On the Role of Municipal Police Resources during the Mexican Drug War

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Abstract

This study examines the relationship between municipal police forces and criminal activity in Mexico during 2008, the year that ended a fifteen year decline in the national homicide rate. Regression discontinuity estimates indicate that a 1 million 2019 dollar municipal police subsidy caused more policing for infractions and misdemeanors, but not for felonies. Surprisingly, the estimates also point to substantial homicide increases, mostly related to organized criminal activity. Our evidence suggests this effect is due to enhanced communications between the Federal Secretariat of Public Security, which is in charge of the Federal Police, and municipal governments. In addition, the subsidy is shown to reduce popular support for the president's party, the PAN.

Mexico suffered the reversal of a 15 year-old decline in its homicide rate during 2008. In this well-known trend, the national homicide rate was at an all-time low of 8.3 per $100,000$ people in 2007, before reaching 13.1 in 2008 and eventually 23.7 in 2011.[1]

This paper contributes to the discussion on the causes of this trend reversal: it examines in detail a federal subsidy that enhanced some municipal police forces in 2008. Eligibility was granted to those municipalities with the highest measure of crime rates multiplied by population squared in state and nationwide rankings. In practice, these rules translate to a step function conducive to sharp regression discontinuity analysis.

I then estimate local causal effects of receiving the subsidy on a variety of administrative, criminal and electoral outcomes. This exercise reveals that the

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[1] These homicides are measured by the bureaux of vital records across the country and have been compiled by the mexican statistical agency, INEGI, since 1990.

9 million pesos subsidy, equal to 0.99 million 2019 USD, increased the size of municipal police by around 75% and tripled its interventions for low-level law violations, known as infractions.[2] This effect is coupled with an increase in fines dictated by the municipal justice systems. In contrast, there is no such increase in municipal law enforcement concerning more serious crimes. In particular, this implies there was no municipal police crackdowns on organized criminals. Going further, the subsidy caused a large increase in homicides related to organized criminal activities in municipalities where drug trade organizations operate and a decline in popular support for the political party of the president, the PAN, as evidenced in the 2009 federal deputies election. Interestingly, the homicide increase is not reflected in Mexico's federal judicial system.

I attribute this violent consequence of the subsidy not to increased local municipal policing activity, but to enhanced communication channels the Secretariat of Public Security established with municipal police forces. Unfortunately, more information on the operations of the Federal Police during this time period is needed to explore the consequences of improved federal-municipal communications on organized crime homicides, and the reasons why such homicides did not reach the judicial system.

The main litterature this paper contributes to is concerned with the causes and consequences of the Mexican Drug War. In particular, the role of public security forces on these homicide trends has been considered before. In an early observational study, Escalante Gonzalbo (2011) hypothesized that federal police and military deployments started by the Calderón administration right after taking office in December 2006 were an important determinant of homicide trends. Such hypothesis was furthered by Dell (2015), who estimates a causal effect of having a mayor – or municipal president – affiliated with president Calderón's political party (PAN) on 2007-2009 homicides, via an electoral regression discontinuity design. Dell (2015) finds such a political affiliation to triple homicides related to organized criminal activity and attributes this effect to municipal, federal and military crackdowns. Our study complements this body of work by considering Mexico's police forces directly. In line with Dell (2015), I find that changes in federal-municipal relationships are relevant to understand the homicide trend.

On a broader level, this paper supports the view of municipal police as a low-intensity law enforcement device necessary for day-to-day conflict resolution at a local scale, as described in the qualitative work of Fondevila and Meneses Reyes (2017).

The paper is organized as follows: section 1 discusses the subsidy in more detail, the way it was allocated, and the suggested regression discontinuity framework; section 2 presents the data; section 3 presents and discusses what the subsidy actually did, based on rich municipal data from 2008 as well as the criminal and electoral effects of the subsidy; and section 4 concludes.

[2] These include, for instance, traffic law violations.

1 Empirical Setting

Subsidy Context

Eight days after taking office, president Calderón oversaw a major deployment of the army, navy and federal police in the western state of Michoacán to combat the growth of organized criminal organizations. This deployment of $5,000$ troops in December 12, 2006 marked the beginning of the Mexican Drug War. Similar deployments took place the next month in two more states, and five further deployments took place in 2008.[3]

Given increased federal police activity across the country, Genaro García – the Secretary of Public Security – designed a monetary subsidy for municipalities meant to enhance the quality of municipal police forces and improve communications with the federal government. This paper examines this subsidy, called the *Subsidio para la Seguridad de los Municipios* (SUBSEMUN). In 2008, it got a budget of 396.5 million 2019 USD approved by the Federal Chamber of Deputies, and was distributed among 150 municipalities.[4] Different versions of this yearly subsidy have been rolled out since then.

According to the official 2008 subsidy documentation, individual subsidy awards range between 0.99 and 10.5 million 2019 USD, to be paid in three installments during the year.[5] To receive this money, municipalities must comply with personalized agreements that specify the immediate objectives of the award. Figure A.1 illustrates the contents of one such agreement.

These agreements reveal the subsidy is meant to enhance municipal police forces and strengthen their cooperation with the Federal Police. To achieve the former objective, the subsidy mandates purchases of equipment complementary to labor in the production of public security (e.g. guns, ammunition, vehicles, computers); improvements to municipal police buildings; and wage increases for municipal police officers. These wage increases must be financed with the municipalities' own funds. To achieve the latter objective, the subsidy requires municipalities to have their police force evaluated by the Secretariat of Public Security, and to join *Plataforma México* – the internal criminal information-sharing platform designed by the Federal Government.

In practice, these requirements did not affect participation in the subsidy because all eligible municipalities were enrolled.[6] Moreover, municipalities tend to remain in the program: only two municipalities out of the 150 selected dropped out in the $2008 - 2012$ period.

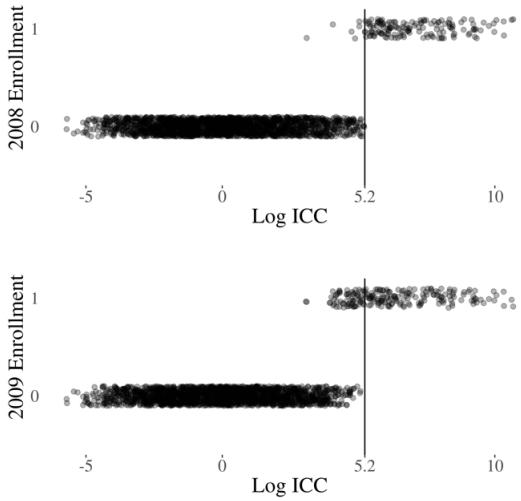
[3] See Merino (2011) for an outline of these deployments.

[4] In Mexico, there are currently $2,458$ municipalities. Most of them are small and sparsely populated: according to the 2010 census, the 300 most populated municipalities accounted for 70.4% of Mexico's population, which equals 112.3 millions.

[5] The installments are 30% in April, 30% in July, and 40% in October

[6] Every eligible municipality appears in the 2008 end-of-year documentation available in the SUBSEMUN archives in Mexico City.

Figure 1: 2008-2009 Subsidy Enrollment



Source: Official documentation of SUBSEMUN 2008 and 2009 and INEGI's crime and population statistics.
Notes: The horizontal axis measures the log of ICC in each panel. The vertical axis measures whether the municipality is enrolled in the subsidy or not. A small amount of random vertical noise is included for visualization purposes.

Eligibility Criteria

The rules governing municipal enrollment to the subsidy are explained in the official subsidy documentation.[7] Every municipality is assigned a criminality index, called the ICC, defined for municipality i as:

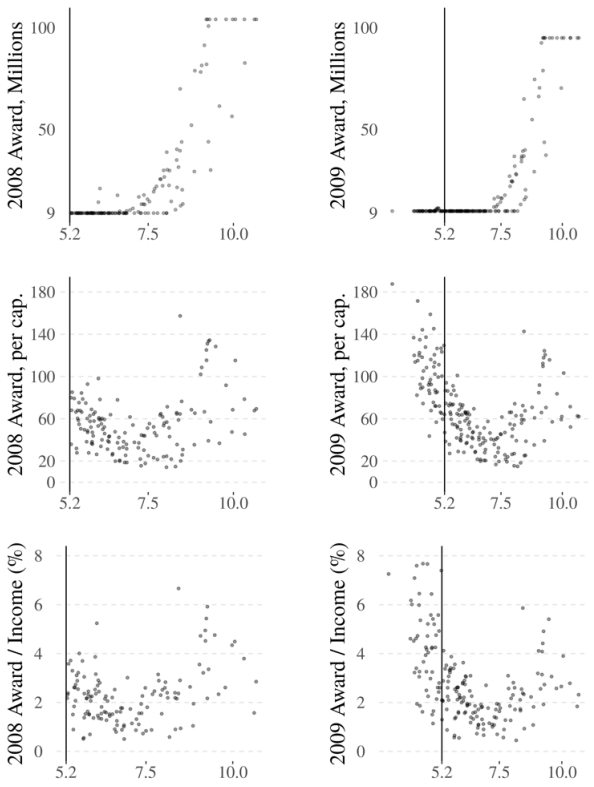
$$ICC_i = crimes_i \times \frac{population_i}{100,000}, \tag{1}$$

where $crimes_i$ is a measure of crimes committed in municipality i between 1997 and 2005 and $population_i$ is the municipality's population in 2005. Both measures come from the National Institute of Statistics and Geography (INEGI), so the ICC is observable. Eligibility is then awarded to the two municipalities within each of Mexico's 32 states with the highest ICC, and then to the remaining 86 municipalities with the highest ICC countrywide. Following these instructions, I replicated the official list of municipalities selected for the subsidy for 2008.

[7] The rules presented here were published in the *Diario Oficial de la Federación* on January 15, 2008 and can be found in `http://www.dof.gob.mx/nota_detalle.php?codigo=5028260&fecha=15/01/2008`, accessed on 08-05-2019.

The top panel of Figure 1 shows a municipal-level scatterplot (with a small amount of vertical noise) that relates official enrollment to the subsidy with logged ICC. It reveals that, if eligibility was simply awarded to the 150 municipalities with the highest ICC, then only six municipalities would be misclassified.[8] For the rest of the paper, I drop these municipalities from analysis, so that enrollment status in 2008 is a step function of ICC.

Figure 2: 2008-2009 Subsidy Awards



Source: 2008 and 2009 SUBSEMUN municipal agreements and INEGI's crime population and municipal income statistics.
Notes: The horizontal axis measures the log of ICC in every panel. The unit of the vertical axis is millions of nominal mexican pesos for the top panels, and nominal mexican pesos per capita for the bottom ones.

The bottom panel of Figure 1 reveals a feature that drives the interpretation of our regression discontinuity estimates: municipalities right below the cutoff

[8] The 6 eligible municipalities with ICC below the cutoff are located in the sparsely populated, low crime states of Aguascalientes, Hidalgo, Nayarit, Tlaxcala and Yucatán.

became enrolled in 2009. As will be seen in our econometric framework, this means that the untreated counterfactual status is one where the municipality enrolls in the subsidy in 2009. Naturally, this nuanced interpretation is only warranted for outcomes beyond 2008. Our focus is mostly on 2008 outcomes.

Interestingly, the ICC should not be thought of as a measure of crimes per 100,000 inhabitants: otherwise, $crimes_i$ should be multiplied by the reciprocal of $\frac{population_i}{100{,}000}$. Whether this measure is the one that the Secretariat of Public Security actually intended to use or not is beyond the scope of this paper. I simply note that, had a measure of crimes per $100,000$ people been used, many small, sparsely populated municipalities would have been eligible.

Regarding money amounts, the 2008 rules restrict awards to range between $\$9,000,000$ MXN and $\$104,092,600$MXN.[9] In practice, 54% of enrolled municipalities – or 81 municipalities – were assigned the minimum amount. The top left panel of Figure 2 illustrates this by relating municipal money awards (in millions of nominal mexican pesos) with $\log(ICC)$. It shows that municipalities above but near the cutoff received this minimum amount. In addition, the top right panel shows that municipalities below but near the cutoff also received $\$9,000,000$ MXN.

Although these two features clarify the meaning of the intervention near the cutoff, there is substantial heterogeneity in the per-capita award amounts, as shown in the middle two panels of Figure 2. This heterogeneity must be taken into account when looking for a more precise – monetary – interpretation of our results, required for a cost-benefit analysis of the subsidy. As will be seen in the econometric framework, the causal estimates do not contain such a precise interpretation. One reason for this is that no rules to decide award amounts were made public.[10]

Finally, the bottom left panel of Figure 2 shows that the share of municipalities' anual income accounted for by the subsidy ranged from 0.5 to 4 percent. This notion of income includes all tax revenue, revenue from the sale of government services (e.g. garbage collection), and all contributions made by state and federal governments. The bottom right panel shows the subsidy is relatively larger for municipalities enrolled in 2009, representing between 1 and 8 percent of their income. This is natural since, as will be seen in the summary statistics, municipal population is increasing in the ICC.

Econometric Framework

We evaluate this subsidy based on the discontinuity in treatment assignment discussed previously. Denote the ICC cutoff by k and let i and t index municipalities and years, respectively.[11] We will report estimates that correspond

[9] Or 0.99 and 10.5 million 2019 USD.

[10] However, an *ad-hoc* attempt at explaining the variance of *per capita* award amounts is described in section B of the appendix. It shows that an allocation that keeps the ratio of money awards to ICC constant across municipalities subject to the specified money award ranges explains 98% of the variation in money amounts.

[11] Cutoff k is given by the 144^{th} highest municipal ICC.

to the coefficient on $\mathbb{1}\{ICC_i \geq k\}$ in the regression specified by the following equation:

$$\begin{aligned} Y_{it} \quad &= \quad \beta_0 \; + \; \beta_1 \mathbb{1}\{ICC_i \geq k\} \; + \; f(ICC_i - k) \\ &\quad + \; \beta_2 \mathbb{1}\{ICC_i \geq k\} g(ICC_i - k) \; + \; \epsilon_{it}, \end{aligned} \tag{2}$$

where f and g are polynomials with the same degree.

To discuss the meaning of this estimand, define Y_{it}^{y} as municipality i's outcome in year t had it enrolled in the subsidy in year y. Because municipalities right below the ICC cutoff were enrolled in the program in 2009, as evidenced in the bottom Panel of Figure 1, the regression discontinuity identification assumption required in this setting for any year t is the following.

Assumption 1. $\mathrm{E}[Y_t^{2009} \mid ICC = icc]$ *is continuous as* $icc = k$.

If Assumption 1 holds, then

$$\begin{aligned} & \mathrm{E}[Y_t \mid ICC = k] - \lim_{icc \uparrow k} \mathrm{E}[Y_t \mid ICC = icc] \\ = \; & \mathrm{E}[Y_t^{2008} \mid ICC = k] - \lim_{icc \uparrow k} \mathrm{E}[Y_t^{2009} \mid ICC = icc] \\ = \; & \mathrm{E}[Y_t^{2008} \mid ICC = k] - \mathrm{E}[Y_t^{2009} \mid ICC = icc] \\ = \; & \mathrm{E}[Y_t^{2008} - Y_t^{2009} \mid ICC = k], \end{aligned}$$

and since the population coefficient on $\mathbb{1}\{ICC_i \geq k\}$ approximates $\mathrm{E}[Y_t \mid ICC = k] - \lim_{icc \uparrow k} \mathrm{E}[Y_t \mid ICC = icc]$, we can interpret the sample estimates as measures of the causal effect of enrolling in the program in 2008 instead of 2009 for those municipalities that have an ICC located at the cutoff.

2 Data

Data Sources

The data are at the municipal-year level and contain subsidy, administrative, electoral and criminal information.

The subsidy information comes from the official government publication – the *Diario Oficial de la Federación* – and the physical archives of the agency that currently manages the subsidy – the *Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*. The publication made available rules and regulations for the subsidy allocation; criteria to determine municipal eligibility; the lists of selected municipalities; as well as individual municipal agreements with the federal government. Appendices to these agreements detail investments and purchases to be made with the subsidy money and were sourced from the archives. Figure (A.1) of the appendix shows parts of one such document.

Administrative information is sourced from the 2005 short-format census run by INEGI, and from a municipal government census conducted by INEGI

in 2009-2010 that provides granular information from 2008 on government assets, municipal police activity and employment, and the municipal justice system. Unfortunately, it is possible to have municipal administrations that fill in census forms but did not govern during 2008. I avoid such cases in the analysis by restricting attention to municipalities that were governed by a single administration from February 2008 to March 2010 – the last month in which information was obtained by INEGI.[12]

I obtained voting outcomes for federal deputy elections from the National Electoral Institute. These outcomes are available at the smaller electoral precinct level, so that computation of municipal-level vote shares is straightforward. I focus federal deputy elections because the was one such national election close to the rollout date of the subsidy, in July 2009. In contrast, presidential elections did not take place until July 1, 2012.

Our main measure of homicides is sourced from a compilation of death records reported by the Bureaux of Vital Records across the country and the agencies of the *Ministerio Público* made by INEGI. These compilations offer homicide information going back to 1990. We will refer to these data as the *Forensic* data.

A second source of homicide data comes from the 2007-2011 internal government records of deadly events related to organized crime. This previously confidential information was published by the Drug Policy Institute at CIDE in 2016. It records deaths due to executions, aggressions, and confrontations. Because these categories are not clearly defined, I simply consider the total amounts of homicides in a given municipality-year. These data are officially known as the *Base de Eventos PPD*, and we will refer to them as the *BE-PPD* data.

We will also employ broader criminal information compiled by INEGI during 1997-2012 from the records of trials in Mexico's district courts. These are the lowest courts in the hierarchy of the federal judicial system and they deal with all federal offences.[13] These offences include most crimes, e.g. homicides, robbery, fraud or trafficking of illegal substances.[14] We will refer to these data as the *Judicial* data.

Finally, I employ the dataset on drug trade organization presence of Coscia and Rios (2012). They encode the presence of major organizations in a binary variable at the municipal level, between 2004 and 2010.

Summary Statistics

Figures 3 and 4 provide summary statistics.

In particular, the top panel of Figure 3 shows a global binscatter of logged population on $\log(ICC)$ and a global fourth-order polynomial. It shows that log

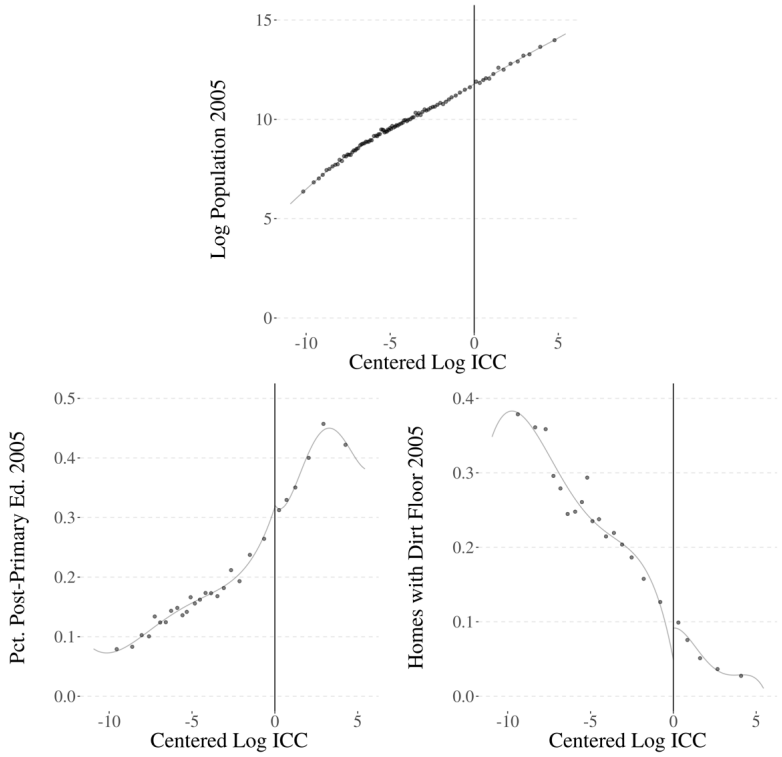
[12] I chose February as the starting month because January 2008 was a month in which many municipal governments were sworn in.

[13] See the *Ley Orgánica del Poder Judicial de la Federación*, title 4^{th} for the official organization and responsibilities of district courts.

[14] The full list of federal offences in 2008 is available upon request.

population is increasing with $log(ICC)$, and that this relationship is linear. This is not surprising: the ICC, defined in (1), is proportional to population squared provided the crime rate is held constant. Because of this relationship between the ICC, population and crimes, the local nature of our regression discontinuity estimates is important when interpreting our results. On average, municipalities at the cutoff have 129 thousand inhabitants.[15] Moreover, municipalities above the ICC cutoff accounted for 57.7% of Mexico's population in 2005.

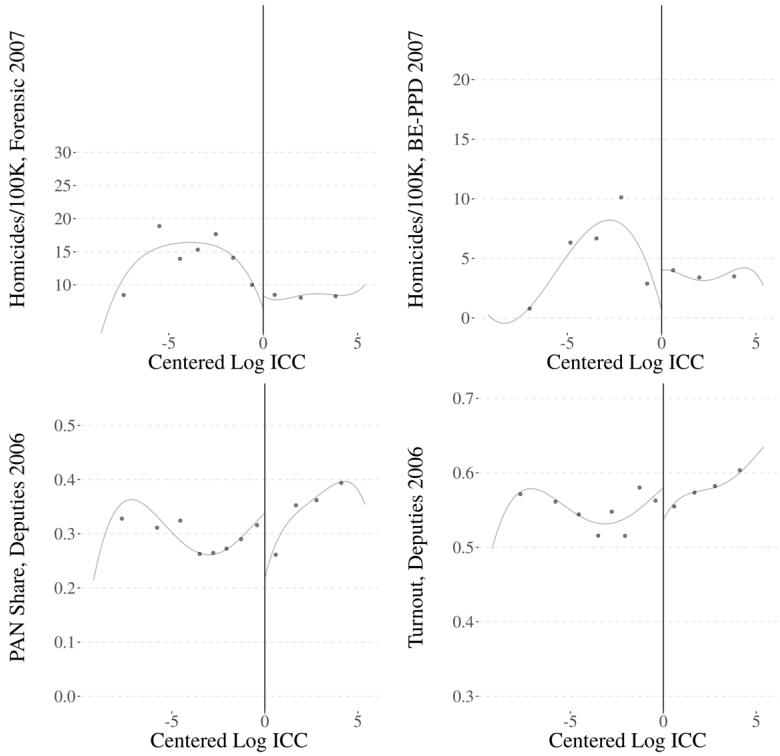
Figure 3: Population and Economic Characteristics by log(ICC)



Notes: This figure contains quantile-spaced binscatters and fourth-order polynomial fits for all municipalities in Mexico for which there is data. Every dependent variable is sourced from INEGI's *II Conteo de Población y Vivienda 2005*. Of the 2413 municipalities that appear in this census, 2169 have the crime data needed to construct the ICC. The number of bins was chosen so as to minimize the integrated mean-squared error of the local means estimator. See Calonico, Cattaneo, and Rocio Titiunik (2015) for details. In the bottom-left panel, the dependent variable is the percentage of municipal population at or above 15 years of age with at least one year of post-primary education. In the bottom-right, it is the percentage of homes in the municipality with dirt floor.

[15] In the graph, log population equals 11.77 at the cutoff.

Figure 4: Homicides and Electoral Results before 2008 by log(ICC)



Notes: See Figure 3. The dependent variable in the top left panel is the municipal homicide rate from the *Forensic* data. The homicide rate in the top right panel comes from the *BE-PPD* data. The bottom two panels depict the municipal vote share for the *PAN* party and turnout for the 2006 federal elections.

In turn, the bottom two panels of Figure 3 reveal that municipalities with higher ICC are richer and better educated. At the cutoff, a third of the municipal population above 14 years of age has completed a schooling year beyond primary school and 10% of homes have dirt floors, on average. These two panels also provide initial evidence in support of the identification assumption 1 for $t = 2005$, since both outcomes are seen to vary continuously at the cutoff. Formal tests fail to reject the hypothesis of continuity in the conditional expectation of these outcomes in Appendix Table A.1.

Figure 4 inspects the homicide and electoral patterns prior to the rollout of the subsidy. In particular, the top left panel shows considerable variation in homicide rates across ICC levels. The rate at the cutoff is roughly similar to the nationwide homicide rate in 2007: 8.3. The homicides in the *BE-PPD* data show a similar pattern and appear to account for about half the homicides in

the *Forensic* data.

Finally, the bottom two panels of Figure 4 show that the population in municipalities with higher ICC were slightly more supportive of the ruling PAN party and more likely to vote. However, the differences shown in these global binscatters are not statistically significant.

3 Results

This section presents the main results of the paper. Within our regression discontinuity framework, we first examine the effects of subsidy enrollment on the composition and activities of municipal police and the municipal justice system, as well as the relationship between municipal and federal police. This analysis sheds light on the nature of the subsidy and therefore clarifies the interpretation of our results on criminal and electoral outcomes.

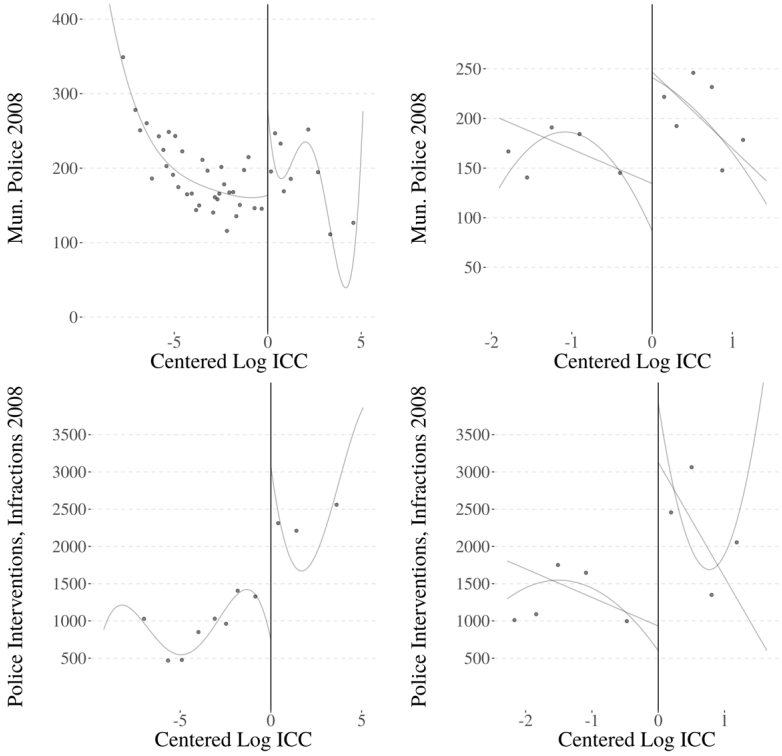
Effects on Municipal Law Enforcement

Figure 5 shows the effects of the subsidy on the size of municipal police per $100,000$ people in the top panels, and on the number of municipal police interventions due to infractions per $100,000$ people in the bottom panels. Infractions are non-severe violations of law, such as traffic violations, as opposed to other more severe crimes like robberies. The horizontal axis of each panel is the logged ICC, centered at the discontinuity in enrollment status. Panels to the left show global binscatters and a fourth-order polynomial fit of the data, estimated separately on each side of the cutoff, as per our specification in (2). Panels to the right show local binscatters as well as linear and quadratic fits on each side of the cutoff. The bandwidth in these panels is different on each side of the cutoff and is chosen so as to minimize the mean squared error of the local linear regression discontinuity estimator.[16]

The top right panel in figure 5 shows that the subsidy increased the amount of police officers by 111 according to the linear specification. This result is non-trivial. On the one hand, the subsidy mandated purchases of equipment that is complementary with police officers in the production of public security, thus shifting out municipal demand for police labor. On the other hand, the subsidy was conditional on officer wage increases to be paid out of the municipality's own funds, thus establishing a price floor for this input and reducing quantity demanded of police labor. I then view a growing police force as evidence that the subsidy effectively handed out complementary inputs, such as the ones detailed in A.1. This finding is replicated in column (1) of the first row of Panel A in Table 1, along with the 95% confidence intervals, the estimate's p-value, and the number of observations used of estimation on each side of the cutoff. The confidence intervals and p-values are robust bias corrected and clustered at the state level. Columns (2), (3) and (4) add demographic, state, and both demographic and state controls, respectively.

[16] See Cattaneo, Idrobo, and Rocío Titiunik (2018) for details.

Figure 5: Effects on Municipal Police



Notes: This figure shows the amount of municipal police officers per 100,000 people in the top panels and the number of municipal police interventions per 100,000 people in the bottom panels, as a function of $log(ICC)$. Each panel contains a quantile-spaced binscatter with the number of bins chosen as advocated in Calonico, Cattaneo, and Rocio Titiunik (2015). The panels to the left show all available data with a fourth order polynomial fit based on the regression specified in (2). The panels to the right use triangular weights around the cutoff and choose the bandwidths on each side of the cutoff separately, so as to minimize the mean squared error of the local linear regression discontinuity estimator. See Cattaneo, Idrobo, and Rocío Titiunik (2018) for further details.

Table 1: Effects on Municipal Law Enforcement

		RD (1)	RD + state (2)	RD + dem (3)	RD + state + dem (4)
Panel A: Municipal Police					
Police/100K 2008		111.18	129.4	142.08	64.78
	95pct CI	[-5.37, 265.3]	[69.89, 220.82]	[43.29, 280.74]	[-34.58, 201.38]
	p-value	0.06	0	0.01	0.17
	N_l, N_r	66, 21	40, 20	44, 16	40, 17
High-ranked Male Police/100K 2008		115.7	129.67	163.06	96.18
	95pct CI	[15.68, 286.99]	[69.23, 227.94]	[98.07, 309.27]	[23.45, 210.36]
	p-value	0.03	0	0	0.01
	N_l, N_r	56, 20	43, 21	36, 19	30, 16
Computers 2008		6.71	6.34	4.26	8.92
	95pct CI	[-2.09, 23.26]	[0, 12.38]	[-2.11, 14.95]	[-2.54, 21.15]
	p-value	0.1	0.05	0.14	0.12
	N_l, N_r	141, 20	89, 11	51, 15	63, 6
Interventions/100K, Infractions 2008		2175.57	2210.76	2755.53	1944.82
	95pct CI	[299.69, 4910.46]	[341.52, 4704.91]	[511.11, 5811.84]	[310.86, 4947.37]
	p-value	0.03	0.02	0.02	0.03
	N_l, N_r	89, 22	93, 12	42, 16	114, 17
Interventions/100K, Crimes 2008		1267.62	-1016.91	-625.51	-486.08
	95pct CI	[-1067.42, 2986.44]	[-2799.63, -14.56]	[-4386.7, 864.34]	[-2072.54, 707.39]
	p-value	0.35	0.05	0.19	0.34
	N_l, N_r	40, 22	34, 13	47, 16	41, 15
Panel B: Municipal Justice					
Mun. Justice Fines/100K 2008		852.55	816.5	1008.8	354.88
	95pct CI	[145.24, 1991.57]	[370.44, 1549.54]	[270.75, 2172.53]	[-98.77, 1132.81]
	p-value	0.02	0	0.01	0.1
	N_l, N_r	60, 22	52, 20	36, 19	61, 16
Mun. Justice Arrests/100K 2008		503.46	-804.81	1260.87	-978.68
	95pct CI	[-1676.74, 2427.63]	[-4439.73, 1684.05]	[-462.14, 2982.47]	[-4559.61, 2381.38]
	p-value	0.72	0.38	0.15	0.54
	N_l, N_r	51, 17	93, 20	45, 12	75, 16
Panel C: Relationship with Federal Police					
Fed. Police Cases/100K 2008		8.53	7.75	11.69	11.85
	95pct CI	[2.27, 19.13]	[3.48, 14.75]	[8.32, 19.35]	[7.29, 18.42]
	p-value	0.01	0	0	0
	N_l, N_r	35, 23	42, 20	36, 21	43, 16
Homicides/100K, Forensic - BE-PPD 2008		1.14	-1.23	1.5	-1.88
	95pct CI	[-4.96, 8.05]	[-4.64, 1.92]	[-3.58, 7.48]	[-4.5, 0.55]
	p-value	0.64	0.42	0.49	0.13
	N_l, N_r	116, 91	87, 61	168, 82	98, 43

Notes: This table presents regression discontinuity estimates, 95% confidence intervals, and the number of observations within the bandwidth on each side of the cutoff for linear specifications of equation (2). Point estimation uses triangular weights around the cutoff and bandwidths of different sizes that minimize the mean squared error of the local linear regression discontinuity estimator. Confidence intervals and p-values are robust bias corrected and clustered at the state level. Column (1) reports the estimates without added covariates; column (2) includes municipal demographic characteristics from 2005; column (3) includes state fixed effects; and column (4) includes the demographic characteristics and state fixed effects. The municipal demographic characteristics are: % illiterate population; % that does not speak spanish; % with no schooling; % with some schooling; % with post-primary education; % without access to healthcare; indigenous language prevalence; share of homes with dirt floor, a single bedroom, no access to tap water, no sewage.

The next two sets of estimates in Panel A of Table 1 provide further evidence on the wage and complementary input effects of the subsidy. In particular, wage increases can be seen by the large, positive and statistically significant increase in the narrow labor category of male, high-earning police officers; and increases in inputs can be seen from a positive but imprecisely estimated increase in the stock of computers used for public security by the municipal government.[17] The baseline estimate implies the subsidy raised this stock by 6.7 computers on average (and for municipalities at the ICC cutoff).[18]

Overall, these findings suggest that the subsidy did work as planned: it caused municipal police forces to have more equipment and perceive higher wages.

In turn, the bottom right panel of Figure 5 shows that the subsidy also led to more policing activity: it caused a tripling of recorded police interventions related to infractions. This, however, cannot be said of police interventions related to crimes, as can be seen in the last two rows of Panel A in Table 1.

Panel B of Table 1 corroborates this by inspecting the effects on sanctions dictated by the municipal justice systems. Specifically, the baseline estimates indicate that the subsidy caused a substantial increase in fines of about 852 for every $100,000$ people. In contrast, the estimated effect on arrests is statistically indistinguishable from zero.

Effects on Municipal-Federal Cooperation

As explained in section 1, an important goal of the subsidy was to enhance cooperation between the municipal and federal police forces. In practice, measuring this cooperation is challenging, since the deployments of federal police at the time are still considered confidential information. I now present two attempts at measuring this.

Consider first the number cases brought to municipal justices by federal police, as recorded in the municipal census. Panel C of Table 1 documents a significant increase in this measure of 8.5 for every $100,000$ people, from a baseline of about zero.

A second way we may measure the extent of this cooperation is via homicide reporting in the *BE-PPD* data. To do this, let H_t be the true municipal homicide rate in year t and V_t be the municipal homicide rate related to organized crime reported in the *BE-PPD* data in year t. We can write H_t as:

$$H_t = h_t^{oc} + h_t,$$

where h_t^{oc} is the homicide rate due to organized crime and h_t is the homicide rate covering all other homicides. h_t^{oc} can itself be written as:

$$h_t^{oc} = V_t + \tilde{V}_t,$$

[17] This labor category is known in Mexico as *personal de confianza*.

[18] This measure of computers is the number of computers used by the public security forces at the end of 2008 and comes from INEGI's census of municipal governments, conducted between october 12, 2009 and march 31, 2010. Therefore, this is a noisy measure if municipalities do not systematically keep track of this equipment.

where $\tilde{V}_t$ is the organized crime-related homicide rate that is not reported in the *BE-PPD* data. Assuming that the *Forensic* data records H_t, our regression discontinuity framework using outcome $Y_t \equiv H_t - V_t$ approximates:

$$\begin{aligned} & \mathrm{E}[(H_t^{2008} - V_t^{2008}) - (H_t^{2009} - V_t^{2009}) \mid ICC = k] \\ = \; & \mathrm{E}[\tilde{V}_t^{2008} - \tilde{V}_t^{2009} \mid ICC = k] \; + \; \mathrm{E}[h_t^{2008} - h_t^{2009} \mid ICC = k]. \end{aligned} \tag{3}$$

In this last expression, the first term measures the effect of enrolling in the subsidy on the organized crime homicides not reported in *BE-PPD*. Because this data is based on internal communications of federal, state and municipal security agencies, we can view $\tilde{V}_t$ as a measure of (lack of) communication between municipal and federal police forces and thus expect the first term in expression (3) to be negative. Similarly, if the subsidy was effective in deterring homicides unrelated with organized crime, the second term should be negative.

The last specification in Panel C of Table 1 presents our estimates for (3). Surprisingly, the estimates are indistinguishable from zero, so that, under our assumptions, either the subsidy did not enhance municipal-federal communications regarding organized crime homicides, or the subsidy did not decrease homicides unrelated with organized crime. Alternatively, if it did improve these communications, then the homicides were likely not reported within the federal government.

Effects on Criminal and Electoral Outcomes

Table 2 presents our results for criminal and electoral outcomes, in the same format as Table 1. Panel A considers the 2008 homicide rate according to the *Forensic*, *BE-PPD*, and *Judicial* data, as well as the aggregate of all crimes that appear in the *Judicial* data.[19]

The first set of results in Panel A reveals an imprecisely estimated average increase in overall homicides of 8.6 per $100,000$ people for municipalities at the ICC cutoff. This is a large increase in homicides, considering the national homicide rate was 8.3 in 2007. Moreover, this apparent increase in homicides seems centered around organized criminal activity: the increase in the homicide rate measured in the *BE-PPD* data is 7.59. This estimate is more precisely measured, but still insignificant at the 5% level. In contrast to this apparent increase in violence due to the subsidy, Panel A shows there is no change in the number of homicides or aggregate crimes considered by district courts in Mexico. Taken as a whole, this evidence implies the subsidy caused a decline in Mexico's joint policing efficiency for serious crimes within municipalities at the ICC cutoff, as measured by the share of homicides that reach Mexico's judicial system.

Relatedly, Panel B shows that the subsidy reduced the vote share for the president's party – the PAN – by 7.8 percentage points in the 2009 federal

[19] This crime measure consists of all potential federal offences considered by Mexico's district courts.

Table 2: Effects on Criminal and Electoral Outcomes

		RD (1)	RD + state (2)	RD + dem (3)	RD + state + dem (4)
Panel A: Criminal Effects, All					
Homicides/100K, Forensic 2008		8.59	3.05	8.65	3.51
	95pct CI	[-3.54, 24.39]	[-1.63, 9.01]	[-1.98, 22.44]	[-1.26, 9.14]
	p-value	0.14	0.17	0.1	0.14
	N_l, N_r	149, 73	135, 44	114, 80	126, 53
Homicides/100K, BE-PPD 2008		7.59	3.99	8.5	4.97
	95pct CI	[-1.93, 20.58]	[-1.2, 9.97]	[-0.03, 20.1]	[0.06, 10.49]
	p-value	0.1	0.12	0.05	0.05
	N_l, N_r	155, 69	201, 44	110, 78	150, 49
Homicides/100K, Judicial 2008		0.34	-0.07	-1.02	0.02
	95pct CI	[-4.3, 4.38]	[-3.33, 2.55]	[-6.83, 3.57]	[-3.66, 3.13]
	p-value	0.99	0.79	0.54	0.88
	N_l, N_r	966, 70	330, 61	444, 59	207, 53
Crimes/100K, Judicial 2008		15.53	18.13	-6.04	12.34
	95pct CI	[-69.98, 97.06]	[-46.09, 90.75]	[-72.45, 76.15]	[-53.3, 78.45]
	p-value	0.75	0.52	0.96	0.71
	N_l, N_r	1149, 69	288, 49	783, 80	213, 43
Panel B: Electoral Effects, All					
PAN Share, Deputies 2009		-0.0776	-0.0458	-0.0903	-0.0652
	95pct CI	[-0.1878, 0.0257]	[-0.0898, -0.0015]	[-0.1788, -0.0098]	[-0.1077, -0.0263]
	p-value	0.1367	0.0428	0.0287	0.0012
	N_l, N_r	345, 80	323, 63	268, 77	225, 53
Turnout, Deputies 2009		-0.0537	-0.0405	-0.0445	-0.0214
	95pct CI	[-0.1321, 0.0132]	[-0.0626, -0.024]	[-0.1097, 0.0097]	[-0.041, -0.0065]
	p-value	0.1088	0	0.1006	0.0069
	N_l, N_r	341, 75	331, 39	245, 77	159, 43
Panel C: Criminal Effects, DTO Presence					
Homicides/100K, Forensic 2008		14.23	8.4	16	12.21
	95pct CI	[3.03, 31.28]	[4.32, 14.45]	[6.8, 31.28]	[7.63, 19.09]
	p-value	0.02	0	0	0
	N_l, N_r	58, 52	69, 32	57, 51	69, 36
Homicides/100K, BE-PPD 2008		13.62	11.35	14.75	10.15
	95pct CI	[3.33, 29.13]	[6.08, 20.05]	[6.21, 28.09]	[5.5, 16.2]
	p-value	0.01	0	0	0
	N_l, N_r	98, 51	116, 43	61, 48	62, 32
Homicides/100K, Judicial 2008		0.03	-0.28	-0.01	0.86
	95pct CI	[-5.88, 5.18]	[-4.33, 3.25]	[-6.04, 5.46]	[-3.12, 4.52]
	p-value	0.9	0.78	0.92	0.72
	N_l, N_r	172, 82	135, 55	143, 69	139, 55
Crimes/100K, Judicial 2008		30.72	57.44	10.55	73.89
	95pct CI	[-77.45, 150.16]	[-16.32, 145.45]	[-74.15, 118.05]	[26.37, 140.99]
	p-value	0.53	0.12	0.65	0
	N_l, N_r	247, 67	172, 42	217, 75	137, 40
Panel D: Electoral Effects, DTO Presence					
PAN Share, Deputies 2009		-0.1311	-0.1115	-0.1266	-0.0925
	95pct CI	[-0.2523, -0.0432]	[-0.1934, -0.0464]	[-0.2204, -0.0677]	[-0.1621, -0.0467]
	p-value	0.0056	0.0014	0.0002	0.0004
	N_l, N_r	103, 71	80, 64	104, 69	77, 71
Turnout, Deputies 2009		-0.0596	-0.0241	-0.0583	-0.0261
	95pct CI	[-0.1335, -0.0064]	[-0.0539, -0.0026]	[-0.1152, -0.0232]	[-0.0551, -0.0045]
	p-value	0.0309	0.0308	0.0032	0.021
	N_l, N_r	225, 56	133, 53	171, 65	119, 47

Notes: This table presents regression discontinuity estimates, 95% confidence intervals, and the number of observations within the bandwidth on each side of the cutoff for linear specifications of equation (2). Point estimation uses triangular weights around the cutoff and bandwidths of different sizes that minimize the mean squared error of the local linear regression discontinuity estimator. Confidence intervals and p-values are robust bias corrected and clustered at the state level. Point estimation uses triangular weights around the cutoff and bandwidths of different sizes that minimize the mean squared error of the local linear regression discontinuity estimator. The same demographic controls are used as in Table 1 and the structure of these two tables is the same.

deputies election, carried out on July 5. Overall, this election proved detrimental to the PAN, who lost its relative majority in the chamber of deputies to the PRI.

So far, I have shown point estimates that are important in magnitude, but imprecisely estimated. Guided by the similar increase in the overall homicide rate (*Forensic* data) and the homicide rate related to organized crime (*BE-PPD* data), I now specialize our analysis to those municipalies with presence of a major Drug Trade Organization (DTO).

The top panels in Figure 6 show global and local binscatters as well as poynomial fits that summarize the relationship between the share of municipalities in which a DTO operates and the logged ICC. These two panels reveal that major DTOs operate in 80% of municipalities around the cutoff, and in over 60% of municipalities within 1 log ICC point of the cutoff.

The rest of the panels in Figure 6 consider only municipalities with the presence of a DTO and present the subsidy effects on overall homicides, homicides related to organized crime, and the PAN vote share in the 2009 federal deputies election. For each of these outcomes, the panels to the right show point estimates that are larger in absolute value than those found when considering all municipalities. For this subset of municipalities, the subsidy doubled the overall homicide rate, tripled the homicide rate related with organized crime, and reduced the PAN vote share in the 2009 election by over 10 percentage points. These large estimates are shown to be statistically significant in Panels C and D of Table 2. As in Panel A, the subsidy did not affect the number of homicide or overall crime cases considered by district courts.

To summarize, the subsidy caused a large increase in homicides in places where drug trafficking organizations operate. This increase in homicides is mostly related with organized criminal activities and is not reflected in Mexico's federal judicial system. Moreover, such violence increase is accompanied by a substantial reduction in the president party's popularity.

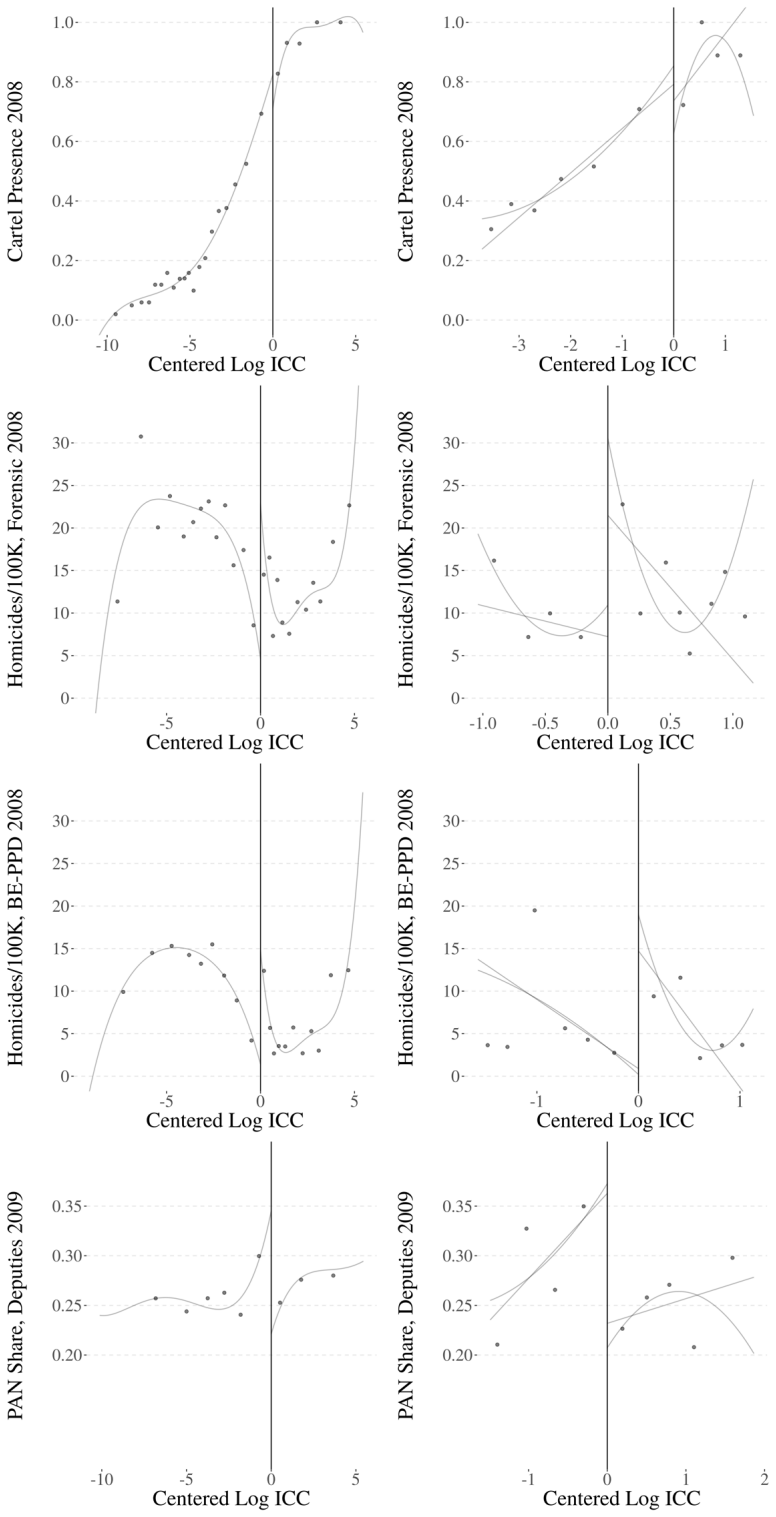
Discussion

Overall, there are contrasting effects of this subsidy. It did not increase municipal police and municipal justice activity regarding high-level criminal activity such as federal offences, but it tripled organized crime-related homicides in municipalities with presence of a drug trade organization. That is, there was a sharp increase in organized crime homicides in the absence of municipal police crackdowns.

But the subsidy was not a failure. It extended municipal police activity within its traditional scope, described by Fondevila and Meneses Reyes 2017 as low-intensity law enforcement services necessary for day-to-day conflict resolution at a local scale.

With no municipal police crackdown on organized crime, the subsidy is unlikely to have influenced organized criminal activity through the increase in municipal police size. I then posit the other facet of the subsidy – that dealing with improved communications and cooperation with the Secretariat of Public Security – as the driving force behind its violent consequences. Unfortunately,

Figure 6: Effects on municipalities with a DTO



Notes: This figure shows regression discontinuity plots for (from top to bottom): an indicator variable for drug cartel presence; the number of homicides per 100,000 population according to the *Forensic* data; the corresponding homicide rate with the *BE-PPD* data; and the PAN vote share in the 2009 federal deputies election. See Table 5 for technical details.

more data on the extent of this cooperation is required more data to further examine this hypothesis.

4 Conclusion

I examine the consequences of a security subsidy aimed at improving municipal police forces in 2008, the year in which Mexico's homicide rate radically reversed a 15 year downward trend. The findings are as follows. The subsidy increased the size of municipal police despite the introduction of a wage floor for police officers, thus likely providing municipalities with the policing equipment detailed in the individual agreements signed between municipal governments and the Secretariat of Public Security. Coupled to this police size increase, the subsidy caused more policing and municipal justice activity centered on low-level crimes, called infractions. This type of activity is what municipal police specializes in, so that this result is evidence the subsidy did enhance municipal policing. However, a possibly unintended consequence of the subsidy was a sharp increase in homicides related to organized criminal activities. I attribute this consequence not to the increased local municipal policing activity, but to the enhanced communication and cooperation channels the Secretariat of Public Security established with municipal police forces. More information on the operations of the Federal Police during this time period is needed to explore the consequences of improved federal-municipal communications on organized crime homicides.

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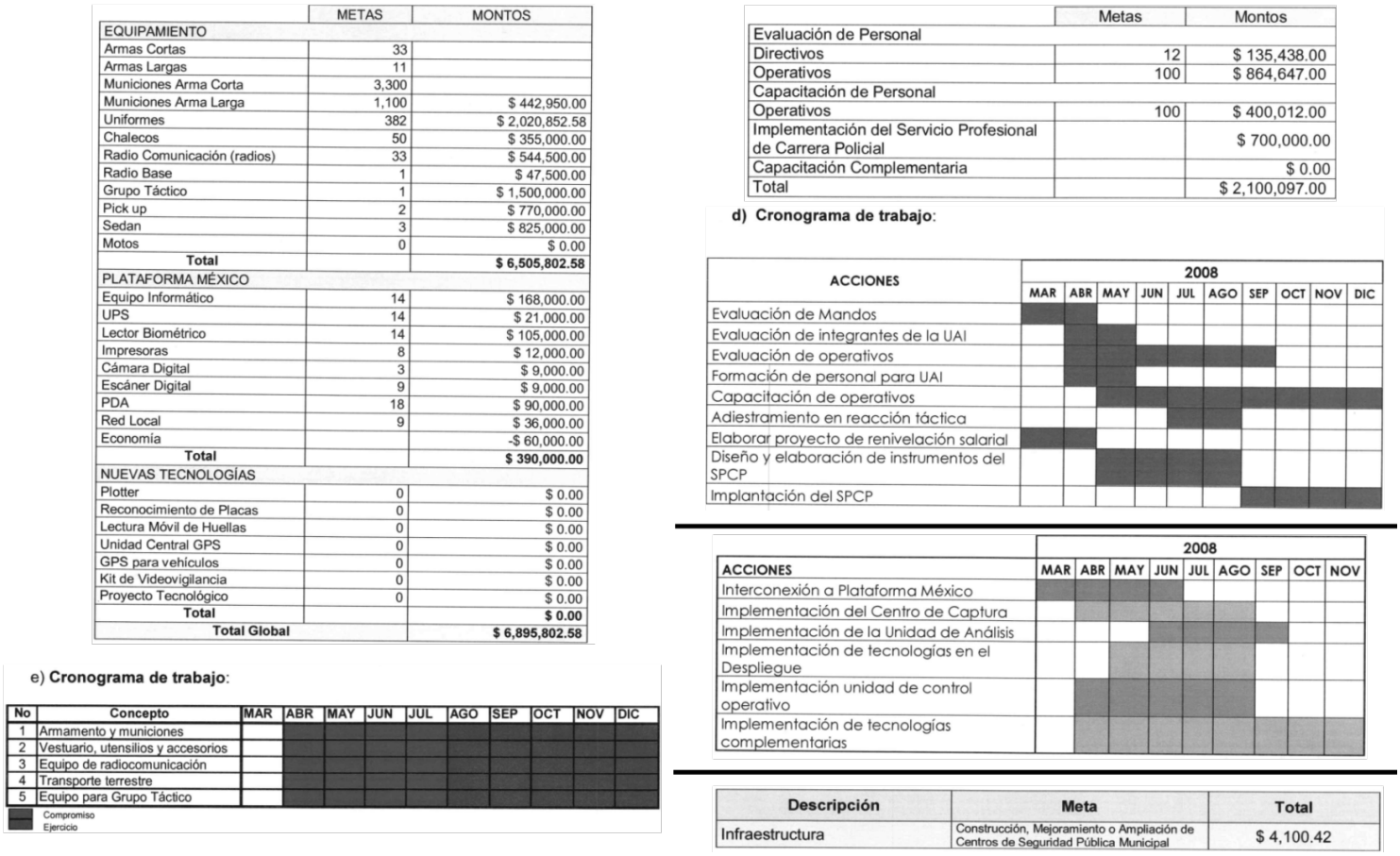
A Additional Figures and Tables

Figure A.1: Collage of a Municipal Agreement



	METAS	MONTOS
EQUIPAMIENTO		
Armas Cortas	33	
Armas Largas	11	
Municiones Arma Corta	3,300	
Municiones Arma Larga	1,100	$ 442,950.00
Uniformes	382	$ 2,020,852.58
Chalecos	50	$ 355,000.00
Radio Comunicación (radios)	33	$ 544,500.00
Radio Base	1	$ 47,500.00
Grupo Táctico	1	$ 1,500,000.00
Pick up	2	$ 770,000.00
Sedan	3	$ 825,000.00
Motos	0	$ 0.00
Total		**$ 6,505,802.58**
PLATAFORMA MÉXICO		
Equipo Informático	14	$ 168,000.00
UPS	14	$ 21,000.00
Lector Biométrico	14	$ 105,000.00
Impresoras	8	$ 12,000.00
Cámara Digital	3	$ 9,000.00
Escáner Digital	9	$ 9,000.00
PDA	18	$ 90,000.00
Red Local	9	$ 36,000.00
Economía		-$ 60,000.00
Total		**$ 390,000.00**
NUEVAS TECNOLOGÍAS		
Plotter	0	$ 0.00
Reconocimiento de Placas	0	$ 0.00
Lectura Móvil de Huellas	0	$ 0.00
Unidad Central GPS	0	$ 0.00
GPS para vehículos	0	$ 0.00
Kit de Videovigilancia	0	$ 0.00
Proyecto Tecnológico	0	$ 0.00
Total		**$ 0.00**
Total Global		**$ 6,895,802.58**

e) **Cronograma de trabajo**:

No	Concepto	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC
1	Armamento y municiones										
2	Vestuario, utensilios y accesorios										
3	Equipo de radiocomunicación										
4	Transporte terrestre										
5	Equipo para Grupo Táctico										

Compromiso
Ejercicio

	Metas	Montos
Evaluación de Personal		
Directivos	12	$ 135,438.00
Operativos	100	$ 864,647.00
Capacitación de Personal		
Operativos	100	$ 400,012.00
Implementación del Servicio Profesional de Carrera Policial		$ 700,000.00
Capacitación Complementaria		$ 0.00
Total		$ 2,100,097.00

d) **Cronograma de trabajo**:

ACCIONES	2008									
	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC
Evaluación de Mandos										
Evaluación de integrantes de la UAI										
Evaluación de operativos										
Formación de personal para UAI										
Capacitación de operativos										
Adiestramiento en reacción táctica										
Elaborar proyecto de renivelación salarial										
Diseño y elaboración de instrumentos del SPCP										
Implantación del SPCP										

ACCIONES	2008								
	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV
Interconexión a Plataforma México									
Implementación del Centro de Captura									
Implementación de la Unidad de Análisis									
Implementación de tecnologías en el Despliegue									
Implementación unidad de control operativo									
Implementación de tecnologías complementarias									

Descripción	Meta	Total
Infraestructura	Construcción, Mejoramiento o Ampliación de Centros de Seguridad Pública Municipal	$ 4,100.42

B On the Allocation of Money Awards

In this section I describe an *ad-hoc* money allocation that explains 98% of the variation in subsidy awards for the 2008 edition of the subsidy. To set up the problem, we take the total funds approved by the Federal Chamber of Deputies and the upper and lower bounds on money awards as given. The former may be reasonable, but the bounds on money awards are a choice variable of the

Table A.1: Continuity check on Demographics

Outcome		RD	RD + state controls
Illiterate Population 2005		−0.005	−0.013
	95% CI	[−0.037, 0.028]	[−0.043, 0.01]
	p-value	0.796	0.212
	N_l, N_r	492, 62	348, 64
Population w/o Schooling 2005		−0.006	−0.011
	95% CI	[−0.037, 0.03]	[−0.037, 0.011]
	p-value	0.836	0.277
	N_l, N_r	453, 68	331, 68
Population w Incomplete Basic Schooling 2005		0	−0.007
	95% CI	[−0.066, 0.075]	[−0.062, 0.044]
	p-value	0.91	0.734
	N_l, N_r	390, 76	183, 60
Indigenous Language Prevalence 2005		−0.024	−0.059
	95% CI	[−0.082, 0.019]	[−0.121, −0.019]
	p-value	0.223	0.007
	N_l, N_r	368, 54	263, 37
Homes w Dirt Floor 2005		−0.012	−0.039
	95% CI	[−0.066, 0.031]	[−0.089, −0.004]
	p-value	0.483	0.033
	N_l, N_r	359, 54	242, 52
Single Room Homes 2005		−0.006	−0.023
	95% CI	[−0.057, 0.04]	[−0.052, −0.006]
	p-value	0.724	0.014
	N_l, N_r	296, 52	360, 38
Homes w/o Running Water 2005		−0.066	−0.114
	95% CI	[−0.15, 0.004]	[−0.204, −0.056]
	p-value	0.064	0.001
	N_l, N_r	346, 43	248, 38
Homes w/o Access to Sewer 2005		−0.052	−0.103
	95% CI	[−0.129, 0.011]	[−0.178, −0.05]
	p-value	0.101	0.001
	N_l, N_r	349, 53	252, 37
Homes w/o Running Water, Sewer and Electricity 2005		−0.007	−0.022
	95% CI	[−0.019, 0.007]	[−0.044, −0.003]
	p-value	0.353	0.026
	N_l, N_r	387, 52	250, 38

Notes: This table presents regression discontinuity estimates, 95% confidence intervals, and the number of observations on each side of the cutoff for linear specifications with no covariates in the first column, and with state indicators in the second one. Point estimation uses triangular weights around the cutoff and bandwidths of different sizes that minimize the mean squared error of the local linear regression discontinuity estimator. Confidence intervals and p-values are robust bias corrected and clustered at the state level.

subsidy administrator and should therefore be treated as such in a more serious analysis of money allocations.

Let m_i be i's money award and M be the subsidy funds. The official rules specify bounds on the awards for all municipalities, $[m_l, m_h]$, as well as bounds on the awards within each state, $[S_l, S_h]$.[20]

Figure A.2: Collage of a Municipal Agreement

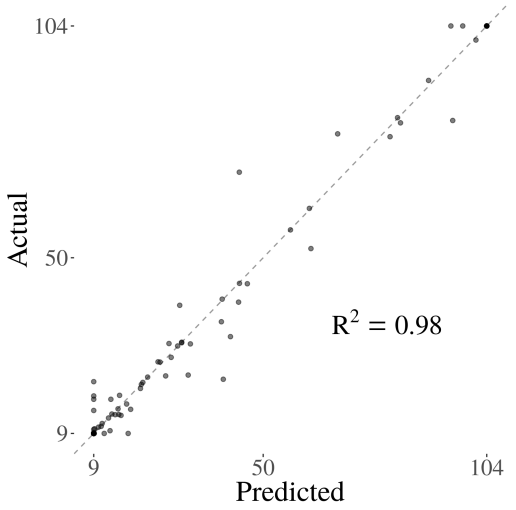


Figure (A.2) shows the scatterplot of money awards specified in the subsidy documentation on money awards specified as follows:

$$\begin{aligned}
\underset{m_1,\ldots,m_{150}}{\arg\max} \quad & \sum_{i=1}^{150} ICC_i \log m_i \\
\text{s.t.} \quad & \sum_i m_i = M \\
& m_i \in [m_l, m_h] \quad \text{for every municipality } i \\
& \sum_{i:i\in S} m_i \in [S_l, S_h] \quad \text{for every state } S.
\end{aligned}$$

[20] We have $M = 3589400000$, $[m_l, m_h] = [9000000, 104092600]$ and $S_h = 287152000$. The units are nominal mexican pesos. S_l is defined as the 9 million pesos multiplied by the number of municipalities selected in the state, and is therefore not binding.