Evaluating Local Policy for Violence Reduction: the Case of the Program “Pacto pela Vida” of the State of Pernambuco, Brazil

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Introduction
Brazil presents very high levels of violent criminality. In 2011 for example, its homicide rate (homicide per 100,000) was 27.1, which put the country in third position among South America countries, only behind Venezuela and Colombia (UNODC, 2012).

We also note significant regional difference among the levels of homicide rate of its states and cities. In 2007, the states of Pernambuco and Rio de Janeiro were the states with the highest homicide rates (around 50.0 or more).

In 2007, the government of the state of Pernambuco implemented a new policy designed to reduce its levels of homicide rates. Inspired by international experience, the new plan (“Pacto pela Vida”) was based on hot spot policing, financial incentives and social actions. The objective of the research is to evaluate the impact of the program on the homicide rate of the Pernambuco.

Method
• The program was not a social experiment
• There was a unique “treated”: the state of Pernambuco
• Difficulties in finding a control group
• Difficulties in making inference on the results

Thus, the research applies the Synthetic Control approach (Abadie and Gazzvezabal, 2003; Abadie et al. 2010)

The Synthetic Control approach enables us to obtain a contra-factual that is composed by a combination (weighted mean) of non “treated” states (cities) by using a panel data information about a set of geographic unities.

More formally, defining the period of analysis as 1 ≤ t ≤ T0, where T0 is the time of implementation of the program, we are interested in \( Y_{it} - Y_{it}^X \) for \( t > T0 \) where \( Y_{it} \) and \( Y_{it}^X \), are the value of the homicide rate of State i with and without the intervention.

Following Abadie et al. (2010), we assume that, for each potential control j:

\[ Y_{it}^X = \delta_t + \theta_j Z_j + \gamma_j \mu_j + \epsilon_{it} \]  

Where \( \delta_t \) is unknown common factor, \( Z_j \) is a vector of observable variables does not affected, \( \mu_j \) is a specific state effect and \( \epsilon_{it} \) is a transitory non observable term.

For a number N of potential controls, the strategy looks for a vector of weights, \( W = (w_1, w_2, ..., w_N) \), where \( w_j \geq 0 \) and \( \sum_{j=1}^{N} w_j = 1 \), such that:

\[ \sum_{j=1}^{N} w_j Y_{it}^X = Y_{it} \quad \text{for} \ t \leq T0, \quad \text{and} \ \sum_{j=1}^{N} w_j Z_j = Z_i \]  

Where the vector \( w^* \) is minimized by the solution of \( \hat{Y}_{it} = Y_{it} - \sum_{j=1}^{N} w_j Y_{it}^X \) for \( t > T0 \)

The impact of the program thus can be obtained by:

\[ \hat{r}_{it} = Y_{it} - \sum_{j=1}^{N} w_j Y_{it}^X \]  

Results

Table 1 presents the characteristics of Pernambuco, of its synthetic control and of the sample average of the 23 potential controls (we exclude the states of Rio, São Paulo and Minas Gerais because they also implemented similar programs). The Synthetic Control is composed only by the state of Espírito Santo.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pernambuco</th>
<th>Synthetic Control</th>
<th>Sample of States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gini Index</td>
<td>0.667</td>
<td>0.571</td>
<td>0.580</td>
</tr>
<tr>
<td>Log. per capita income</td>
<td>5.943</td>
<td>6.248</td>
<td>6.031</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>0.099</td>
<td>0.081</td>
<td>0.079</td>
</tr>
<tr>
<td>Prop. of Young (15-25)</td>
<td>0.219</td>
<td>0.213</td>
<td>0.221</td>
</tr>
<tr>
<td>Density</td>
<td>80,954</td>
<td>68,072</td>
<td>29,066</td>
</tr>
<tr>
<td>Log. of population</td>
<td>15,888</td>
<td>14,956</td>
<td>14,795</td>
</tr>
<tr>
<td>Homicide rate - 1996</td>
<td>40.80</td>
<td>42.50</td>
<td>29.91</td>
</tr>
<tr>
<td>Homicide rate - 2001</td>
<td>58.80</td>
<td>46.00</td>
<td>22.53</td>
</tr>
<tr>
<td>Homicide rate - 2007</td>
<td>52.60</td>
<td>50.90</td>
<td>26.40</td>
</tr>
</tbody>
</table>

The evidence of graphic suggests that the program has reduced the homicide rate of Pernambuco. The annual average difference between the homicide rates of Pernambuco and of its Synthetic Control was 9.1 perceptual points from 2007 to 2011.

Conclusions

The results of this research suggest that the Program “Pacto Pela Vida” implemented by the Government of Pernambuco contributed to the reduction of homicide rates of this Brazilian state. The program implied an annual average reduction of 9.1 perceptual point of the homicide rate of Pernambuco from 2007 until 2011.

As an immediate extension, we intended to evaluate the impact of the policy on homicide rates of the City of Recife (capital of Pernambuco) and of the Metropolitan Region of Recife.

Graphic 1 – Homicide rate of Pernambuco and of its Synthetic Control

Graphic 2 – Homicide rate gaps between Pernambuco and its Synthetic Control and of placebos (False treated)

Source: author’s calculation based on PNAD – IBGE and Brazilian Minister of Health

Table 1- Characteristics of Pernambuco, of its Synthetic Control and of the sample of states

Source: author’s calculation based on PNAD – IBGE and Brazilian Minister of Health

The graphic 2 shows the gaps between the homicide rates of each “non-treated” 23 states and of their Synthetic Controls Based on the distributions of gaps, it is clear that the above results obtained for Pernambuco is statically significant.