

Bonus for firearms seizures and police performance*

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Abstract

This paper studies the effect of monetary incentives for firearms seizures on police performance and public safety outcomes. Using data from Brazilian states, we evaluate the impact of Pernambuco's Pact for Life (*Pacto pela Vida*) Program, which offers a monetary bonus to police officers for firearms seizures and other outcomes. Our results indicate that the bonus has a causal and positive impact on the number of firearms seizures by police officers. Although we see a decrease in the number of crimes in Pernambuco, it is not possible to be attributed to the bonus policy.

Keywords: Monetary Incentives, Policing, Firearms Seizures, Policy Evaluation.

JEL: J31; J38; J45; K42

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1. Introduction

Providing incentives via payment is an important mechanism to align the interests of employers and employees.¹ It is not different in the public employment service, which employs many workers, and governments aim to improve the efficiency of public service delivery. There is evidence that the payment instrument is effective in the public sector where the measurement of tasks is better (Burgess et al., 2017). However, Burgess & Ratto (2003) argue that incentives for public sector workers may differ from those in the private sector, in part due to strong union opposition and weak government. This paper investigates the impact of a payment incentive for firearms seizure on police officers' performance. In addition, we look at the effects of this policy on some public safety outcomes.

A branch of the literature studies the relationship between the circulation of firearms and crime. Empirical research examining this relationship does not present a consensus about neither the direction or magnitude of the effect (Khalil, 2017). While studies such as Lott & Mustard (1997) argue firearm circulation reduces crime rates, other studies such as Duggan (2001) and Khalil (2017) suggest the opposite: more guns in circulation are related to more crimes. Within this debate, many works try to evaluate the impact of policy interventions on this subject. For example, Gius (2020) finds evidence that firearm seizure laws resulted in a decline in murder and gun-related murder rates in Connecticut but an increase in gun-related murder rates in Indiana.

The police are responsible for enforcing the law, maintaining public order and safety, and detecting, preventing, and investigating criminal activity. However, individual police officers are workers with their own set of incentives, which may differ from the objectives of their employers (Owens & Ba, 2021). Moreover, monitoring the daily practices of police officers is a challenging task. Thus, monetary payments could be an mechanisms to improve their productivity.²

Despite the unquestionable importance of studying the effects of monetary incentives

¹See Grossman & Hart (1983) and Holmstrom & Milgrom (1987) for seminal theoretical works on this subject.

²Mas (2006) argues that police performance depends on the awarded pay raise relative to expectations, and police performance declines sharply when officers lose arbitrations about payments. Alternative mechanisms can be used to improve police performance. For example, Banerjee et al. (2021) provide evidence that management reforms can improve policing.

on police performance and public safety outcomes, there is still a lack of studies. This is so at least partly, because of the difficulty accessing high quality data that allows credible research. We obtained access to data not publicly available via FOIA-like requests for
30 Brazilian states.³ Thus, we went deeper into this subject and studied the Pact for Life (*Pacto pela Vida*) Program in Pernambuco, a Brazilian state. We found evidence that police officers' seizure of firearms is positively affected by bonus payments. Indeed, we deployed a synthetic control estimate to evaluate this policy, and for all tests employed, there was a positive impact of monetary bonus on the seizure of firearms. However, we did
35 not find a causal effect of that policy on the number of crimes.

2. Empirical Strategy

The Pact for Life Program is a public security policy that includes several government institutions from both judiciary and executive power. The program was deployed in May 2007 in the Brazilian state of *Pernambuco*⁴ and aimed to reduce the number of homicides,
40 with a target of mitigating intentional violent mortality rates by 12% per year. In October of 2017, the program was improved, and a new mechanism to reward police officers was deployed: a bonus for firearms seizures. Its productivity indicators were the seizure of firearms that do not comply with legal provisions, compliance with an arrest warrant, and drug bust. The Pact for Life's reward has the legal nature of a meritorious award and does
45 not integrate, for any purpose, the remuneration of the public agent. According to the firearm classification, the bonus paid per seized firearm corresponds to an amount between R\$700 and R\$2000.⁵ Next, we explain our empirical approach to explore the impacts of Pact for Life.

This paper employs the synthetic control method to evaluate the causal effect of inter-
50 ventions in comparative case studies. The method generates a counterfactual comparison by constructing a weighted combination of multiple untreated units as the (synthetic) control

³FOIA means Freedom of Information Act. In Brazil, there is a similar legislation called Lei de Acesso à Informação (LAI).

⁴Pernambuco is one of the 27 federative units of Brazil. The state has the tenth largest GDP in the country, with a share of 2.8% of the Brazilian GDP.

⁵For comparison purposes, in 2017 the Brazilian minimum wage was R\$ 937. Also, the average wage was around R\$3000 in that year in Recife, the capital of Pernambuco.

group to which the treated unit can be compared.

Our control group is comprised of twelve Brazilian states.⁶ They do not have experience of similar policies up to the time that Pernambuco implemented its policy of monetary incentives for firearms seizures. We use monthly information⁷ starting in 2015 to estimate the treatment effect for Pernambuco (unit $i = 1$), measured by the following parameter:

$$\alpha_{1t} = Y_{1t} - Y_{1t}^N, \tag{1}$$

where Y_{1t} is the outcome of interest for Pernambuco and Y_{1t}^N is what the outcome would be in absence of the treatment. As Y_{1t}^N is not observed, the synthetic control algorithm finds optimal weights $W = [w_2, \dots, w_J]$ such that $Y_{1t}^N = \sum_{j=2}^J w_j Y_{jt}$.

We rely on the time series of the outcome before the intervention, and we use other observable characteristics (summarized in matrix X_0) at the timing of the interventions to estimate weights that make the (synthetic) control group as similar as possible to *Pernambuco*. In this study, X_0 includes variables comprising government spending (*per capita*) on several areas (e.g., education, health, habitation, culture, science and technology), the average wage from all jobs in real terms, percentage of individuals in specific age brackets (e.g., 23-35, 36-60 and 61 or more years old), the share of employed adults, the percentage of males, and average years of study. Following Abadie et al. (2010), we choose the weights of the synthetic control, W^* , that minimizes $\|X_1 - X_0 * W\|$. Furthermore, we also apply the placebo procedure and the statistical inference suggested by Firpo & Possebom (2018).

Our primary outcome of interest is the number of firearm seizures, which is more directly connected to the goal of the intervention. We also investigate the impact on victims of crimes, which comprises murder, bodily injury followed by death, and robbery followed by death.⁸ We collect firearms seizure data directly from the Department of Public Security of each Brazilian state by making use of the federal law on access to information - Law 12.527-2011. The remaining data on public safety are from the Brazilian Ministry of Justice.

⁶São Paulo, Amapá, Rio Grande do Norte, Sergipe, Tocantins, Rio de Janeiro, Mato Grosso do Sul, Rio Grande do Sul, Santa Catarina, Minas Gerais, Paraná, Distrito Federal.

⁷To avoid volatility that the public safety data reports could cause in monthly information, we smooth the series by using 3-months and 6-months moving averages.

⁸In the online Appendix, we show the estimate for other types of crime, and evaluate the impact of the policy on each type of crime separately.

3. Results

Figure 1 presents the effects of the policy on firearms seizure. According to Figure 1, there is a significant increase in firearms seizures after the start of the payment of bonuses, even when we consider the placebo test (Panel 1c and 1d). Furthermore, the confidence interval
80 of Firpo & Possebom (2018) (Panel 1e and 1f) indicates that the impact is significant. Thus, the synthetic control suggests that we should observe a smaller number of firearms seizures in the absence of such a policy.⁹

Now we look at the policy effect on crimes measured by the number of victims.¹⁰ Figure 2 shows a lower number of crimes in the state of *Pernambuco* after adopting the bonus policy
85 for firearm seizures. However, this reduction cannot be associated with the bonus policy, as shown in all tests in Figure 2. Indeed, placebo tests (Panel 2c and 2d) do not indicate a substantial difference for *Pernambuco* state. Finally, the confidence interval (Panel 2e and 2f) suggests no significant impact of the policy.

4. Final Remarks

90 The contributions of this paper are twofold. First, we find a positive impact of police performance in a specific task - firearms seizures - after implementing monetary rewards linked to that activity. We interpret that as evidence that public policy can use this mechanism to improve the quality of service delivery by police. Policymakers should identify which tasks executed by police officers impact public safety outcomes and then design a
95 program of monetary payments that reward professionals with an excellent performance to those tasks. Second, we evaluate the causal impact of the bonuses attained for firearms seizures on public safety outcomes. Although we see a downward trend in the number of crimes after 2017, our results reveal that it is not explained by the bonus policy, because

⁹In the Online Appendix, we also compare alternative estimators for the policy effect, as in Ferman & Pinto (2021). All estimations corroborate the results presented here.

¹⁰In the online Appendix, we analyze the impact on other crime measures. In those empirical exercises, we evaluate the impact of the policy on the total number of occurrences, which encompasses rape, theft and theft of a vehicle, robbery of a financial institution, robbery of cargo, and attempted murder. In addition, we estimate the effect of the bonus policy on the number of murders and attempted murders separately. All estimations indicates no significant effect of the bonus policy on the number crimes.

we do not find a significant difference across treatment and synthetic control (see Panel 2e
100 and 2f).

It is important to note that by increasing the effort to seize firearms, the police force can generate a decrease in attendance in other areas. For example, Baicker & Jacobson (2007) find that encouraging police officers into activities of drug seizures may induce them to devote less attention to other crimes. Further research can shed some light on this subject.

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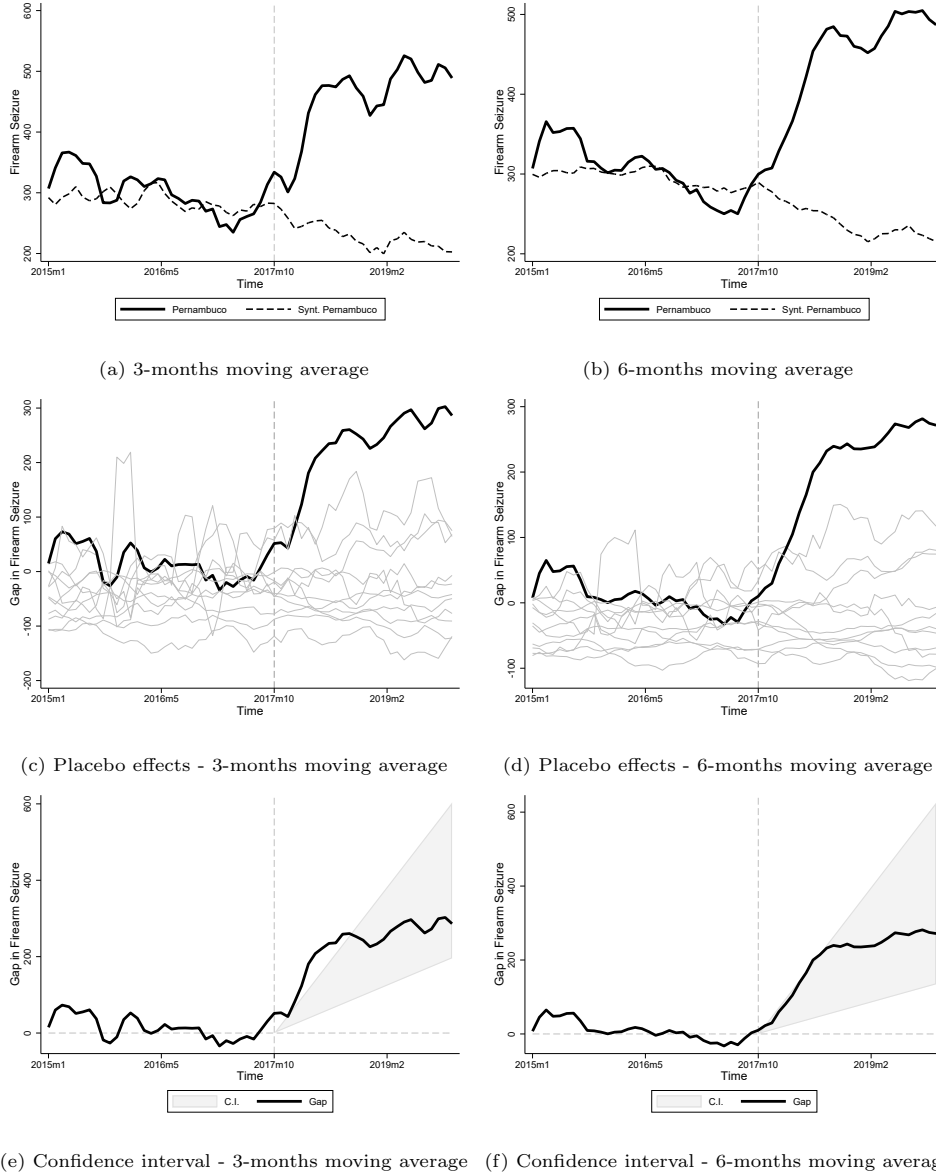


Figure 1: Firearms seizures

Weightings given to the control group states: (a) Amapá = 0.006, Rio Grande do Norte = 0.592, Rio de Janeiro = 0.019, Sergipe = 0.229, São Paulo = 0.154, Tocantins = 0.001; (b) Rio Grande do Norte = 0.637, Rio de Janeiro = 0.024, Sergipe = 0.180, São Paulo = 0.159. Difference in Means test: (a) Pre-Treatment t Test Statistic = 3.00, Post-Treatment t Test Statistic = 15.80; (b) Pre-Treatment t Test Statistic = 2.00, Post-Treatment t Test Statistic = 12.95. For the placebo test (Panel 1c and 1d), we follow Abadie et al. (2010) and exclude states with a poor pre-intervention fit, i.e. whose pre-intervention MSPE is five times greater than Pernambuco. In Panel 1(e) and 1(f) the confidence interval is 92.3%.

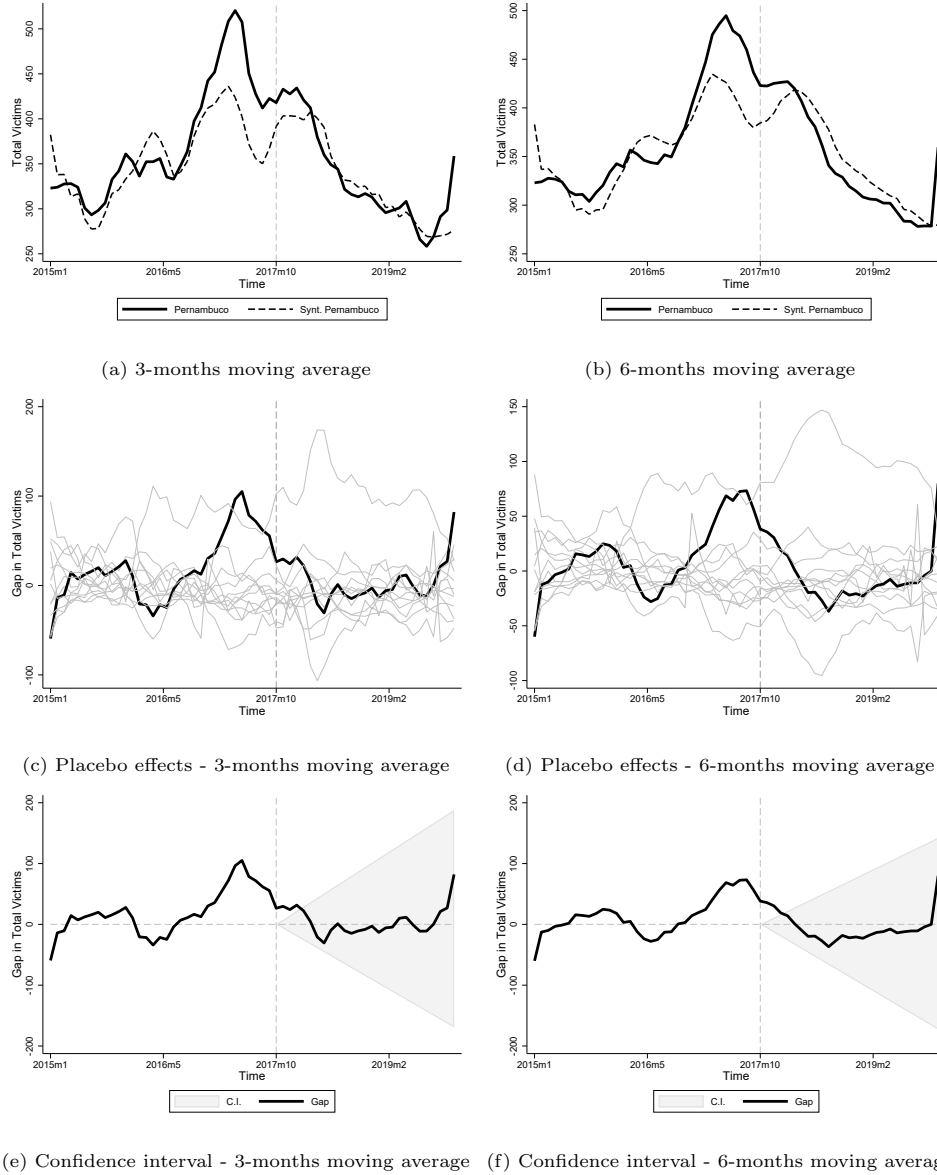


Figure 2: Victims of crimes

Weightings given to the control group states: (a) Minas Gerais = 0.107, Rio Grande do Norte = 0.215, Rio de Janeiro = 0.678; (b) Rio Grande do Norte = 0.226, Rio de Janeiro = 0.774. Difference in Means test – SC (Abadie et al. 2003): (a) Pre-Treatment t Test Statistic = 3.10, Post-Treatment t Test Statistic = 0.95; (b) Pre-Treatment t Test Statistic = 2.55, Post-Treatment t Test Statistic = -1.15. For the placebo test (Panel 2c and 2d), we follow Abadie et al. (2010) and exclude states with a poor pre-intervention fit, i.e., whose pre-intervention MSPE is five times greater than Pernambuco. In Panel (2e) and (2f) the confidence interval is 92.3%.