The Economic Costs of Violence in México

The Costs of Crime and Violence in Latin America and the Caribbean: Methodological Innovations and New Dimensions

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Homicides in México, 2003 - 2010
Structural Changes in the Drug Business

- **International Factors**
  - Increasing flow of goods and services after NAFTA.
  - Stronger control over the Caribbean route.
  - Reduction of the cocaine supply from Colombia (Mejia y Castillo, 2012).
  - Expiration of the U.S. Federal Assault Weapons Ban in 2004 (Dube et al., 2012).

- **Domestic Factors**
  - Democratization and federalism (Rios, 2011).
  - In 2006 the federal government started an aggressive campaign to fight Drug Traffic Organizations (DTOs).
  (Calderon et al., 2013; Guerrero, 2010 and 2011; Merino, 2011; Escalante, 2010; Signoret, 2011; Dell, 2011)
Structural Changes in the Drug Business

• Consequences:
  • Increase in the profits of the Drug Trafficking Industry.
  • Fragmentation between DTOs
  • Entry of new competitors.

• DTOs act as profit maximizers:
  • DTOs compete to establish to control over territories (plazas) and routes to US markets.
  • They can get rid of competition through the use of violence.
Fragmentation of DTOs

Source: Coscia, Michele and Viridiana Rios (2012)
Fallecimientos por presunta rivalidad delinquencial
Dic 2006 - Sep 2011

Puertos
Cruces fronterizos de ferrocarril
Cruces fronterizos con EUA
Cruces de carga de ferrocarril
Aeropuertos
Pistas de aterrizaje
Red ferroviaria
Autopistas
0
1 - 20
21 - 100
101 - 500
501 o más

Fuente: Robles, Calderón y Margaloni (2013)
Research Objective

• Estimate the effects of violence on the economic activity and labor outcomes.

• Two different empirical strategies.
  • Instrumental Variables.
    • Estimate the marginal effects of violence on the economy.
  • Synthetic Controls.
    • Estimate the medium term effects of a drug war between DTOs (turf wars).
Violence does not have a linear effect over the economic cost

Turf wars between cartels: significant increments in executions. Extorsions, kidnapping and common crime also increase.

Internalize costs: pay for protection, thefts, pay their “dues” to drug-cartels.
Turf wars are followed by an increase in other type of common crimes

• Drug-trafficking organizations (DTOs) need resources to sustain a war.

• The beheading or capture of DTOs’ leaders weakens the internal structure of the organization. Local gangs become unemployed or out of control to commit crime.

• As violence increases, the probability of punishing a crime decreases → Weak institutions → Opportunistic crime.

• Instruments for intimidation and punishment for cooperating with the federal authorities or rival DTOs.
Reports of Extortion and Burglaries at Local Businesses, 2000-2011

- **Extorsión**: 1.19, 1.34, 1.62, 1.87, 2.34, 2.86, 3.01, 2.95, 4.56, 5.88, 5.63, 4.06
- **Robo a Negocios**: 54.21, 59.92, 56.93, 56.10, 52.96, 50.81, 54.42, 57.89, 60.28, 63.32, 70.25, 72.31

*Graph showing the trend of reports of extortion and burglaries from 2000 to 2011.*
Extortion is more prevalent in disputed territories

- Stationary bandits vs roving bandits.
- Díaz-Cayeros et al. (2012) use list experiments to measure the prevalence of extortion across the country:
  - 10% of the population are extorted by DTOs.
  - In disputed territories, extortion rate is 30%.
  - Evidence of similar or greater rates of extortion by local police Magaloni et al., (2013).
  - Lower extortion rates in territories under monopolistic control.
  - In these places, citizens report “to ask narcos for help when having a difficult problem”.

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10% of the population are extorted by DTOs.
Data and Variables

• Violence:
  • Homicide rate per 100 thousand inhabitants.

• Labor outcomes:
  • Labor participation (% people working).
  • Unemployment (% unoccupied people).
  • Own business (%).
  • Self-employed (%)
  • Quarterly Income
    • Encuesta Nacional de Ocupación y Empleo (ENOE), quarterly frequency, 2005-2010, 1,183 municipios.
Data and Variables

- **Economic Activity:**
  - GDP indicators at the municipal level not available.
  - Our proxy: *Domestic Electricity Consumption per capita.*
    - Similar time trends and variation to GDP series.
    - Good measure of the economic activity in both the formal and informal sectors of the economy (Pinotti 2011).
  - 2002 to 2010, 1,308 municipios. Fuente: INEGI.
GDP per capita and Domestic Electricity Consumption, 2003-2010

<table>
<thead>
<tr>
<th>Year</th>
<th>GDP per capita (2003 Pesos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>45.42</td>
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<tr>
<td>2004</td>
<td>45.58</td>
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<tr>
<td>2005</td>
<td>45.62</td>
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<tr>
<td>2006</td>
<td>46.62</td>
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<tr>
<td>2007</td>
<td>46.32</td>
</tr>
<tr>
<td>2008</td>
<td>46.49</td>
</tr>
<tr>
<td>2009</td>
<td>44.68</td>
</tr>
<tr>
<td>2010</td>
<td>45.36</td>
</tr>
</tbody>
</table>

Megawatt-hour per capita

GDP per capita / Domestic Electricity Consumption

2003 Pesos

Megawatt-hour per capita
Quarterly GDP per capita and Industrial Electricity Consumption, 2003-2010

[Graph showing the quarterly GDP per capita and Industrial Electricity Consumption from 2003 to 2010.]
Instrumental Variables: Mejía and Castillo (2012)

Distance of the municipality to the closest US border

Historical seizures of cocaine in Colombia vs Homicides (SINAIS)
Econometric Specification: Identifying Marginal Effects

• First Stage

\[ TasaHom_{mt} = \alpha_m + \gamma_t + \theta DistFrontXPropIncautacion_{mt} + \varepsilon_{mt} \]  \hspace{1cm} (2)

- \( TasaHom_{mt} \): = Homicide rate
- \( \theta DistFrontXPropIncautacion_{mt} \): = Instrument

• Second Stage

\[ y_{mt} = \alpha_m + \gamma_t + \beta TasaHom_{mt} + \varepsilon_{mt} \]  \hspace{1cm} (1)

- \( y_{mt} \): = Outcome of interest.
Between 2009 and 2010 there was an average increment of 5.98 in the homicide rate (per 100,000 inhabitants):

- Reduction of 1.32 pp the proportion of the employed population (~2.37% over the mean)
- Reduction 0.24 pp the proportion of owners (~9% over the mean)
- Reduction 7% of labor income
• **Objective:**
  - Estimate the medium term effects of a drug war between DTOs (*turf wars*).

• **Empirical Strategy:**
  - Variation of matching methodology.
  - Objective: Construct proper counterfactuals that best replicate the initial conditions of the treated units.
  - The synthetic control for each treated unit is a weighted average of the control group.
We want to identify the occurrence of a turf war. Nevertheless, we do not observe:

- War declarations.
- The time of arrival or the number of new competitors.
- Extortion.

But we observe:

- Dramatic increases in the levels of violence, presumably related to a turf war.
Total homicides 1998-2010
Selected cities

Homicidios totales 1998 - 2010
Ciudades Seleccionadas

- Juarez
- Culiacan
- Tijuana
- Chihuahua
Homicidios totales 1998-2010, ciudades seleccionadas

Homicides (1998 - 2010)

Monterrey
Guadalajara
Cuernavaca
Reynosa
• A “turf war” has occurred in a municipality when the number of homicides, from one year to the other, increases in more than 3 standard deviations with respect to the historic mean since 1998.

• According to this definition, 26.3% of the municipalities (642 territories) have experienced a “turf war”.
  • Similar number found in other studies (Coscia and Ríos, 2012).
  • This group includes 90% of the top 100 municipalities with higher homicide rates.
  • Also includes 84% of the top 100 municipalities with higher rates of drug related deaths.
Predictor Variables

5. % Workers in the commercial sector, 2003.
8. Geographic Latitude.
Example: Ciudad Juárez
Example: Tijuana
## Pre-treatment characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment Group</th>
<th>Synthetic Control</th>
<th>Unweighted Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mead</td>
<td>s.d.</td>
<td>Mean</td>
</tr>
<tr>
<td>Domestic Electricity Consumption per capita (Megawatt-hour), 2000-2005</td>
<td>1.202</td>
<td>(1.153)</td>
<td>1.209</td>
</tr>
<tr>
<td>Homicide rate per 100,000 inhabitants (2000-2005)</td>
<td>10.020</td>
<td>(11.763)</td>
<td>13.570</td>
</tr>
<tr>
<td>Population density (habitants per square km), 2005</td>
<td>337.8</td>
<td>(1,427.2)</td>
<td>368.8</td>
</tr>
<tr>
<td>Residential density (habitants per square km), 2005</td>
<td>79.6</td>
<td>(337.8)</td>
<td>87.8</td>
</tr>
<tr>
<td>Employment in the commercial sector (% of population between 15 - 70 old), 2003</td>
<td>0.050</td>
<td>(0.029)</td>
<td>0.049</td>
</tr>
<tr>
<td>Employment in the manufacturing sector (% of population between 15 - 70 old), 2003</td>
<td>0.045</td>
<td>(0.074)</td>
<td>0.039</td>
</tr>
<tr>
<td>Gross product per employee, commercial sector, 2003</td>
<td>0.083</td>
<td>(0.058)</td>
<td>0.081</td>
</tr>
<tr>
<td>Gross product per employee, manufacturing sector, 2003</td>
<td>0.284</td>
<td>(0.578)</td>
<td>0.275</td>
</tr>
<tr>
<td>Years of schooling, 2005</td>
<td>6.500</td>
<td>(1.661)</td>
<td>6.548</td>
</tr>
<tr>
<td>Human Development Index, 2005</td>
<td>0.783</td>
<td>(0.062)</td>
<td>0.779</td>
</tr>
</tbody>
</table>
Electricity Consumption before and after treatment

Electricity per capita (Mega-watts hour)

-4 -3 -2 -1 0 1 2 3

Synthetic Control

Treatment group

- dashed line: Synthetic Control
- solid line: Treated
### Results

<table>
<thead>
<tr>
<th>Period</th>
<th>Electricity Consumption</th>
<th>Homicide Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Treated</td>
<td>Synthetic</td>
</tr>
<tr>
<td>Pre-treatment (t-4 a t-1)</td>
<td>1.232</td>
<td>1.209</td>
</tr>
<tr>
<td>Year of Treatment, t</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year t + 1</td>
<td>1.250</td>
<td>1.253</td>
</tr>
<tr>
<td>Year t + 2</td>
<td>1.184</td>
<td>1.235</td>
</tr>
<tr>
<td>Year t + 3</td>
<td>1.229</td>
<td>1.327</td>
</tr>
<tr>
<td>Yearly average from t to t+1</td>
<td>1.217</td>
<td>1.244</td>
</tr>
<tr>
<td>Yearly average from t to t+2</td>
<td>1.221</td>
<td>1.272</td>
</tr>
<tr>
<td>Yearly average from t to t+3</td>
<td>1.194</td>
<td>1.284</td>
</tr>
</tbody>
</table>
Thank You
Synthetic Controls

$X_1$: \((k \times 1)\)-vector of pre-treatment variables for the treated unit

$X_0$: \((k \times J)\)-matrix of pre-treatment variables for control units

\[ W^* = \arg\min \quad ||X_1 - X_0 W|| \]

$Y_1$: \((k \times 1)\)-vector of post-treatment outcomes for the treated unit

$Y_0$: \((T \times J)\)-matrix of post-treatment outcomes for control units

Treatment effect: \(Y_1 - Y_0 W^*\)
## Summary Statistics

<table>
<thead>
<tr>
<th>Estadísticas Descriptivas</th>
<th>Media</th>
<th>Desv. Est.</th>
<th>Mín</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>Máx</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Datos anuales de 2002 a 2010 (n = 1,308 municipios)</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Consumo Electricidad per Capita</td>
<td>1.00</td>
<td>1.29</td>
<td>0.01</td>
<td>0.40</td>
<td>0.64</td>
<td>1.13</td>
<td>22.58</td>
</tr>
<tr>
<td>Tasas de homicidios por 100 mil habitantes</td>
<td>12.69</td>
<td>23.65</td>
<td>0.00</td>
<td>0.00</td>
<td>7.17</td>
<td>15.93</td>
<td>769.84</td>
</tr>
<tr>
<td>Promedio de homicidios</td>
<td>8.54</td>
<td>62.52</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>5.00</td>
<td>3,965.00</td>
</tr>
<tr>
<td>Observaciones</td>
<td>14,388</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Datos Trimestrales de 2005 a 2010 (n= 1183 municipios)</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tasas de homicidios por 100 mil habitantes</td>
<td>4.22</td>
<td>18.29</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>3.19</td>
<td>1,498.64</td>
</tr>
<tr>
<td>Promedio de homicidios</td>
<td>1.81</td>
<td>14.57</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>1,279.00</td>
</tr>
<tr>
<td>Personas Trabajando (% población*100)</td>
<td>56.04</td>
<td>5.86</td>
<td>12.28</td>
<td>53.36</td>
<td>56.35</td>
<td>59.05</td>
<td>100.00</td>
</tr>
<tr>
<td>Personas Desocupadas (% población*100)</td>
<td>2.52</td>
<td>1.72</td>
<td>0.00</td>
<td>1.37</td>
<td>2.48</td>
<td>3.56</td>
<td>25.00</td>
</tr>
<tr>
<td>Con Negocio Propio (% población*100)</td>
<td>2.63</td>
<td>1.63</td>
<td>0.00</td>
<td>1.75</td>
<td>2.55</td>
<td>3.34</td>
<td>30.19</td>
</tr>
<tr>
<td>Auto empleado (% población*100)</td>
<td>12.68</td>
<td>5.94</td>
<td>0.00</td>
<td>9.37</td>
<td>10.79</td>
<td>13.98</td>
<td>78.72</td>
</tr>
<tr>
<td>Ingreso trimestral</td>
<td>4,614.98</td>
<td>1,568.25</td>
<td>48.82</td>
<td>3,555.30</td>
<td>4,757.92</td>
<td>5,737.25</td>
<td>56,705.73</td>
</tr>
<tr>
<td>Logaritmo (Ingreso Trimestral)</td>
<td>8.36</td>
<td>0.42</td>
<td>3.91</td>
<td>8.18</td>
<td>8.47</td>
<td>8.65</td>
<td>10.86</td>
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<td>Observaciones</td>
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