib} + \mu_t + \Delta \text{Controls}_{it} + \text{Crime}_\text{Baseline}_{it} + \varepsilon_{it} \]

  - The first stage:
    
    \[ \Delta \text{guns}_{it} = -\gamma_{ED} \text{guns}_{ib} + \mu_t + \Delta \text{Controls}_{it} + \text{Crime}_\text{Baseline}_{it} + \varepsilon_{it} \]
Results

• Reduced form


• No impact on property crime, statistical or magnitude
Results

• Mechanism: suicides by firearms dropped more steeply where they were high in baseline

• Structural estimates: firearms cause homicides
  – No systematic effect on property crime or car robbery
Results

• Results very similar with apprehension
  – Validate suicides by firearms, and vice versa
Conclusion

• ED had a non-negligible but far from negligible effect on homicides

• No systematic impact on property crime nor car robbery

• Evidence in favor of the Lethality Hypothesis