

Online appendix for
**Killing in the Slums: The Problems of Social Order,
Criminal Governance, and Police Violence in Rio de
Janeiro**

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A1 Descriptive statistics of favelas and UPPs

Table A1 shows basic socio-demographic characteristics of the favelas with and without UPPs. It also shows these characteristics for census tracks in the rest of the city using data from the 2010 census. We follow the definition of favelas provided by the Brazilian census bureau, the Instituto Brasileiro de Geografia e Estatística (IBGE): an area irregularly occupied, with a lack of some basic public services. According to IBGE around 22 percent of Rio residents live in a favela. As shown in the table, relative to the rest of the city, households in favelas are significantly poorer, have less access to public services (garbage and sewerage), and are more overcrowded than households in the rest of the city. They also have a higher share of non-white, and illiterate residents.

Favelas treated with an UPP tend to be more populated and have more sewerage coverage than favelas without a UPP. This is because the UPP program prioritized favelas closer to the city’s Center and the South Zone, leaving behind more remote, poorer and less populated areas.

Table A1: **Sociodemographic characteristics of favelas with and without UPPs**

Variable	Rest of city	Favelas		Diff	P-value
		No UPPs	UPPs		
Average population		1,548	2,936	-1,388	0.01
Mean household income (Reais)	2,366	725	665	60	0.00
People per household	2.85	3.31	3.41	-0.10	0.00
% males 15 to 34 yo	0.49	0.49	0.49	0.00	0.574
Black population	0.10	0.17	0.20	-0.03	0.00
Non-white pop.	0.44	0.67	0.70	-0.03	0.01
Illiterate pop.	0.02	0.06	0.06	0.00	0.11
Garbage collection (households %)	1.00	0.98	0.96	0.02	0.05
Sewage coverage (households %)	0.93	0.78	0.89	-0.11	0.00
Total population	4,926,113	915,158	478,637		
Observations	1	591	163		

NOTE: Data from 2010 Census data.

Table A2 presents descriptive statistics for UPP areas. It is important to consider that UPP areas were designed to connect geographically clustered favelas. For this reason, the UPPs tend to include blocks of the city that the IBGE doesn’t consider favelas properly. For this reason, the total population covered by the UPP almost doubles the population in treated favelas. For consistency, in this paper, we use the UPP areas as our unit of analysis rather than the favela areas.

Table A2: Descriptive statistics of UPPs

UPP	Date of entry UPP	Favelas	Estimated Population	Median income	Pop. in favela (%)	Police officers	Police per 1,000	Criminal Faction
UPP Santa Marta	Dec 2008	1	6364	1020.05	61	140	22.00	CV
UPP Batan	Feb 2009	4	26085	775.49	18	107	4.10	MLC
UPP Cidade de Deus	Feb 2009	9	57007	766.42	10	343	6.02	CON
UPP Babilonia	Jun 2009	2	7357	2756.82	51	107	14.54	CON
UPP Pavao-Pavaozinho	Dec 2009	2	18538	1108.20	56	189	10.20	CV
UPP Cabritos	Jan 2010	3	13572	1648.18	32	144	10.61	CV
UPP Providencia	Apr 2010	4	23145	832.15	21	251	10.84	CV
UPP Borel	Jun 2010	6	23751	974.92	53	287	12.08	CON
UPP Andarai	Jul 2010	7	21040	1485.20	48	219	10.41	CV
UPP Formiga	Jul 2010	1	8772	860.60	49	111	12.65	CV
UPP Salgueiro	Sep 2010	2	8537	2124.52	39	123	14.41	CV
UPP Turano	Oct 2010	10	20024	854.59	60	173	8.64	CV
UPP Sao Joao	Jan 2011	3	17861	1029.20	38			CV
UPP Fallet	Feb 2011	5	21228	978.22	42	259	12.20	CON
UPP Prazeres	Feb 2011	4	9361	889.11	54	182	19.44	CV
UPP Mangueira	Mar 2011	5	20649	743.61	71	332	16.08	CV
UPP Sao Carlos	May 2011	5	25472	786.43	60	244	9.58	ADA
UPP Macacos	Nov 2011	2	31273	670.32	61	221	7.07	ADA
UPP Vidigal	Jan 2012	2	12797	776.45	81	246	19.22	ADA
UPP Fazendinha	Apr 2012	4	25590	718.72	47	314	12.27	CV-HQ
UPP Nova Brasilia	Apr 2012	4	29179	661.95	81	340	11.65	CV-HQ
UPP Adeus	May 2012	3	18060	912.40	21	245	13.57	CV-HQ
UPP Alemao	May 2012	2	22359	604.71	85	320	14.31	CV-HQ
UPP Chatuba	Jun 2012	3	13724	638.84	66	230	16.76	CV-HQ
UPP Fe-Sereno	Jun 2012	3	8694	704.36	41	170	19.55	CV-HQ
UPP Parque Proletariado	Aug 2012	2	18568	651.72	92	220	11.85	CV-HQ
UPP Vila Cruzeiro	Aug 2012	3	27820	712.35	69	300	10.78	CV-HQ
UPP Rocinha	Sep 2012	2	74191	692.45	96	700	9.44	ADA
UPP Jacarezinho	Jan 2013	9	53543	659.16	70	543	10.14	CV
UPP Manguinhos	Jan 2013	8	29163	676.27	78	588	20.16	CV
UPP Tuiti	Apr 2013	4	23960	1040.46	57			CV
UPP Caju	Apr 2013	10	23776	626.56	82	350	14.72	CON
UPP Cerro Cora	Jun 2013	5	7429	787.90	60	232	31.23	CV
UPP Arara	Sept 2013	5	20816	645.94	55	273	13.11	CV
UPP Camarista	Dec 2013	6	11384	547.72	100			CV
UPP Lins	Dec 2013	9	41688	1682.06	20			CV
UPP Kennedy	May 2014	8	10787	647.9	100	300	27.9	CON
Total/Average		163	833,564 *	745.3	57.1	8,803	10.56	

NOTE: Population and income data come from the census 2010 (IBGE), values were aggregated from census tracts at UPP level using GIS. Median income is weighted by UPP population. The number of police officers comes from http://www.upprj.com/index.php/as_upps_us. Criminal faction is the group controlling the favela before the intervention (CON stands for contested control). * Population count includes areas served by the UPP which could be larger than the specific favela, therefore this figures might differ from public data and Table 1 in the main text.

A2 Description of fieldwork and qualitative interviews

The qualitative evidence presented in this paper draws from field research conducted between 2012 and 2018. Overall, we collected a total of 134 interviews in a structured, semi-structured, and narrative approach. Table A3 summarizes these interviews, the areas studied, and the participants. In our qualitative research, participants range from high and low-ranked officers from the Military Police of the State of Rio de Janeiro (PMERJ), officials from the Secretary of Public Security (SESEG), community leaders, entrepreneurs, and residents from Rio's favelas. These interviews and focus groups were neither taped nor recorded to protect interviewees from possible harm due to the risky nature of this research. Moreover, we avoided recording audios to stimulate participation and to motivate honest responses. We used simultaneous transcriptions of interviews to capture participant responses accurately.

Our interviews will not be made public for two reasons. First, publishing the information would put the interviewees and possibly our team at risk because of the sensitive nature of the interviews. Police officers and favelas' residents provided many details of their everyday lives during our interviews, which could be easily recognized by their peers. After eight years of work, our research team can be easily recognized in these spaces. People know about our research and could easily connect people that we interviewed or visited in the police battalions or in the favelas. Although the interviews are anonymous, releasing materials that contain many details, which can be used as identifiers to trace subjects, could potentially get our subjects and our team in trouble with the police and criminal groups. We refer to the article by Fujii (2012) which discusses why researchers might need withhold data for safety reasons, and how it has mattered in real terms.

Second, we agreed with our subjects before our interviews and focus groups that their identity would remain anonymous. We also compromise in only using fragments of their interviews in the research and making sure that our subjects can't be traced. All the written materials were transcribed during the interview, stored, organized, and coded in the qualitative analysis software NVivo (see below for more details).

Table A3: Inventory of Qualitative work in Rio de Janeiro

Year	Areas/Police units	Description	Type	Average hours per interview	Total interviews	Participants
2012	Complexo do Alemão, Rocinha, Mangueira, PMERJ's headquarters, SESEG, BOPE Batallion, Secretary of Public Security.	Exploratory interviews to gather information about the UPP and the pacification process.	Semi-structured interview	3 hours	22	Community leaders, favela's residents, UPP Commanders, General Commander of the UPP, High-ranked officers, University professors, Government officials, including the former Secretary of Public Security
2012	Favela da Rocinha	Focus group with 5 community leaders to gather perceptions and information about the pacification process in Rocinha.	Focus group	4 hours	1	Community leaders

2013	Rio de Janeiro	Interviews with government officials and police officers to deepen our understanding of the challenges and outcomes of the on-going pacification process in Rocinha, Alemão, and Mangueira.	Semi-structured interview	3 hours	15	Government officials and Police officers
2014	41st Batallion, 3rd Batallion, UPP Rocinha, UPP São Carlos, UPP Cajú, UPP Cidade de Deus, PMERJ's Headquarters, UPP Providência, and UPP Nova Brasilia (Complexo do Alemão).	Individual interviews with current (2014) and former commanders of the UPP and PMERJ to gather information about policing challenges, policies under the UPP project, the legitimacy of the UPP after Amarildo and future for the UPP project.	Structured Interview	4-5 hours	14	PMERJ's commanders and former Commanders

2014	UPP Rocinha, 41st Battalion, and 3rd Battalion	Focus group with around 5 police officers from each area to discuss police violence and current challenges in officers' daily life under the UPP approach.	Focus group	3-4 hours	3	Low-ranked police officers mainly working on patrolling and special units in Battalions and UPPs.
2014	Complexo da Maré and Complexo do Alemão	Individual interviews to gather information about the current situation of the UPP in Complexo do Alemão due to the high violence scenario in the UPPs and gather information about the recent Military occupation in Maré as a pre-strategy to implement a UPP unit.	Semi-structured, structured, and narrative interview	3-4 hours	5	Community leaders and resident of Maré and Rocinha

2015	UPP Rocinha	Focus group to understand the use of BWC in Rocinha and gather information on current patrolling challenges in the territory.	Focus Group	2 hours	2	Police officers using BWC in Rocinha
2015	Favela da Rocinha	Individual interviews with Rocinha's residents and community leaders to inquire about their perceptions on the use of BWC on the officers' use of force	Narrative Interview	2 hours	6	Residents and community leaders of Rocinha
2015	UPP Rocinha	Individual interviews with low-ranked police officers to gather information about daily activities, such as the distribution of guns and bullets, work assignments, and operation strategies and supervision at Rocinha	Semi-structured interview	2 hours	6	Low-ranked and administrative officers responsible for daily operations at Rocinha

		In-depth interviews with residents of favelas					
2016	Batan, Rocinha, Providência, Cidade de Deus, and Maré	to gather substantial qualitative evidence on residents' perceptions about public security, police violence, exposure to violence, trust in the police, armed criminal groups, etc.	Case Studies	3 hours	40	Residents of favelas with a diverse profile (age, race, time of residency, etc)	
∞	2016	Youth from favelas throughout Rio de Janeiro	Focus groups with Youth from the Agency program (mainly youth from favelas) to discuss empowerment, violence and the impact of the UPPs.	Focus Group	2 hours	7	Youth from the Agency Program
	2018	Batan, Rocinha, Providência, Cidade de Deus, Complexo do Alemão and Maré	Focus groups with residents of favelas to gather information on Criminal Governance and Social Order	Focus Group	2 hours	6	Residents of favelas age 18-32

2018	Rocinha, Maré, and Complexo.	Interviews with residents of favelas to gather information on Criminal Governance and Social Order	Narrative Interview	1 hour	12	Community leaders, entrepreneurs, and residents of favelas
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Throughout these years, we "experienced" some of the most challenging moments of the process. For example, we collected interviews, and a focus group in Complexo do Alemão the day the Armed Forces were retiring and before the UPPs' arrival. In Rocinha, we visited the favela and collected interviews, and a focus group after a community leader had been murdered the day before, just prior to the assignment of a UPP. We also visited Rocinha and interviewed with the then UPP Commander, Major Edson Santos in the summer of 2013. He was accused of ordering the torturing and subsequent killing of *Amarildo*. We also were in Rio for the Army intervention in Maré, that marks the end of the "pacification." Our survey collected responses from Maré residents during the period of the "occupation" by the Army. We collected interviews in Cidade de Deus one week after the UPP had been bombed, apparently by CV.

For this paper, we selected six sites according to our criminal regime typology: Providência (Bandit regime), Rocinha (Symbiotic rule), Complexo de Maré (Split regime), Complexo Alemão (Insurgent criminal rule), Batan (Predatory criminal rule), and Cidade de Deus (Split). Collecting research in these and other areas was extremely challenging and, in some occasions, we had to cancel our visits or leave the areas because of tensions, armed confrontations, or the killing of residents. Thanks to the collaboration with social activists, NGOs, and the police, we were able to collect extensive interviews and various focus groups through the course of these years.

We partnered with social activists and NGOs such as Observatório de Favelas, Redes de Maré, and Agencia de Redes para a Juventude to reflect about the problems of the "pacification", present in our work. Jointly, we collect a large N survey on perceptions of security among residents of the favelas that were selected for this paper. In subsequent sections of the Online Appendix, we offer more detail about the survey and methods for data collection. Together with Observatório de Favelas and Redes da Maré we collected 40 life stories among residents living in these six areas before the collection of our large N survey.

In addition, in 2018 we visited Rio again to collect additional interviews and focus groups with residents from the sites we selected for our study. We discussed how residents remember living under the ex-ante criminal regime and how their lives changed with the "pacification" or, in the case of Maré, with the occupation by the Army. We conducted eleven individual interviews and six focus groups (5 to 6 people each). Our interviews and focus groups followed the following guideline:

- 1) Personal information (name, age, occupation, self-reported race, and time of residency in the favela).
- 2) Do you like to live in (name of the favela)? Please tell me two negative and positive things of living in the favela? We used this question to "break the ice."
- 3) In your opinion, does your territory have informal rules that regulate residents' conduct in your

community? If so, please list the most important ones? From respondent's answers, we selected to three crucial rules presented and asked the participant to explain if or how these rules have changed over time.

4) Do you believe that local residents were satisfied with these rules? Did people recognize them as just? In your opinion, do residents follow these common rules? If not, is there any consequence for disobeying them?

5) Who established these rules of conduct and ensured that they were followed by residents?

6) We asked interviewees to list the five most common conflicts faced in his or her community and how residents generally resolve these conflicts.

7) How they (people helping ensure social order) enforce these common rules?

8) We then asked specifically about how criminal groups interact with the community.

10) We also ask about how theft, rape, and murder were dealt with by criminal groups in charge.

11) A last question explores the relationship with the state, police and security institutions and how these interact with residents. We also asked about how social order in the community changed with the UPP.

We stored these interviews in NVivo, which is mainly divided into three categories: 1) Sources: contains the original transcribed interviews or documents that we are working on; 2) Nodes: these are the main topics that we created to code the materials; 3) Cases: places, people, or additional features to link to the material. We categorized our focus groups and interviews with residents according to the nodes shown in A1.

Figure A1: NVivo nodes for community interviews

Name	Files	Referen...
Baile Funk	5	9
Bandit Rule	2	29
BOPE	7	12
Coexistent rules	11	26
Conflict Resolution	15	43
Contested and Anarchic Criminal Order	5	14
Criminal disorder	7	40
Favela within favela	4	13
Gaza strip	2	6
History of drug trafficking in Rio	2	4
Individual criminal traits	5	15
Insurgent criminal rule	8	39
Judiciary system	3	3
Life in the community	8	20
Military Occupation	7	14
Monopoly	7	11
Naturalization of violence	6	9
New (UPP) vs. Old (Batallions)	2	2
Oportunities for kids and youth	7	12
Outcome of violence	7	18
Perceptions and great quotes	14	56
Perceptions of residents about crime and criminal groups	10	54
Perceptions of residents about the police	11	67
Police encounters with criminals	4	13
Police legitimacy	11	50
Police violence	7	12
Predadoty criminal order	4	8
Relantiohsip between the police and residents	10	40
Relationship between criminal groups and the community	17	119
Relationship with the state	10	33
Relationship between the police and criminal groups	10	16
Slavery and police violence	1	1
Symbiotic criminal rule	6	33
Territorial Control	13	30
Territorial Disorganization after the UPP	11	57
The Case of Amarildo	4	5
The UPP Policy	11	52
Types of punishment	5	12

NOTE: This is a screen shoot from our NVivo nodes regarding our interviews and focus groups with favela residents.

Through the course of these years, we interviewed key players in the Military Police. We signed collaboration agreements with the Secretary of Security and Rio’s Military Police to exchange information, present preliminary findings of our work and train police officers on methodologies for data analysis

and impact evaluation. In the course of our research, we interviewed the Secretary of Security, Mariano Beltrame, at least four times, and with each of the General Commanders of Rio's UPPs. We also interviewed with BOPE police officers and PMERJ General Commander of Operations during 2013 and 2014 more than ten times. Moreover, we collected interviews with UPP commanders and police officers in the following UPPs: Rocinha, Alemão, Providência, Cidade de Deus, Caju, Santa Marta, Pavão-Pavãozinho, Babilônia, Mangueira, São Carlos, Nova Brasília, and Adeus. In addition, we collected interviews with police officers in non-pacified areas, including Battalion 41 (one of the most violent battalions in Rio where OCGs have shifted operations after the "pacification") and the 3rd Battalion.

Throughout the years, we had several opportunities to participate in strategic meetings of high-ranked commanders aimed at defining institutional strategies. For example, in 2012 the team was granted accesses as listeners (no notes or records) to a meeting aimed at defining police strategies to occupy the Rocinha favela after the killing of a community leader. In 2013, our team was also granted access as listeners to a closed meeting that discussed policing strategies to addressing the protests of 2013. In another occasion, the former commander of the Caju favela took our team in a night shift police-patrolling to give us first-hand experience on officers' daily life challenges and concerns on the streets. Additionally, our team engaged in various on-site research visits to favelas to observe and learn about residents' everyday life and gather aspects of the culture, thoughts, and behavior only possible with a deeper interaction with the community.

In parallel, the researchers conducted one Randomized Controlled Evaluation on body-worn cameras in Rocinha aimed at reducing police violence. That required visiting Rio and that favela more than 15 times over the course of 2013 and 2016. The research, as well as the RTC, allowed us to make institutional recommendations aimed at reducing the use of lethal force by the police and improving public security in Rio. Additionally, we also collected a large N survey (6,000) of a representative sample of the entire PMERJ. The team also was granted access to a large dataset on individual daily consumption of officers' ammunition and professional their professional trajectory within the PMERJ. Additionally, we were invited to evaluate a large retraining program on the use of force where 5,000 police officers from the most violent battalions were randomly assigned and design a methodology to restrain the use of lethal force. Unfortunately, these initiatives were suspended after the Military intervention and the Army control over the security affairs of the city.

Figure A2 shows the nodes that were created in NVivo to code our interviews with police officers collected during these years. We note that our interviews with police officers are not limited to these topics. Although our interviews are mostly semi-structured and followed guidelines, Nvivo coding is intuitive, and the list of nodes grew during the coding process since other main topics appeared:

Figure A2: NVivo nodes for police interviews

Name	Files	Referen...
Auto de Resistência	4	21
Background	8	20
Changing in command	5	10
Commader profile and power	11	189
Encounters with criminals	6	24
Great quotes and perceptions	4	19
Incentives to perform a good work	10	43
Individual professional trajectory	7	42
Infrastructure and staff	7	22
Judiciary system	6	21
Lack of police experience and training	6	12
Lack of staff, infrastructure	8	28
New (UPP) vs. old model (Batallion)	8	32
Police accountability	10	36
Police brutality	1	1
Police culture	9	57
Police perception about crime and criminal groups	9	44
Police perception about the community	10	58
Police violence	6	20
Police within the police	3	6
PovGov Insights	6	11
Previous command	7	17
Proximity Policing (Pacification)	8	47
Relationship with the community	10	93
Relationship with criminals	6	36
Relationship with the government	3	16
Residents' perception of criminal groups	1	4
Residents' perception of the police	2	2
Strategies to keep territorial control	7	15
The Amarildo Case	2	10
Transfer within the police	9	27
UPP challenges	9	86
Use of ammunition	3	14
Violence mindset	1	5
War Ethos	5	7
Work satisfaction	10	29

NOTE: This is a screen shoot from our NVivo nodes regarding our interviews and focus groups with police officers.

A3 Mapping criminal governance with external sources (Disque Denuncia dataset)

In this paper we analyze how police interventions have different results depending on the ext-ante criminal regime. As a central piece of our empirical analysis, we rely on data provided by the Military Police on territorial control prior the "pacification," as reported in Table A1. Using data generated directly by the police raises several concerns regarding its accuracy.

To address this concern we cross validated the data provided by the police with a unique dataset of tips to the police. This dataset was provided by an independent Brazilian NGO, *Disque Denuncia* (DD), that has been collecting citizens' reports on crime and OCG activity in Rio de Janeiro since 1995 and has accumulated more than two million phone calls.¹ The calls are related to a broad type of topics, from noise complaints to homicides, and from petty crime to major criminal plots. DD provides an anonymous, 24-hour hotline that guarantees that calls are neither recorded nor tracked. DD works directly with the Ministry of Public Security and every call is forwarded directly to police authorities. DD's hotline number can be found across the city in public transportation, supermarket bags, as well as in TV advertisements; there is even a product placement strategy in popular telenovelas. Given the large volume of the data set, a full analysis of this data has never been conducted.²

The DD data set used in this Appendix goes from 2002 to 2016, that is, the crucial years of our analysis. The data set for this particular period has about 212,000 calls, each including the timing, location and a text describing the citizen's complaint. Using text analysis techniques we extract the mention of a particular criminal group and mentions about the UPP. Then, we compute the number of mentions of a particular drug faction at the favela level and calculate the rate of total mentions. The assumption here is that a drug faction would be mentioned more in a favela where it has a stronger presence. We then aggregate the mentions at the favela level by year and summed up the number of mentions of ADA, CV, TCP, Militia and UPP. To illustrate this approach consider the case in which a favela A has a total of 10 mentions during a year X, and 9 of these mentions refer to CV, we could then consider that the favela was mainly controlled by the CV.³

Below we provide a visual representation of these mentions for five favelas. We also connect this information with an analytic narrative supported by a careful reading of the DD calls. With this analysis we intend to provide support for the accuracy of our data on criminal governance, and to open new avenues of analysis for mapping criminal dominance.

¹<https://disquedenuncia.org.br/o-disque-denuncia>

²Monteiro and Rocha (2017) use the DD data set to codify armed conflict across Rio's favelas.

³For future analysis we will specify a particular set of thresholds to define dominance.

- Rocinha

The largest favela in Rio de Janeiro has always been a valuable territory for criminal control. During the 1980s and 1990s there are reports that this favela was mainly controlled by the Comando Vermelho. During this period prominent trafficker names such as Denis da Rocinha, Bolado and Naldo appear in the local news. Dudu da Rocinha, one of the most important drug lords of Rio de Janeiro started dominating this favela around 1989 until his arrest in 1995. He was succeeded by Lulu.

Rocinha had a war in 2004 due to disputes among local CV drug traffickers. When Dudu escaped from prison, he tried to regain control of the favela by betraying the current lord in 2004, Lulu da Rocinha, with the support of the Red Command. According to news reports, the within faction war (both traffickers belonged to CV) started on April 9th, 2004, causing a bloodshed that affected both local residents and “asphalt” residents. During this turf war, the BOPE intervened and was responsible for killing Lulu da Rocinha. Several anonymous complaints at DD about the location of Dudu da Rocinha (who supposedly fled Rocinha after the conflict and was seen in places such as, Complexo do Alemão, Cidade de Deus, etc.) suggest that Dudu da Rocinha was never really able to establish his own control, which led to the split of the favela between two traffickers “Bem-Te-Vi”, with the lower area of the favela, and Lyon with the uphill territory of Rocinha.

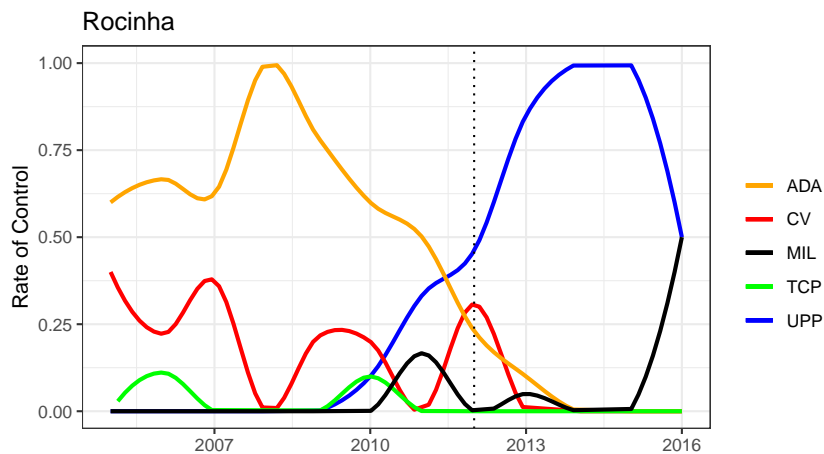
Bem-Te-Vi betrayed CV and joined ADA. Together quickly took control of Rocinha in middle 2004. Figure A3 shows the transition of powers between CV and ADA during this year. However, the existence of CV mentions suggest that drug traffickers were still marginally present in the area. Not coincidentally, we can start finding complaints of Rocinha trying to take over the control of Vidigal in 2004/2005 – which led us to think that ADA was trying to expand its territory and eliminate threats coming from their neighbors. Precisely, ADA established a total control of Vidigal in 2005 at Bem- Te-Vi command. Bem-Te-Vi was the third in the line of succession for Lulu and after “Dudu” and CV betrayal, the trafficker formed a new alliance with Amigos dos Amigos (ADA) and was able to quickly take over the entire territory.

Bem-Te-Vi died in October 2015 after a civil police intervention. Consistent with DD information about drug trafficking activities in Rocinha, two new players “Joca” and “Nem” started to frequently appear in complaints, such as corruption, trafficking, and the location of the traffickers. “Joca” assumed the control of Rocinha after the death of Bem-Te-Vi in October of 2005. However, according to a newspaper from the time, the trafficker lacked full control and loyalty of the local soldiers and support of the community. Instead, “Nem” inherited from his predecessor the trafficking soldiers, guns and arsenal. Soon, Joca lost the control of the Rocinha uphill territory and

Nem assumed absolute control of the territory. Coherent with the complaints from DD, Rocinha suffered a shift from a systematic environment of collaboration with security institutions through corruption and cooperation since ADA's control in 2004 to a high target of police interventions after 2007, which coincide with Sergio Cabral first year in office and his approach to regain territorial control from drug trafficking affected areas.

This analysis shows that from around July/August 2004 until the arrival of the UPP in 2012, ADA has been in control of Rocinha. This coincides with the information provided by the police. Again, figure A3 shows the increasing mentions of the UPP after the 2011 BOPE invasion and the intervention in 2012. Most recent calls show a trend of an increasing number of calls mentioning the militia, although we still do not have enough information to provide any inference regarding this trend.

Figure A3: Criminal Governance in Rocinha (2002-2016)



NOTE: This plot represents the proportion of mentions for each criminal group in Rocinha. The orange line represents the mentions of ADA, the red line the mentions of CV, the green line the mentions of TCP, the black line the mentions of the militias, and the blue line the mentions of UPP. The dashed vertical line shows the entrance of the UPP in 2012. The plot shows how before the UPP intervention Rocinha was mainly controlled by ADA, this information coincides with the one provided by the police to the researchers.

- Complexo Alemão

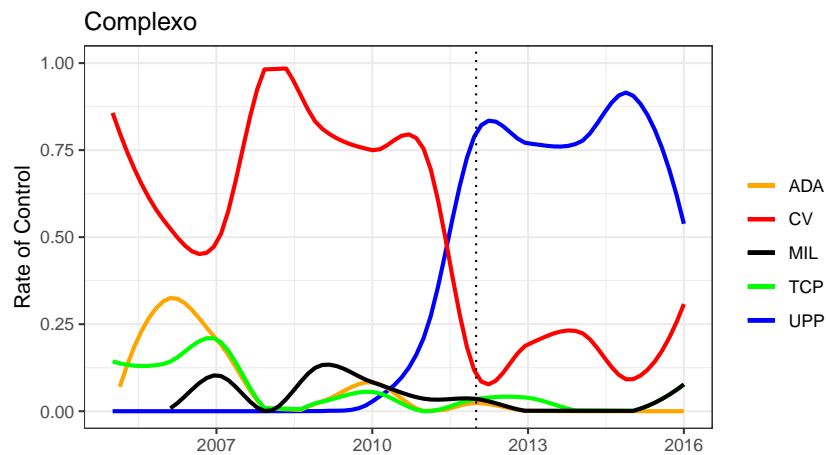
Complexo do Alemão is a complex of 23 favelas with a population around 180,000. CV has absolute control of Complexo do Alemão. Complexo do Alemão – is the most important territory for CV and exhibits a pattern of violence very consistent with CV's “war against the state” mentality. Since the 90s, the territory have hosted the most wanted criminals from Rio de Janeiro, ranging from powerful heads of the organization, such as Marcinho-VP – whose great influence allowed him to control Complexo do Alemão's activities from inside prisons – to ruthless local lords, such

as “TOTA” and “Elias Maluco” – the first well-know for burning his victims alive for betrayals and the former for the cruel death of the journalist Tim Lopes. TOTA was killed because of his ruthless methods apparently following orders from Marcinho-VP.

Even though Complexo do Alemão has served as the CV’s headquarter since the 1990s and the faction has a strong territorial consolidation and control, Terceiro Comando (TC) controlled Morro do Adeus till 2008 – when a brutal confrontation between the two factions, which affected mainly local residents, gave CV absolute control of the territory and ended a local war that lasted years. In fact, in Figure A4 we observe that mentions about TC practically disappear after 2008.

With the pacification strategy arriving at Complexo do Alemão in November 2010, complaints about drug traffickers who left Alemão seeking for refuge increased significantly. According to DD database, traffickers fled Alemão and took shelter in places, such as Morro da Alegria, Santa Cruz, Vigário Geral, São Gonçalo, Favela Cinco Bocas in Brás de Pina, Duque de Caxias in Baixada Fluminense. Curiously, the DD complaints also point out that in a few territories, such as Vigário Geral and Favela Cinco Boca these criminals engaged in confrontations – which suggests that they were involved in conflicts to take control of new territories or establish a new dominance. Remarkably, a few complaints also describe the number of traffickers arriving in new territories. According to DD database, these criminals arrived in these new areas in cars with, in certain cases, more than 100 men heavily armed.

Figure A4: **Criminal Governance in Complexo do Alemão (2002-2016)**



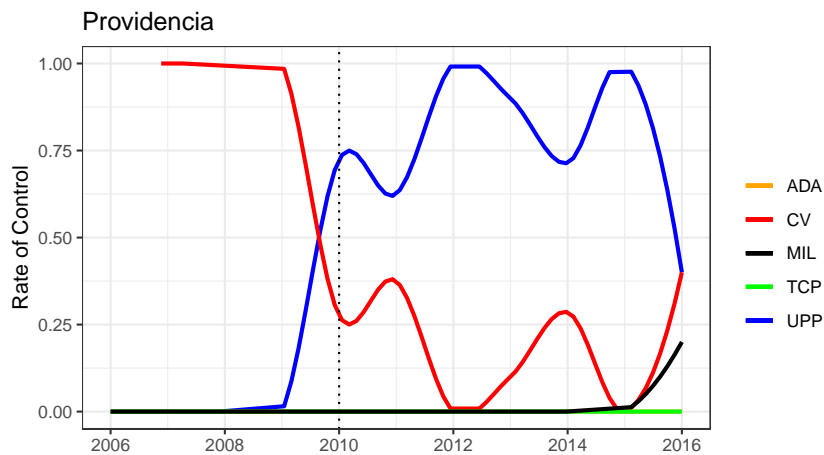
NOTE: This plot represents the proportion of mentions for each criminal group in Complexo do Alemão. The orange line represents the mentions of ADA, the red line the mentions of CV, the green line the mentions of TCP, the black line the mentions of the militias, and the blue line the mentions of UPP. The dashed vertical line shows the entrance of the UPP in 2012. The plot shows how before the UPP intervention the Complexo has been always a stronghold by CV, this information coincides with the one provided by the police to the researchers.

- Providência

With roots dating back to the late nineteenth-century when free slaves and survivors of the Canudos war, the bloodiest civil war in Brazilian history, first settled in the hills of Rio de Janeiro in what is known today as Morro da Providência. Indeed, Providência is considered the first favela of Rio de Janeiro.

The favela came to be considered one of the most dangerous in the city, with signs of violence already in 1948. However, it was in 1963 that police made the first major operation in the region using 500 policemen, trained dogs, helicopters and transmitting radios. The police arrested 223 people, and seized smuggled goods and weapons. Five years later, on December 29, 1968, a dynamite explosion knocked out more than 20 shacks on the hill, leaving at least seven dead and 600 homeless. Even though Providência reported cases of extreme violence since the late forties, drug trafficking activities started to take place in early 80s and the area has been controlled by CV ever since, as shown in A5.

Figure A5: **Criminal Governance in Morro da Providencia (2002-2016)**



NOTE: This plot represents the proportion of mentions for each criminal group in Morro da Providencia. The orange line represents the mentions of ADA, the red line the mentions of CV, the green line the mentions of TCP, the black line the mentions of the militias, and the blue line the mentions of UPP. The dashed vertical line shows the entrance of the UPP in 2010. *The plot shows how before the UPP intervention Morro da Providencia was controlled by CV, this information coincides with the one provided by the police to the researchers.*

- Batan

Favela do Batan is a neighborhood located in Realengo, East Zone of Rio. Even though Batan physically resemble other vicinities in Rio's periphery, the area is considered a favela for its agglomeration of homes and poor infrastructure.

ADA "controlled" Batan till 2007. However, the territory remained heavily contested with TC,

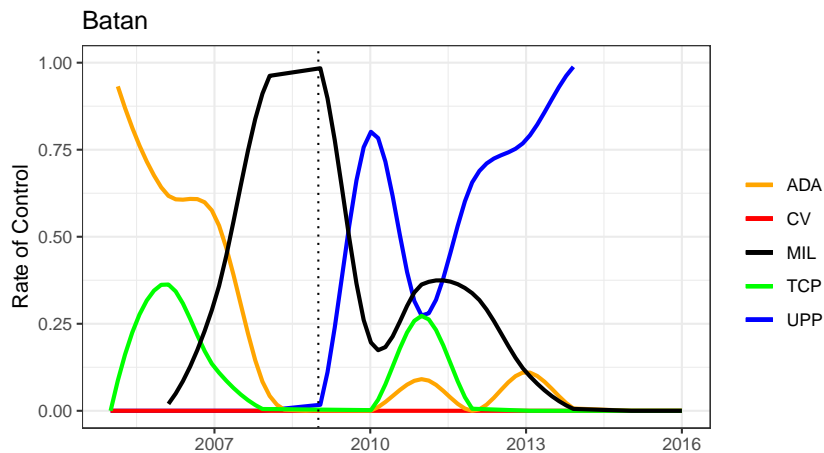
ADA's main rival for territorial control in the areas. The "war" between ADA and TC, which controlled a neighboring favela called Fumacê, intensified in 2006 when several complaints from DD database indicates that the situation had scaled up from previous years.

The DD database shows that since 2004 ADA and TC have been constantly engaged in confrontations to take control of "Bocas de Fumo". There is a relevant amount of complaints that report intense shootings and several attempts from both factions to invade each other territories. Indeed, the volume of reports from DD confirms that Batan has been a highly contested area. Additionally, the complaints often report high levels of aggression and violence from rival criminal factions towards local residents, such as beatings, home expulsion, and invasion.

In 2007, the Militia took control of Batan and expelled drug traffickers from the territory. A few complaints from DD clearly acknowledge the presence of the militia in the territory since 2007. However, reports about militia's activities significantly reduced during 2007/2008. Though, we note that there are complaints in 2007 that reports the abusive and violent behavior of "milicianos", confirming a pattern of extortion that is well known. Indeed, Milicianos from Batan kidnapped and tortured a group of journalists from "O Dia" who were working on an article about militias illegal activities in 2008.

Remarkably, Batan has been throughout the years a highly contested territory regardless of what criminal group was in power. In fact, DD complaints show that even after the militia takes control of Batan, drug traffickers made attempts to retake the area. The war between rival criminal factions in Batan lasted several years and ceased when the militia took over of the territory. However, the reign of the militia lasted much less than ADA.

Figure A6: Criminal Governance in Batan (2002-2016)



NOTE: This plot represents the proportion of mentions for each criminal group in Batan. The orange line represents the mentions of ADA, the red line the mentions of CV, the green line the mentions of TCP, the black line the mentions of the militias, and the blue line the mentions of UPP. The dashed vertical line shows the entrance of the UPP in 2008. *The plot shows how before the UPP intervention Batan was controlled by the Militia, this information coincides with the one provided by the police to the researchers.*

- Cidade de Deus

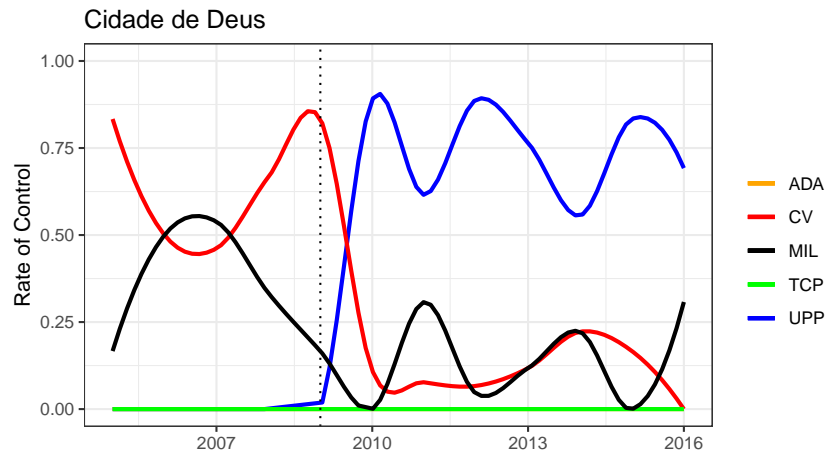
Cidade de Deus was established as a neighborhood in 1960 as a result of a strong removal policy towards favelas in Rio de Janeiro. With around 40,000 inhabitants, Cidade de Deus became quite famous after the release of the movie City of God in 2002. The movie – that portraits high violence and constant disputes between local criminal for trafficking activities – reveals interesting aspects of daily life in CDD, which are very consistent with a pattern of governance and violence found in DD database.

Remarkably, the DD database shows that CDD has been a territory extremely contested by criminals from different factions, militias, and traffickers within the CV faction - the main drug faction in the area. These disputes within the faction and local traffickers, who are constantly fighting to expand their dominance of local “Bocas de Fumo”, illustrates how CDD has a complex criminal governance. The lack of tools to keep a steady dominance in CDD creates an environment with high levels of homicides, crimes, and shootings.

The complaints about conflicts between drug traffickers and the militia suggest that different dynamics of violence took place among these criminals. Distinguishing from patterns of confrontation among rival factions (intense shootings and planned invasions to take control of “Bocas de Fumo”) “milicianos” use strategies such as the kidnapping of drug traffickers, extortion, and summary executions to deteriorate drug trafficking activities in Cidade de Deus. At the same time, militias

charge for gas, cable, and private security services.

Figure A7: Criminal Governance in Cidade de Deus (2002-2016)



NOTE: This plot represents the proportion of mentions for each criminal group in Cidade de Deus. The orange line represents the mentions of ADA, the red line the mentions of CV, the green line the mentions of TCP, the black line the mentions of the militias, and the blue line the mentions of UPP. The dashed vertical line shows the entrance of the UPP in 2009. The plot shows how before the UPP intervention Cidade de Deus was contested between CV and the Militia, this information coincides with the one provided by the police to the researchers.

A4 Text Analysis on Heterogeneous Behavior of OCGs using DD data

In this paper we use text analysis of the DD dataset to provide support of our main hypothesis that OCGs establish different forms of criminal regimes, which shape the outcomes of police interventions. Measuring criminal regimes is challenging because most of the time this behavior remains unobserved. Although criminal groups might provide some signaling about their preferences by, for instance, engaging in “violent lobbying”,⁴ these activities are often only few of the many alternatives that criminal groups have at hand. Moreover, criminal groups have an interest to conduct most of their activities hidden from the state and their OCG rivals. To observe these activities an active role of the community in providing information is necessary.

Although communities might be able to provide some information regarding street level governance in a number of ways (protesting, boycotting, complaining to upper level authorities, etc.), most of the time expressing an opinion about criminal groups controlling their communities or abusive police officers is extremely risky and potentially deadly. To overcome these two obstacles of hidden information (by the criminal group and by the community) we rely on the *Disque Denuncia* dataset described in section A3 of this Online Appendix. In particular, we rely on a rule-based method. Using the text of the call and a set of key words and phrases we classified each call into one of the following typologies of criminal behavior. One call might refer to one or more criminal behaviors as these are not necessarily mutually exclusive. Our argument is that, even if all criminal organizations engage at some level in, for example, corruption, some of these organizations will recur to this practice more often.

To obtain the key words and phrases for each group we performed a careful qualitative assessment of a sample of calls coming from each of our research sites. The key words/phrases used in this classification are presented in table A4.

To estimate the likelihood that a particular call belongs to one of the four categories before and after the UPP intervention defined above before and after the UPP intervention we compute the following linear model:

$$y_i = \beta Faction_i * UPP_i + \lambda_i + \delta_t + \gamma Module_i + \epsilon_i \quad (1)$$

Where y is a binary variable, that takes the value of 1 if the call i corresponds to a particular category (collusion, predation, confrontation or insurgency), and zero otherwise. The variable $Faction$ corresponds to the criminal group controlling the specific favela before the UPP intervention. UPP

⁴Term borrowed from Lessing, Benjamin. *Making Peace in Drug Wars: Crackdowns and Cartels in Latin America*. Cambridge University Press, 2017.

Table A4: Key Terms and Phrases

Topic	Key Term/Phrase
Collusion	Propina (Bribe), Recebem valores (Receive money), A quantia (the amount), Foram pagos por traficante (Were paid by trafficker), Avisar da (To tip someone), Informaram a traficante (Inform traffickers), Nao reprimir o trafico (Do not repress drug trafficking), Vazamento de informações(Leaking information), Informa sobre operação (Informing about a police operation) Policias corruptos (Corrupt officers)
Predation	Expulsam (To expel), Extorquir (Extort), Exigir (To demand), Cobram (To charge), Extorsão (Extortion)
Confrontation	Apavorados (Scared), Aterrorizados (Frightened), Panic (Panic), Terror (Terror), Trocam tiros, Rivais (Rivals), Tiroteio entre traficantes (Shootings between traffickers), Tiroteio entre quadrilhas (Shootings between gangs), Morro seria invadido (Favela will be invaded)
Insurgency	Confronto entre policiais e traficantes (Shooting between police and traffickers), Assasinar a tiros um policial (To kill a police officer), Assasinar o policial (To kill a police), Matou um policial (To kill a police), Oferecendo o valor (Offering money [to kill a police]), Em represalia (Retaliation), Atentado (Assault), Atentar (To assault)
Banditry	Aterrorizando moradores (Terrorizing citizens), Mortes de moradores (Deaths of citizens), Ameaça de moradores (Threat) , Agride Fisicamente moradores (Harming citizens), Mata os moradores (Killing citizens), Praticando barbaridades (Practicing barbarities), Moradores em panico (Scared citizens), Expulsando moradores (Expelling citizens), Invadir residência (Invading households), Executou moradores (Executing people)

is a binary variable that takes the value of 1 after the intervention. Additionally, we control by the location of the call, that is, the particular UPP territory of origin. We also include a fixed effect for the month-year in which the call was received. Also, because the dataset is divided in 24 pre-defined modules created by DD we include a module fixed effect. Because calls originate in specific UPP areas, which are relatively self-contained geographic units the errors are likely to be correlated within UPP. To address this concern we clustered standard errors at the UPP level.

Table A5 shows the results of our model on each of the four types of calls. Columns with odd numbers show models without the interactive effect, thus pooling observations before and after the UPP intervention. Columns with even numbers show the models with the interactive effect, thus differentiating between calls before and after the UPP intervention.

In columns 1 and 2 we observe that calls about collusion between criminal groups and the police are more likely to happen in Symbiotic areas (controlled by ADA). In column 3 and 4 we observe that, as predicted by our theory, militia controlled areas show higher levels of predatory behavior. Columns 5 and 6 shows that areas under split rule present higher levels of confrontation. The regression on insurgency terms shows that CV controlled areas have higher incidence of insurgency related calls. However, these calls seem to happen at higher rates in bandit controlled areas. Finally, the results on banditry show that Bandit controlled areas have a higher presence of these terms compared to all other areas (except predatory ones). These results fully support our theoretical claims about differences among criminal governance orders in their relationship with the state, confrontation with other OCGs and predation vis-a-vis the community.

The intervention of the UPP seems to increase calls related to Insurgency in all areas but in those controlled by ADA, which support our contention that this criminal faction didn't respond by fighting the police. Insurgency related calls increase more in CV and militia-controlled areas, possibly suggesting that CV drug traffickers moved to that area once the militias had left. Surprisingly, we observe an increase in predation in militia-controlled areas, which doesn't support our finding that the UPP reduced extortion in this areas. It should be taken in to account, however, that there was only one UPP intervention in a militia-controlled area (Batam).

Overall, these results suggest that criminal organizations behave differently. Whereas ADA areas seem to have a higher incidence of collusion related calls, militia controlled areas have a higher incidence of predation related calls, and CV controlled areas have a higher incidence of insurgency and banditry related calls.

Table A5: Heterogeneous Effect of UPP Intervention on Criminal Governance

	<i>Dependent variable:</i>									
	Collusion		Predation		Confrontation		Insurgency		Banditry	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CV-HQ	-0.010 (0.007)	0.001 (0.013)	-0.015* (0.007)	-0.014** (0.005)	-0.042*** (0.008)	-0.059*** (0.012)	-0.051*** (0.012)	-0.050** (0.018)	-0.028*** (0.003)	-0.036*** (0.006)
ADA	0.030** (0.009)	0.025 (0.016)	-0.007 (0.006)	-0.005 (0.007)	-0.072*** (0.011)	-0.079*** (0.013)	-0.090*** (0.010)	-0.053* (0.022)	-0.031*** (0.004)	-0.032*** (0.006)
MILITIA	-0.012 (0.012)	-0.008 (0.029)	0.062*** (0.015)	0.042* (0.017)	-0.034* (0.014)	-0.038 (0.031)	-0.110*** (0.009)	-0.135*** (0.019)	-0.002 (0.005)	-0.007 (0.008)
SPLIT	-0.008 (0.011)	0.007 (0.016)	-0.028*** (0.006)	-0.017+ (0.009)	-0.016+ (0.009)	-0.027* (0.012)	-0.110*** (0.009)	-0.068*** (0.017)	-0.035*** (0.005)	-0.044*** (0.009)
Post UPP		0.014 (0.011)		0.008 (0.009)		-0.019+ (0.011)		0.055* (0.023)		-0.013* (0.006)
CV-HQ x Post UPP		-0.016 (0.015)		0.012+ (0.007)		0.024 (0.020)		0.031 (0.028)		0.008 (0.007)
ADA x Post UPP		0.021 (0.026)		0.009 (0.012)		0.003 (0.017)		-0.044+ (0.023)		-0.009 (0.007)
MILITIA x Post UPP		-0.005 (0.030)		0.019 (0.014)		0.011 (0.028)		0.032 (0.023)		0.010 (0.008)
SPLIT x Post UPP		-0.019 (0.022)		0.010 (0.010)		0.007 (0.015)		-0.017 (0.019)		0.004 (0.008)
UPP FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
TIME FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
MODULE FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	3,706	3,706	3,706	3,706	3,706	3,706	3,706	3,706	3,706	3,706
R ²	0.196	0.197	0.377	0.355	0.269	0.269	0.186	0.192	0.056	0.058

Note:

+ p<0.1; * p<0.05; ** p<0.01; *** p<0.001

The unit of analysis is the DD call. The dependent variable is an indicator that takes the value of 1 if the call refers to each of the four pre-classified topics. The dependent variables are the faction dominating a specific UPP (the faction category of reference are CV dominated areas outside Complexo do Alemão), the period after the UPP entered the territory and the interaction between those two terms. All models include UPP and time fixed effects. Standard errors are clustered at UPP level.

A5 Description of geo-referencing process and quality of data

Our DID statistical analysis contrasting treated and non-treated favelas uses two metrics: homicides and killings by the police. Homicides have less problems with under-reporting than crimes such as theft, rape, and assault. This is not to deny, however, that there are problems with the data on homicides since OCGs in Rio often disappear or burn the bodies of their victims.

In terms of police shootings, since the enactment of the “bravery bonus” that paid police officers a salary bonus to kill (in effect from 1995 to 1998), there has been a conscious effort on the part of the Military Police to record them. Moreover, because police officers are almost never sanctioned for shooting someone unnecessarily, they don’t possess strong incentives to under-report fatal shootings.

It is worth mentioning that incentives have changed with the the *Sistema Integrado de Metas*, a “pay-for-performance” incentive system introduced in 2009. The government pays a bonus to those policemen who reduce three criminal indicators: homicide and other violent deaths; car theft; and street robberies. Homicides caused by police action (previously called *Auto de Resistência*) were added to the set of goals in January 2011.⁵

Extensive interviews with members of the Military Police convinced us that fabricating homicide and police killings numbers is not that easy because they get closely revised every other month by a joint commission of the Military and Civil Police, and the results are also examined by representatives from each of the police battalions that compete among themselves to get the highest monetary awards.⁶

In this paper we focus on the city of Rio de Janeiro for the 2005-2017 period. According to the *Instituto de Seguranca Pública* (ISP)⁷ —the institute in charge of recording criminality data— in the state of Rio de Janeiro there were over 25,000 violent deaths in this period, that is, a yearly average rate of 36 violent deaths for every 100,000 inhabitants. The ISP updates these figures monthly at *Delegacia* level, which are the subunits of the police battalions (AISP) in which the state of Rio is divided. Since each *Delegacia* contains several neighborhoods including favela and non-favela areas, these jurisdictions are too large to analyze the particular effects within comparable favelas. Although the ISP also publishes data at UPP level, thus providing more granular information, this approach limits the analysis to treated units only.

To contrast treated and non-treated favelas, our approach uses geocoded data which has a higher level of granularity. The Ministry of Security of Rio de Janeiro (SESEG) provided us the original micro-data

⁵In a companion paper we evaluate its impact on police behavior.

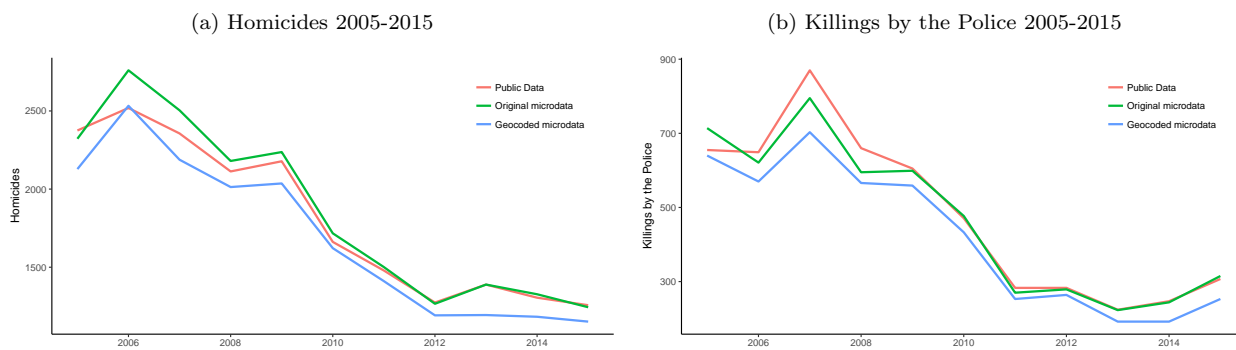
⁶We nonetheless perform robustness tests in subsequent sections of the Online Appendix for the introduction of *Sistema de Metas*.

⁷<http://www.isp.rj.gov.br/dadosoficiais.asp>

with the addresses of the location of the deaths. This data is originally recorded by the Civil Police.

Using this original microdata we geocoded each violent death. Due to misreporting, some of the addresses from the original micro data could not be identified and we coded these as missing values. Below, we provide more details about the geo-coding process. The figure below shows this trends according to the three sources: 1) Public data, 2) Original micro-data and, 3) Geo-coded micro-data.

Figure A8: Comparison of three data sources



NOTE: These figures compare three datasets: i) Public Data, ii) Original Micro Data and, iii) Geo-coded microdata. The public data files come from ISP-Rio de Janeiro. The original micro data was provided to the researchers by the Ministry of Public Security. The geo-coded microdata uses all cases where the address was accurate enough to geo-locate a latitude and longitude.

Since this study makes extensive use of the geo-coded micro-data, it is important to understand the discrepancies between these sources of information. In terms of homicides, the micro-data reports a higher number of violent deaths than the public data provided by SESEG. Interestingly, the discrepancy between the public data and the original micro-data is slightly larger for deaths by police action than for homicides. It should be noted that this discrepancy virtually disappears by 2009, when the *Sistema Integrado de Metas* (SIM) was introduced. Our understanding from interviews with various battalion commanders is that after the introduction of the SIM, both the Military Police and Civil Police of Rio de Janeiro have become significantly more careful in the way they register violent deaths.

An important concern about the differences between the two sources of data is that the introduction of UPPs might increase the accuracy of the data collection, in particular inside favelas. If this is the case, homicides and police killings reported inside UPP areas would be more reliable than occurrences outside UPP areas. Although this difference most likely would bias our estimates towards zero (due to a generalized underreporting) it is possible that an improvement of data quality inside UPP areas might distort our main results. For example, if in a given neighborhood violent deaths were incorrectly assigned to favela areas because there are less chances that these crimes would be investigated (thus reducing the

Table A6: UPP effects on data quality

	<i>Dependent variable:</i>		
	Homicides (diff.)	Killings by the police (diff.)	Violent deaths (diff.)
	(1)	(2)	(3)
UPP	0.214 (0.157)	0.057 (0.074)	0.287 (0.182)
2006	-0.400** (0.143)	-0.091 (0.089)	-0.424* (0.198)
2007	-0.372* (0.187)	0.120 (0.174)	-0.219 (0.238)
2008	-0.531*** (0.145)	-0.004 (0.097)	-0.577** (0.187)
2009	-0.488** (0.151)	-0.048 (0.094)	-0.598** (0.205)
2010	-0.854*** (0.197)	-0.153 (0.099)	-0.971*** (0.254)
2011	-1.037*** (0.216)	-0.490*** (0.103)	-1.375*** (0.259)
2012	-1.138*** (0.221)	-0.476*** (0.099)	-1.455*** (0.260)
2013	-0.955*** (0.224)	-0.541*** (0.098)	-1.307*** (0.250)
2014	-0.942*** (0.233)	-0.438*** (0.103)	-1.248*** (0.271)
2015	-0.860*** (0.222)	-0.290** (0.105)	-1.006*** (0.271)
DP FE	Y	Y	Y
Clustered SE	Y	Y	Y
Observations	4,372	4,372	4,372
Adjusted R ²	0.031	0.034	0.045

Note: + p<0.1; * p<0.05; ** p<0.01; *** p<0.001

NOTE: The dependent variables are the absolute differences between public data from ISP-Rio de Janeiro and the geo-coded microdata in violent deaths, homicides and killings by the police. The unit of analysis is the *delegacia* at a given year, since this is the lower lever provided by ISP. Standard errors are clustered at *delegacia* level.

burden to the police), the decrease after the introduction of the UPP would only be reflecting that observed occurrences are closer to actual occurrences in those areas.

In order to explore the concerns about the effect of UPP on misreporting we measure the effect of the introduction of the UPP in the difference between public data and geocoded micro data. In other words, the effect on the quality of the reporting. The unit of analysis is the *Delegacia*, that is, the smaller jurisdiction for which city wide data is publicly available. The specified model is:

$$y_{d,t} = \beta UPP_{d,t} + \gamma_d + year + \epsilon_{d,t} \quad (2)$$

Where: $y_{d,t} = |Public_{d,t} - Geocoded_{d,t}|$. That is, the dependent variable is the absolute difference between the public data and the geocoded microdata for a given *delegacia* d in month t . The model controls for *delegacia* fixed effects and year fixed effects. UPP is a binary variable that takes the value of 1 after an UPP was introduced in the *delegacia*. Standard errors are clustered at group level. Table A6 shows that the introduction of the UPP is not correlated with differences in the absolute difference between these two measures. Moreover, the results show that the strongest predictor for reducing these differences is time. In other words, misreporting has been systematically decreasing over time, particularly, after the introduction of the SIM for homicides in 2009 and killings by the police in 2011.

A5.1 Details about the geocoding process

The transformation of the original addresses into a point with longitude and latitude followed a procedure, but varied depending on the specific attributes of each observation. In general, we group them in three categories. The first one corresponds to the data which components were either incomplete or in the wrong order, had typos or misspelled words; the second is composed by favelas and *morros*; and the last one corresponds to the addresses that could not be recovered or had to be eliminated.

Most of the addresses belong to the first category. The steps we followed were: 1) looking for the non-captured components (address number or barrio), 2) restoring its order and fixing the misspelled words, 3) generate the longitude and latitude that characterizes each violent death to be later geo-referenced and mapped. One example of an address provided in the original files looks as follows “RUA OLIMPIA 55, TIJUCA“ which was then transformed using google maps to “R. Olímpia, 55 - Tijuca, Rio de Janeiro - RJ, 20521-120, Brazil“ with latitude -22.929655 and longitude -43.227471.

The addresses of the second group did not include much information, only the favela where the violent event took place and some times also the street. Note that this problem is intrinsic to these housing units. Many of these areas have streets without official names. At first sight, this situation raises a dilemma between losing accuracy in our maps by making approximations to the favela centroid,

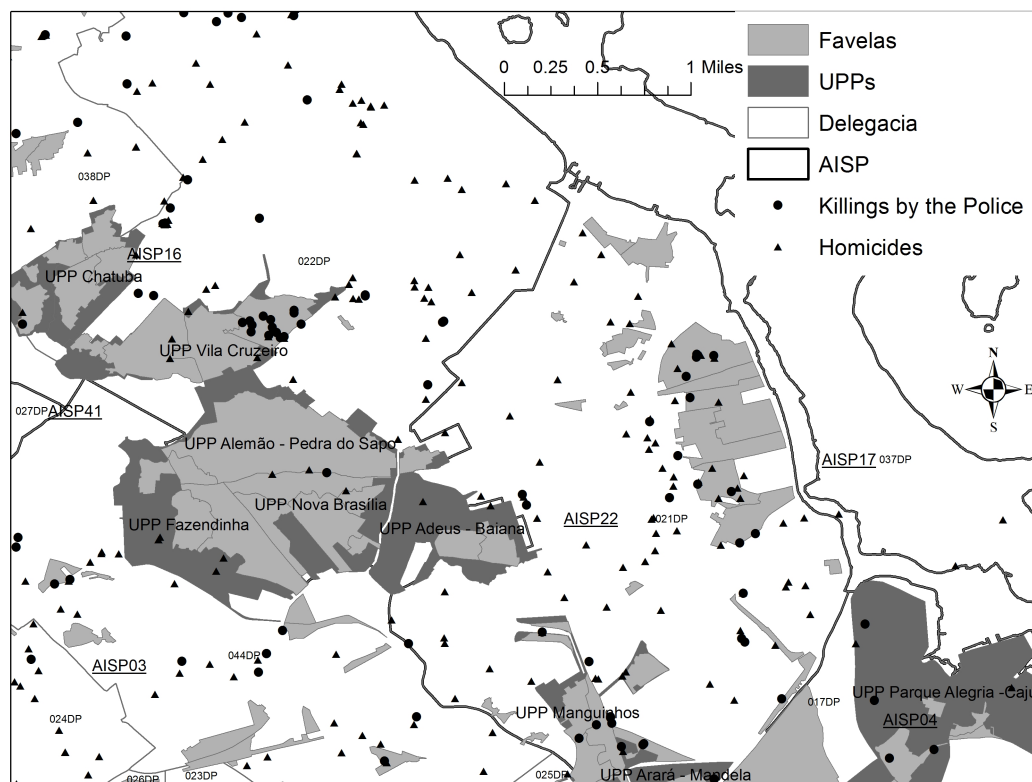
or introducing bias by deleting such observations. In practice such loss in accuracy was minimum and far less distorting than deleting homicides from our sample. We should mention that the biggest favelas such as *Fazenda Coqueiro*, *Cidade de Deus* and *Rocinha* do have a more structured urban characteristics and official street names. Then, the approximations procedure was done mainly for the smallest favelas, implying minor loss of accuracy.

The last category corresponds to those values that we deleted from our database. That may have happened simply because the original file did not provide enough information for us to find an accurate output. For example, if the original file only registered the neighborhood, the state or the country. Also if the address they reported was out of the boundaries of the city of Rio de Janeiro, which is our subject of study. An additional compelling reason to delete some of the addresses is the over-representation of some locations, in particular, hospitals where the victim finally died. Without a more accurate mechanism to track the place where the crime was committed, it was necessary to delete those observations. On average, 17 percent of the original microdata was classified as missing.

A6 Spatial representation of data granularity

To have a clearer idea of the granularity of our data, the following map displays the area of Complexo do Alemão and Complexo de Maré in the north zone of Rio de Janeiro. We can observe the favela areas (light gray), the UPP areas (dark gray) and the geo-coded homicides (dark circles) and killings by the police (dark triangles) in 2008. The map also displays the subdivision of the city into Police Battalions (AISP) and delegacias. Our statistical analyses group homicides and police killings at the favela complex level, which correspond to UPP areas. Given that the perimeters of the UPPs extend by around 100 meters beyond its corresponding favelas, for non-treated areas we also add lethal incidences in the 100 meter buffers outside favela complexes in order to make treated and non-treated areas more comparable.

Figure A9: Homicides and Killings by the Police in Complexo do Alemão and Complexo da Maré, 2008



NOTE: Violence in Rio de Janeiro in 2008 for the area of Complexo do Alemão and Complexo da Maré. Favelas in light gray, UPP area in dark gray. The black dots represent killings by the police and the triangles represent homicides.

A7 Parallel Trends

In this paper we use a generalized DID strategy to estimate the effects of the UPP intervention on violence. We contrast treated and non-treated groups of favelas. A key assumption for the DID analysis is that violence trends before the implementation of the UPP were similar between these groups. If there is a treatment effect, the UPP then creates a deviation from this common trend.

We examine the data for evidence of non-parallel trends prior to the onset of the UPP program. Following Autor (2003) we test this assumption by modeling time leads and lags for the UPP intervention in a 48 months window. If violence trends were similar before intervention then the leads estimates should not show an effect. These results would also suggest that there was not anticipatory effects of the UPP program. To test for the parallel trends assumption, we use the following model:

$$y_{i,t} = \sum_{j=-24}^{-1} \gamma_j UPP_{lead_{ij}} + \gamma_0 UPP_{entrance_{ij}} + \sum_{j=1}^{24} \gamma_j UPP_{lag_{ij}} + \lambda_i + \alpha_t + \epsilon_{i,t} \quad (3)$$

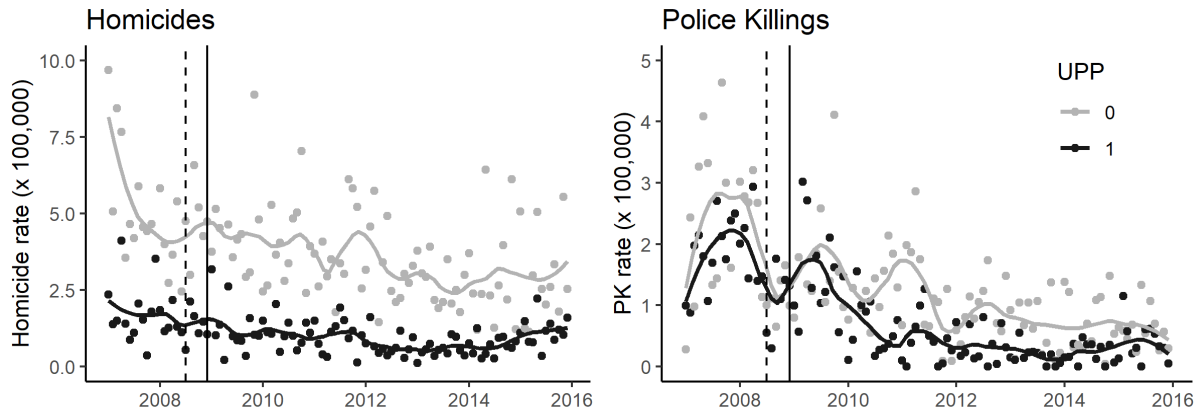
Where the dependent variable is homicides or killings by the police rates for the favela i in the month t . The lead effects are captured by the γ estimates spanning 24 months before the intervention. For example, the coefficient γ_{-1} captures the anticipation effect on the month before the intervention. In a similar way, the lag effects are captured for the estimates spanning 24 months after the intervention. Thus, γ_0 indicates the onset of the intervention. The model also includes favela fixed effects (λ) and time fixed effects (α).

Before presenting these results it is useful to explore visually the trends on the variables of interest for groups of favelas with UPP and without UPP. Figure A10 shows the trends in lethal violence during the period of study. The vertical dashed line indicates the first BOPE occupation and the solid line shows the first UPP placement.⁸ The figure illustrates how before the UPP program favelas that were intervened had lower homicide rates but higher incidence of killings by the police. All favelas followed a decreasing trend in homicides and killings by police after 2008, with spike in violence after 2014. These visual representations also depict one of the main findings of this paper, that is, the decrease in killings by the police was more pronounced in UPP areas.

Figure A11 shows the estimates for the lags and leads. The first plot shows the estimated coefficients for the monthly indicator variables in model 3 using homicide rates as the outcome variable. The shaded areas show the two stages of the treatment: the BOPE intervention period and the UPP installation. The dashed horizontal lines illustrate the average effect before and after the intervention and their 90% and 95% confidence intervals. The second plot in figure A11 illustrates the coefficients for the regression using

⁸The first BOPE occupation took place in the Favela of Batan in September 2008, the first UPP placement was Santa Marta in December 2008.

Figure A10: Lethal Violence trends in Rio de Janeiro (2007-2016)



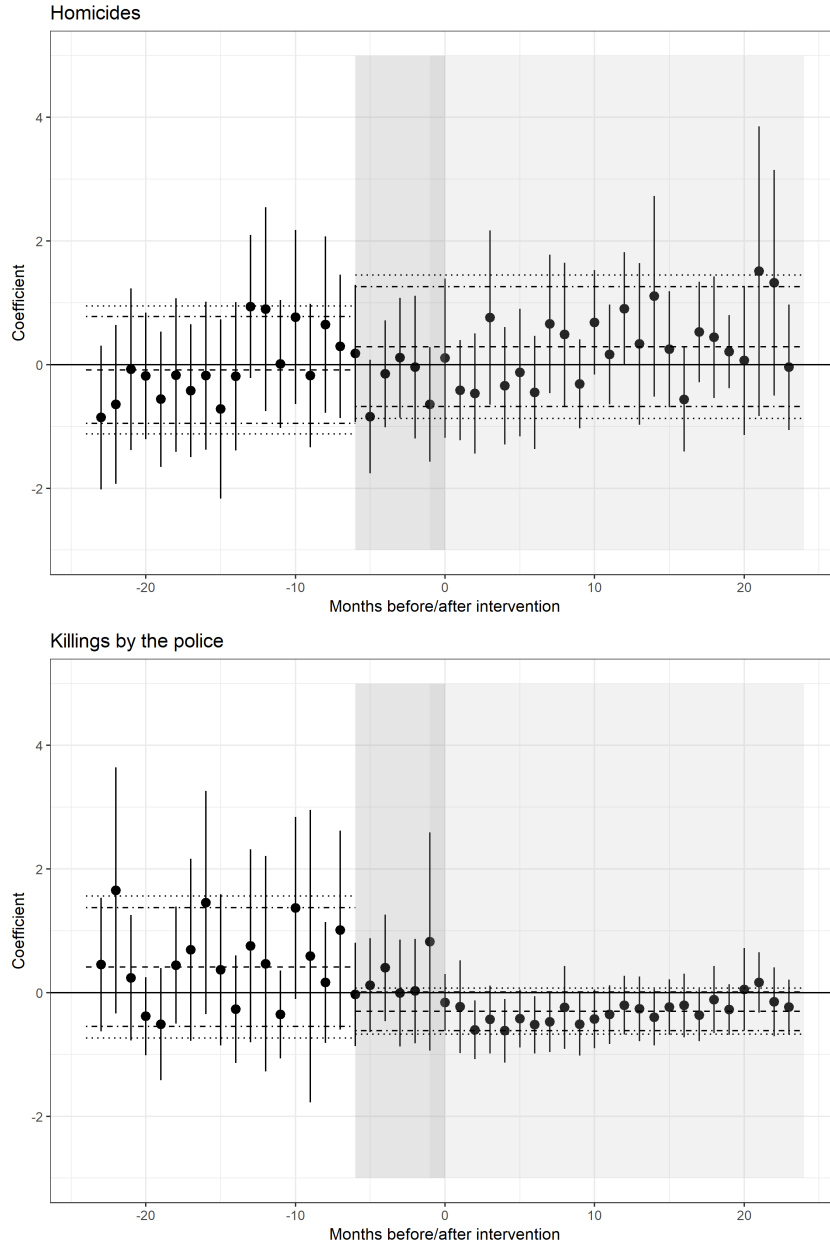
Notes: Homicide and police killings monthly rates for areas with UPP (black) and without UPP (gray) with smoothed loess lines (span=0.2). The dashed vertical line correspond to the first BOPE intervention, the solid vertical line corresponds to the inauguration of the first UPP.

police killings as a dependent variable. The 95% confidence intervals for the estimates are represented in black vertical lines.

These plots highlight three facts: First, the confidence intervals suggest that the monthly coefficients *prior* the intervention are not markedly different from zero neither follow a specific pattern. Second, monthly coefficients for homicides are concentrated around zero *before* and after the intervention. Third, for killings by the police, the coefficients after the intervention significantly decrease compared with the period prior to the intervention. Moreover, these estimates are significantly different than zero.

The evidence from these plots should be taken together with the results from Table 2 in the main text, where we control by unit specific time trends. Jointly, these results suggest that the parallel trends assumption is valid for our DID strategy.

Figure A11: Leads and Lags Coefficients



Notes: Each dot represents the leads and lags coefficients for the months before/after the UPP intervention. The vertical line represents its 95% confidence interval. The dark gray area illustrates the BOPE intervention, usually taken place six months before the UPP intervention. The light gray area shows the period after the UPP intervention. The dashed horizontal line depicts the average effect before and after the intervention. The dashed-dotted horizontal lines are the 90% confidence intervals of this average. The dotted line represents the 95% confidence interval.

A8 Robustness check: analysis of UPPs geographic borders

It could be argued that the assumption of parallel trends between treated and non-treated favelas is problematic given that, according to our theory, criminal regimes are different. In this section we present an alternative approach to demonstrate the validity of our claims. Using our geo-referenced lethal violence data, we implement a DID design that looks at deaths that occur in a 100 meter buffer inside and outside the UPP borders. These are deaths that take place inside and outside the UPP in territories that are controlled by the same criminal faction. We argue that areas close to the UPPs serve as an accurate comparison group.

Our strategy seeks to mimic an experimental research design using observational data by selecting a credible counterfactual to compare areas that have the same criminal regime, inside and outside the UPPs. The key to this quasi-experimental approach is to select a comparison group that is as close as possible in all observable and unobservable characteristics to the treatment group. In other words, we need to find places in the city that are very similar to the places in which the UPPs were installed. Once we find this comparison group, we can contrast the average change over time in lethal violence for the treatment group (the UPP) to the average change over time for the control group.

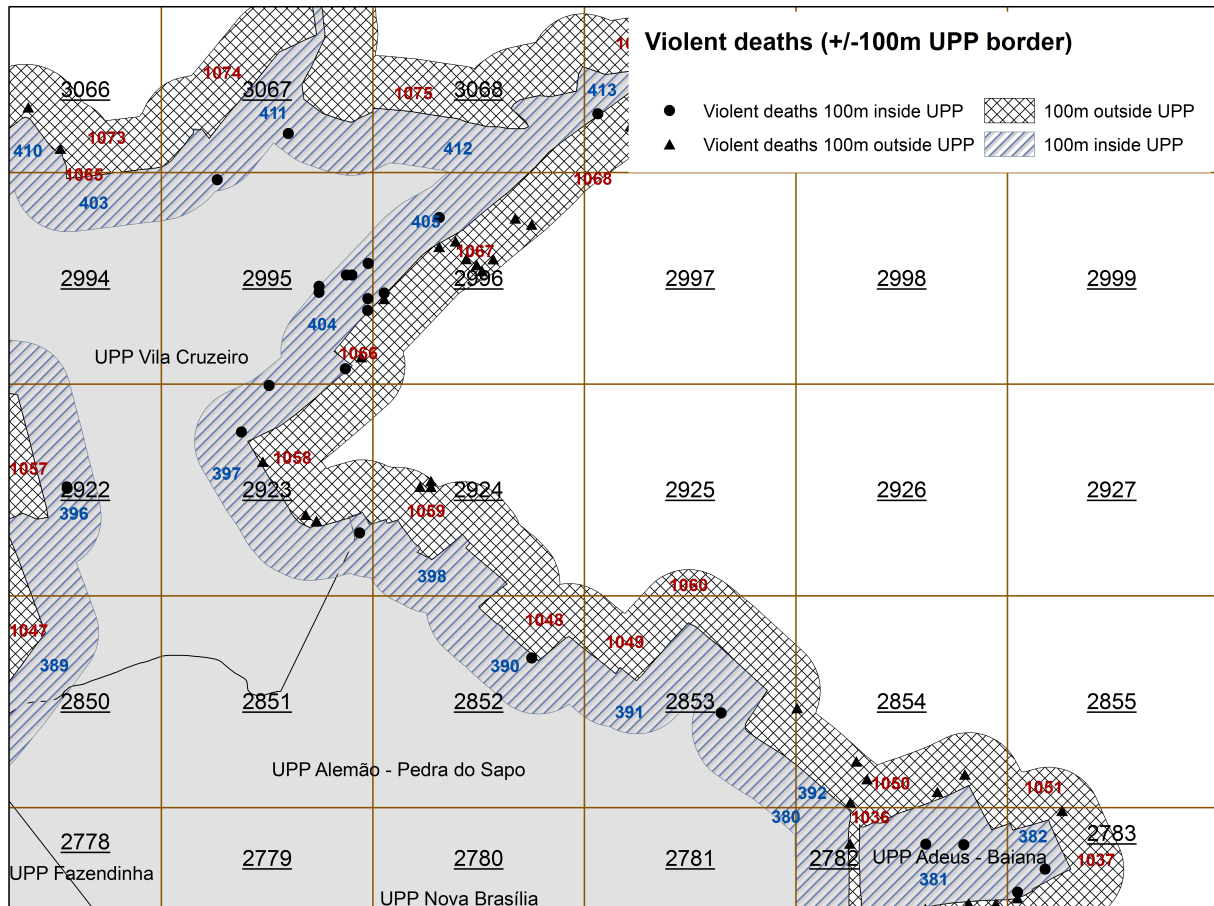
In particular, we look at lethal violence incidents in a buffer of 100 meters inside and 100 meters outside a given UPP. We note that in this quasi-experimental evaluation the borders of the UPPs are defined by the Military Police. As a Colonel in the Chief Command of the Military Police and former Chief Commander of the UPP explained: “the UPP is a very punctual action, it has as a very clear limit, only until a certain street. It doesn’t reach to the other side of the street.”

It is important to highlight that the UPP borders are set such that the intervention includes various streets located outside the favelas. A particular advantage of this strategy is that we are comparing lethal violence incidents in streets that before the intervention had very similar dynamics in terms of how these incidents got reported –both are areas just outside the favelas, one or a couple of streets apart, the only difference being that in one area the UPP is present and in the other it is not.

This strategy raises some methodological challenges related to the definition of the unit of analysis, the specification of comparison units, and the process of normalization by population. We explain these challenges and our strategy to overcome them below. Figure A12 represents this process graphically. Here we observe an area of the Complexo do Alemão’s UPPs. In this figure we can observe the violent deaths within those areas (violent deaths within 100m inside the UPP represented by circles and violent deaths within 100m outside the UPP represented by triangles). The area is divided by 400m x 400m quadrants used to control for border commonalities. The main take away of this figure is that by using these quadrants we can control for border sectors that are *just next to each other*. For example, let’s take

the cell with ID 2853. Within this cell we find a border sector within the Alemão-Pedra do Sapo UPP (sector 391) and a border sector just outside the Alemão-Pedra do Sapo UPP (sector 1049). These two border sectors can be compared using a Difference-in-Difference strategy

Figure A12: Example of 100m border Analysis



NOTE: This figure shows a zoom of the UPPs corresponding to the Complexo do Alemão and their 100m border analysis. The grid represents the 400m x 400m quadrants used to control for location. The underscored number is the ID for each of these quadrants. The area with a shaded by a diagonal pattern represents the 100m border inside the UPP and the black circles correspond to the violent deaths occurring in this area during the 2005-2013 period. The crossed pattern and the black triangles depict, respectively, the 100m border outside the UPP and the violent deaths that fall within this area during the 2005-2013 period.

Since a 100m buffer area around the UPP is not specified a priori, either by constrained census tracts or city blocks, our first strategy consisted on simply sub-setting lethal violence occurrences in this period that occur 100m inside and 100m outside the UPP border (under the assumption that two or more UPPs do not share this border). The next challenge consists in specifying a common group for regions on the border that are next to each other. This step is crucial to guarantee that we actually compare units with

similar characteristics. For this purpose we divided Rio's territory in 400m x 400m cells -or quadrants- and assigned border regions to each of those cells.

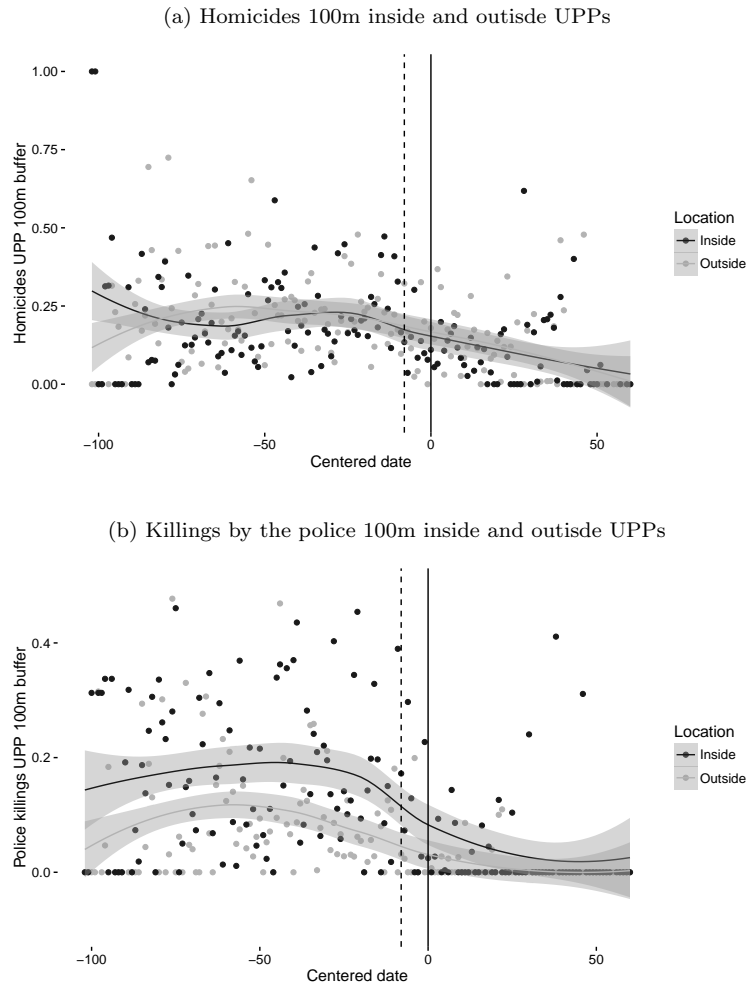
A final step for building this dataset is the process of counting the population for each border sector in order to calculate rates. The problem arises because each buffer sector within each cell actually overlaps several census tracts. To circumvent this issue we simply averaged the population of all census tracts that intersect within a buffer sector. Following this process, even if the population of some sectors is overrepresented we do not have a reason to believe that there are systematic biases.

In total, taking into account the 34 UPPs that became active before December 2015 there are 592 sectors inside the UPP area and 695 outside the UPP area.⁹ The total number of homicides in the period under study in the 100m inside the UPP sum up 504 and the total number police killings is 428. For the 100m area outside the UPP there are 642 homicides and 208 police killings. In other words, the border area of the UPPs follow the same trend of the full sample, that is, the areas where the UPP was introduced have lower levels of homicides than non UPP areas over this period but higher levels of police killings. The next step in this analysis consists of understanding which impact, if any, the UPP intervention had in this dynamic.

Before modeling the UPP effect it is useful to study these trends visually. Figure A13 displays the aggregated data for the sectors 100m inside and 100m outside UPPs. All sectors are then centered to the date of the UPP introduction. The solid vertical line represents the introduction of the UPP whereas the dashed line represents the BOPE intervention. The first panel shows the total number of homicides in the 100m border of the UPPs on a given date. Here, the smoothed line suggests that homicides 100m inside and outside the UPP were not significantly different before and after the intervention. The second panel shows the total number of killings by the police 100m inside and outside the UPP. In this case it is noticeable that areas inside the UPP had a higher number of killings by the police before the intervention than areas bordering the UPP. After the UPP intervention this difference reduces until it becomes statically insignificant.

⁹The difference comes from the sectioning process using quadrants with random location. This is illustrated in figure 4. Here, the quadrant with ID 2925 has a sector outside the UPP that do not has a correspondent inner sector.

Figure A13: Violent deaths trends 100m inside and outside UPPs



NOTE: Each point in the plots represent the homicide/police killings in areas 100m around each UPP during the 2005-2013 period. Gray points correspond to the rates in areas 100m outside the UPP, whereas black dots correspond to occurrences 100m inside the UPP borders. All UPP interventions are centered at zero which is represented by the solid line; the dashed line corresponds to the BOPE intervention. Smoothed loess lines provide an aggregated representation for each case. All observations are weighted by the UPP population.

Although informative, plotting the data by sectors outside and inside the UPP misses a crucial element in the comparison of similar regions before and after the intervention. This element is the geographical location of these sectors. As Figure A12 shows, the areas inside and outside the UPP are long unstructured polygons around the UPP area. The quadrant specification introduces geographical structure by allowing us to compare sectors that are just *next to each other*. This relationship, where sectors are nested within quadrants and quadrants within UPPs, can be modeled using a Hierarchical Linear Model (HLM).

For the sake of comparison we start with a simple DID model without the quadrant specification.

$$y_{s,t} = \beta Post_{s,t} + \lambda Post_{s,t} * UPP100m_{s,t} + \gamma_s + f(time) + \epsilon_{s,t} \quad (4)$$

Where the dependent variable is the homicide or killings by the police rate in the sector s in the month t . UPP100 is a binary indicator coded as one if the given sector is inside the UPP area. Post is a binary indicator coded as one after the UPP was installed (the closest UPPs for outside sectors). The coefficient of interest is λ , corresponding to the interaction between UPP100m and Post, that is, the effect in the UPP area after it was installed. This model controls for sector fixed effects and a temporal linear trend. The standard errors are clustered by specific UPP (note that since UPP100m does not change across time it disappears with the inclusion of fixed effects).

A key identifying assumption of this DID strategy is that the average change in the control group is equivalent to the counterfactual change in the treatment group in the absence of the treatment. As mentioned before, a caveat of this specific model is that it does not control for sector location. It should be noticed that introducing quadrant fixed effects to this model would result in multicollinearity. The HLM modeling approach takes into account this nested structure by assigning a probability distribution to the group intercepts. To begin, we fit the base model but now allowing for a soft constraint to the γ 's.¹⁰ The second Hierarchical Model includes quadrants fixed effects to control for adjacency. Finally, we specify a more complex model using the three levels of UPP/quadrant/sector. Formally:

$$y_{s,q,t} = \beta Post_{s,t} + \lambda Post_{s,t} * UPP100m_{s,t} + \gamma_{q(s),t} + f(time) + \epsilon_{s,t} \quad (5)$$

$$\gamma_{q(s),t} = \gamma_0 + u_q$$

Where the unit of observation is the sector s , in quadrant q at time t . Again, the variable of interest is λ , that is, the interaction between UPP status and post-treatment period. The difference with the base model is that in this case the fixed effects follow a soft constrain. In other words, the γ 's are assigned a normal probability distribution with mean μ_γ and standard deviation σ_γ . This distribution has the effect of pulling the estimates of γ toward the mean. Including sector, quadrant fixed effects and UPP fixed effects implies adding a specific group variable with its own distribution.

Table A7 shows the results for the HLM models. The estimates are relatively stable across specifications and confirm our main results: the UPP intervention has a strong and significant effect on reducing killings by the police but has no effects on homicides. The results are identical to our DID models presented in the main text.

¹⁰In this case, $\gamma_s \sim N(\mu_\gamma, \sigma_\gamma^2)$.

Table A7: **Estimates on Homicides and Killings by the police within 100m +/- UPP border**

<i>Dependent variable:</i>				
Homicides				
	Baseline	HLM1	HLM2	HLM3
	(1)	(2)	(3)	(4)
UPP x Post	-0.515 (0.387)	-0.347 (0.378)	-0.323 (0.377)	-0.350 (0.377)
Killings by the Police				
	(1)	(2)	(3)	(4)
UPP x Post	-1.461*** (0.292)	-1.178*** (0.283)	-1.138*** (0.282)	-1.147*** (0.282)
Sector FE	Y	Y	Y	Y
Quadrant FE	N	N	Y	Y
UPP FE	N	N	N	Y
Linear time trend	Y	Y	Y	Y
Observations	83,916	83,916	83,916	83,916

Note: + p<0.1; * p<0.05; ** p<0.01; *** p<0.001

The unit of analysis is the sector bordering the UPP each month during the 2005-2015 period. Each sector can then lay within 100m inside or 100m outside the UPP. The number of homicides and killings by the police is normalized for every 100,000 inhabitants using the average population of the census tracts covering each sector. In order to control for adjacency effects we displayed a grid of 400m x 400m quadrants in which sectors are incorporated. Model 1 only controls for sector fixed effects and linear time trend. Model two mirrors model 1 using a Hierarchical Linear Model framework. Model 3 includes quadrant fixed effects into the HLM framework and model 4 adds UPP fixed effects.

A8.1 Border effects by criminal group

The next step in this analysis is to explore the heterogeneous effects of the UPP installation according to criminal regime before the intervention. To this end we run the DID analysis on different subsamples of our definition of criminal orders (Insurgent, Bandit, Symbiotic, Predatory, and Split). Table A8 shows the results of estimating model 4 across the different subsamples. These results are consistent with the main results using all intervened and non-intervened complexos as unit of analysis.

In particular, we observe that homicides reduce in areas under Predatory rule. Although non-significant, Bandit and Split areas also show a negative effect. At the same time, homicides seem to increase in areas under Symbiotic rule. All these results are consistent with our theory. The only group in which we find an opposite effect than expected is in areas under Insurgent rule. However, since none of these results are significant at standard levels we cannot offer a full interpretation. The results for police killings mainly confirm that areas under Bandit and Split rule had a significant decrease after the UPP intervention. The effect for Insurgent controlled areas is positive, as expected.

To control for location features we run the HLM models in each of the subsamples. These results are

Table A8: Estimates on Homicide Rates 100m +/- UPP border (by criminal rule)

<i>Dependent variable:</i>					
	Insurgent	Bandit	Homicides Symbiotic	Predatory	Split
	(1)	(2)	(3)	(4)	(5)
UPP x Post	-0.505 (1.038)	-0.557 (0.507)	0.566 (1.149)	-3.128* (1.425)	-0.182 (0.808)
			PK Rate Symbiotic	Predatory	Split
	Insurgent	Bandit	(3)	(4)	(5)
	(1)	(2)	(3)	(4)	(5)
UPP x Post	0.537 (0.361)	-2.061*** (0.478)	-1.238 (0.807)	-0.550 (0.772)	-1.919*** (0.565)
Sector FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
N	12,852	37,152	10,908	4,104	18,900

Note: + p<0.1; * p<0.05; ** p<0.01; *** p<0.001

The unit of analysis is the sector bordering the UPP each month during the 2005-2013 period. Each sector can then lay within 100m inside or 100m outside the UPP. The number of homicides and killings by the police is normalized for every 100,000 inhabitants using the average population of the census tracts covering each sector. In order to control for adjacency effects we displayed a grid of 400m x 400m quadrants in which sectors are incorporated. All models control for sector and time fixed effects.

presented in table A9, which confirms the estimates obtained with the baseline model.

Table A9: HLM estimates on Homicide Rates 100m +/- UPP border (by criminal rule)

<i>Dependent variable:</i>					
	Homicides				
	Insurgent	Bandit	Symbiotic	Predatory	Split
	(1)	(2)	(3)	(4)	(5)
UPP x Post	-0.496 (1.015)	-0.314 (0.525)	0.375 (1.321)	-3.128** (1.402)	0.0004 (0.802)
	PK Rate				
	Insurgent	Bandit	Symbiotic	Predatory	Split
	(1)	(2)	(3)	(4)	(5)
UPP x Post	0.545 (0.588)	-1.701*** (0.485)	-1.181 (0.928)	-0.550 (0.715)	-1.444** (0.476)
Sector FE	Y	Y	Y	Y	Y
Quadrant FE	Y	Y	Y	Y	Y
UPP FE	Y	Y	Y	N	Y
Linear time trend	Y	Y	Y	Y	Y
N	12,852	37,152	10,908	4,104	18,900

Note: + p<0.1; * p<0.05; ** p<0.01; *** p<0.001

The unit of analysis is the sector bordering the UPP each month during the 2005-2013 period. Each sector can then lay within 100m inside or 100m outside the UPP. The number of homicides and killings by the police is normalized for every 100,000 inhabitants using the average population of the census tracts covering each sector. In order to control for adjacency effects we displayed a grid of 400m x 400m quadrants in which sectors are incorporated. All models control for sector, quadrant, and UPP fixed effects (except for the Predatory group that only includes one UPP).

A9 Additional Robustness tests

To assess the robustness of our results, we test for anticipation and selection effects. Anticipation effects exist if violence starts to drop in a treated favela as a consequence of the expectation of the pacification rather than the intervention itself. On the other hand, selection effects will challenge the identification strategy if UPP interventions were predominantly implemented in places where violence was already decreasing.

To test for these effects, we present alternative model specifications that include a lag of the pacification treatment that takes the value of 1 either three, six or nine months before the actual intervention starts. If the observed effects exist only as a result of the intervention, then the coefficients for the placebo tests should not have a significant effect.

Table A10 shows the results for the regressions using lagged values as placebos. We observe that none of the lagged variables have a significant effect on homicides or killings by the police, thus strengthening our interpretation of the pacification effect. All models include complexo and time fixed effects.

Table A10: **Placebo tests**

	<i>Dependent variable:</i>					
	Homicides (1)	PK (2)	Homicides (3)	PK (4)	Homicides (5)	PK (6)
3 months lag	0.133 (0.345)	0.112 (0.259)				
6 months lag			0.439 (0.334)	0.203 (0.301)		
9 months lag					0.495 (0.327)	0.180 (0.307)
Complexo FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Clustered SE	Y	Y	Y	Y	Y	Y
Observations	24,401	24,401	24,401	24,401	24,401	24,401

Note:

+ p<0.1; * p<0.05; ** p<0.01; *** p<0.001

All regressions are for the 2005-15 period with complexo-month as the unit of analysis. The dependent variables, homicides and police killings (pk), are measured in rates of 100,000 inhabitants. The independent variable is the pacification treatment lagged by 3, 6 and 9 months respectively. Models control for unit and time fixed effects. Standard errors (in parenthesis) are clustered at complexo level.

An additional concern for the validity of our results is that the UPP program was not the only policy implemented in this period. In particular, the *Sistema Integrado de Metas* (SIM), a pay for performance model oriented to reward police battalions based on crime reduction, was implemented shortly after the installment of the first UPP. The SIM poses an important threat for identification because police

battalions received rewards for reductions in homicides after 2009, and for reductions killings by the police after 2011, which coincides with the timing of most pacification.

In order to test for the SIM effect, we included in our models a binary variable that takes value of one after 2009 and 2011 for homicides and killings by the police, respectively. Table A11 shows the results of both specifications. Including a SIM effect does not change our main results, that is, that the pacification had no effect on homicides but had a strong and significant effect reducing killings by the police. Note that the SIM reference dates are common to all favelas (treated and non-treated), therefore, the models presented in the main document (that include time fixed effects) are even more flexible than the ones presented here. An important result for our main argument is that the SIM does not seem to have an effect in either homicides or police killings.

Table A11: **SIM Effect**

	<i>Dependent variable:</i>	
	Homicides	Police Killings
	(1)	(2)
BOPE	0.391 (0.358)	-0.379 (0.406)
UPP	0.707 (0.442)	-0.670 ⁺ (0.344)
SIM effect	0.176 (0.643)	0.313 (0.282)
Complexo FE	Y	Y
Common Polynomial time trend	Y	Y
Clustered SE	Y	Y
Observations	26,528	26,528
Adjusted R ²	0.047	0.029

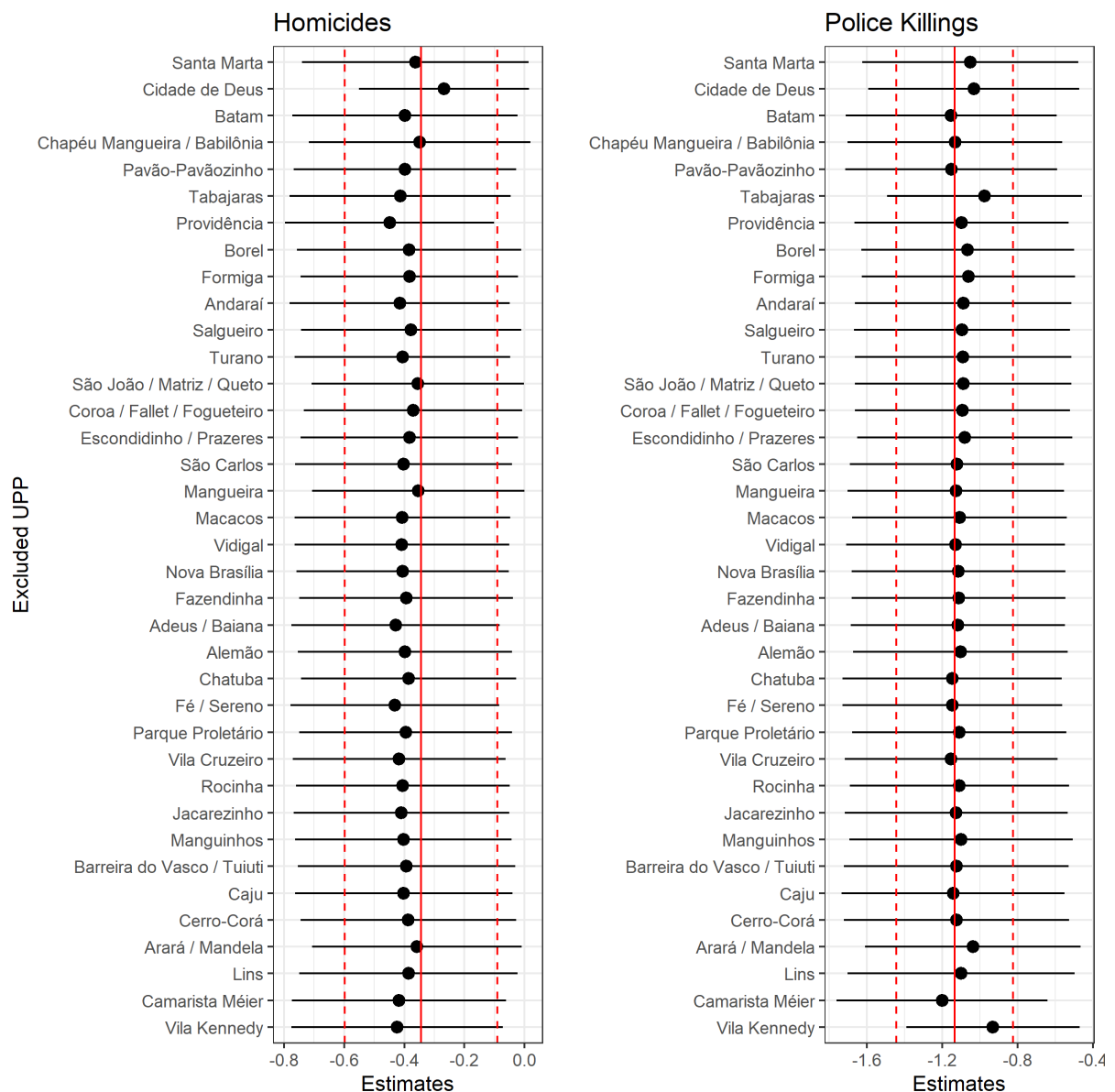
Note: + p<0.1; * p<0.05; ** p<0.01; *** p<0.001

All regressions are for the 2005-15 period with complexo-month as the unit of analysis. The dependent variables (homicides and killings by the police) are measured in rates of 100,000 inhabitants. UPP is a binary variable that takes the value of one after the UPP was introduced in the given favela. BOPE is a binary variable that takes the value of one only during the period in which the BOPE was present in the favela. These two stages of the pacification treatment do not overlap. SIM effect is a binary variable that takes value of 1 after 2009 (for homicides) and after 2011 (for killings by the police). Models control for unit and time fixed effects. Standard errors (in parenthesis) are clustered at complexo level.

A9.1 Robustness to individual UPP exclusion

An additional concern for the validity of our results is that these might be biased by a single UPP. This concern is particularly relevant for large UPPs such as Rocinha. To address this potential issue we ran our models using only treated favelas excluding one UPP at a time. These results are displayed in figure A14. Here, we observe the estimates and confidence intervals for the UPP effect on homicides and on police killings when one specific UPP is eliminated from the sample. This exercise does not modify our conclusions.

Figure A14: Estimates for Homicides and Police Killings excluding one UPP at a time



Notes: Each point represents the estimate excluding one UPP at a time, with its 95% confidence intervals. The UPPs are ordered according to their date of entry. The solid red line represents the estimate using the whole sample, with its 95% confidence interval (dashed line).

A10 Results for Heterogeneous Effects on Other Crime Indicators

This section uses publicly available data on other crime indicators, including extortion, burglary, officers killed in action, and drug seizures. Unfortunately, this data is publicly available at the UPP level only and hence this part of the analysis focuses solely on treated areas. Lethal violence incidences have less problems with under-reporting because, for the most part, it is harder to hide dead bodies. Burglary and extortion are more problematic crime indicators. These criminal incidences could increase with the UPP not necessarily because crimes actually increase but because more people report them. This is the reason why we chose not to include in the analysis crimes such as, for example, street theft or sexual assault. Reports of these crimes are commonly associated with having police nearby to report them, as well as with trust or lack thereof in the police.¹¹

Vehicle theft is a more reliable indicator because victims tend to report this crime to the police to claim insurance coverage. However, this would be a poor indicator for Rio's favelas, where most people don't own cars or use motorcycles. Instead we focus on commercial burglary, defined as the unlawful entry into a business structure. For reasons analogous to vehicle thefts, these commercial burglary might be more commonly reported to the police, although results for this crime should be taken with caution than results for homicides.

The specified models specified are:

$$y_{i,t} = \tau BOPE_{i,t} + \delta UPP_{i,t} * O_i + \gamma(F_i * t) + \lambda_i + \epsilon_{i,t} \quad (6)$$

Measuring an interaction between UPP and the existing criminal order (δ), and controlling for the BOPE intervention, and for favela specific time-trends and UPP fixed-effects. Results are presented in table A12. Once again, our results reveal that the UPP had heterogeneous effects according to the extant criminal order.

As predicted by our theory, the UPP increased burglary in Symbiotic criminal orders. In Predatory criminal orders there are substantial reductions in burglary. The effect on Split and Bandit orders are negative, although the confidence intervals overlap with zero. The UPP caused marked reductions in extortion in Predatory criminal orders, as predicted by our theory.

In terms of officers killed in action, there is a substantial increase in the number of officers killed in Insurgent officers and a decrease in Symbiotic orders, as expected by our theory. Finally, drug seizures increased in every criminal order, probably reflecting more presence of police, and suggesting that the

¹¹In fact, when we run the statistical models with these crimes, all seem to increase with the UPP regardless of criminal order.

Table A12: **Heterogeneous effects of UPP intervention on other outcomes**

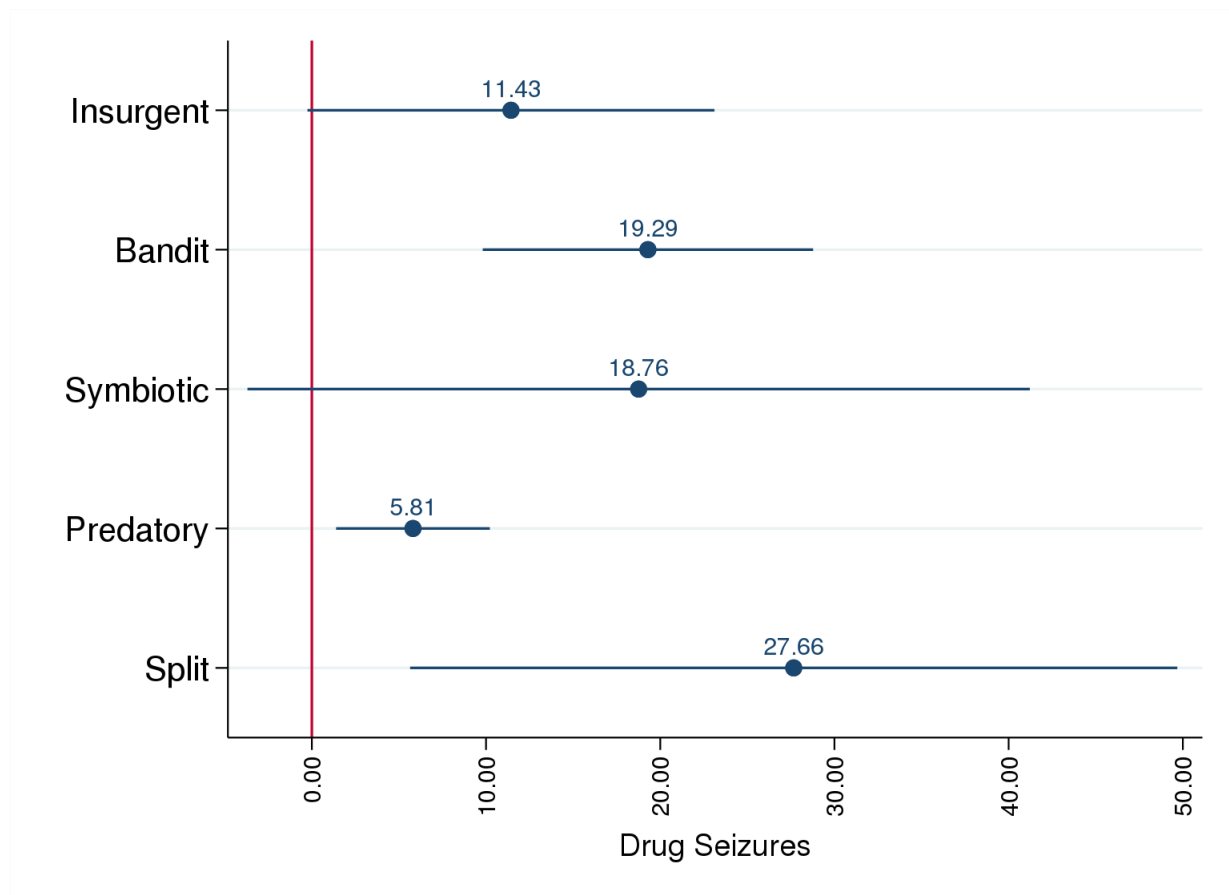
	Burglary (1)	Extortion (2)	Officers Killed (3)	Drug Seizures (4)
UPP	-0.251 (0.362)	0.168 (0.367)	-0.029 (0.028)	19.014*** (4.693)
UPPxInsurgent	0.765 (0.599)	0.591* (0.278)	0.186* (0.085)	-7.839 (7.136)
UPPxSymbiotic	1.098* (0.548)	0.608* (0.276)	-0.127+ (0.077)	-0.635 (11.917)
UPPxPredatory	-1.970*** (0.425)	-0.542 (0.510)	0.060 (0.051)	-13.252* (5.466)
UPPxSplit	-0.537 (0.604)	0.569 (0.658)	0.051 (0.063)	9.885 (11.697)
Complexo FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
Unit-specific time trend	Y	Y	Y	Y
Clustered SE	Y	Y	Y	Y
Observations	4,218	4,218	4,218	4,218
Units	37	37	37	37
Adjusted R ²	0.136	0.025	0.022	0.402

Note: + p<0.1; * p<0.05; ** p<0.01; *** p<0.001

All regressions are for the 2007-16 period with complexo-month as the unit of analysis. The dependent variables (bulglary, extortion, drug seizures and officers killed) are measured in rates of 100,000 inhabitants. UPP is a binary variable that takes the value of one after the UPP was introduced in the given favela. The criminal order of reference is Bandit. All models include group-of-favelas (Complexes) fixed effect, time fixed effects, and time specific time trend. Standard errors are clustered at UPP level.

UPP didn't target drug trafficking differently in these criminal orders (marginal effects for this outcome appear in Figure A15).

Figure A15: **Heterogeneous Effects of UPP interventions on Drug Seizures**



Notes: Estimated marginal UPP effects, with 95 % confidence intervals (by delta method), based on models presented in table A17.

A11 Description of the community survey

The community survey “Security Perceptions in Rio de Janeiro’s Periphery“ presented in this paper was collected in collaboration with *Observatório de Favelas* and *Redes de Desenvolvimento da Maré*, two NGOs with a solid reputation and long experience working in Rio’s favelas. These organizations were in charge of hiring and training enumerators, as well as assessing security concerns to protect their safety. IRB procedures under Stanford University guidelines were followed and are available upon request.

In total, there were 5,300 questionnaires collected in the favelas of Providência, Batan, Cidade de Deus, Rocinha, and Complexo da Maré. These areas were selected because they vary in size, territorial control and contestation. In particular, Batan is controlled by a militia (Predatroy criminal regime), Rocinha by ADA (Symbiotic regime), Providência by CV (Bandit regime), whereas Maré and Cidade de Deus are contested by several criminal factions (Split regime). Maré is an interesting case since CV and TC are present as well as the militias.¹² However, survey data from this particular favela is not shown in this paper because a UPP was not installed. Unfortunately, it was not possible to collect surveys in Complexo do Alemão because intense shootouts made it too dangerous for enumerators.

In total, there were 68 enumerators: 11 in Providência, 19 in Batan, 14 for Cidade de Deus, 9 in Rocinha and 15 in Complexo da Maré. These enumerators were selected with the following criteria: 1) Adults between 18 and 35 years, 2) residents of the areas where they collected the data, and, 3) prior experience working in favelas.

Data collection started in January and ended in May 2016. The NGOs supervised the enumerators weekly in order to solve issues they encountered in the field. The issues varied among a large range of concerns, including shootings in various locations, residents’ reluctance to talk about public security, and a few respondents simply resisting to continue the survey because they found it too long. In general, our enumerators report that many residents found it important to talk about these issues and mentioned that to them the survey was “like a political movement” because they seldom were able to address and talk about security problems. The survey research was accompanied by the collection of 40 “life stories” of residents in these favelas that we fully transcribed.

The selected sampling method was a random systematic sampling in two stages. Favelas were divided by bloc and then household was selected randomly in each bloc. Inside each household, one individual over 18 years old was also selected randomly. This procedure required the enumerator to come back to each selected household to make sure that the respondent was present. Although costly and time consuming, this method guarantees that results are not driven by the timing of the interviews (as it would happen with a one-stage systematic sampling), or that multiple members of one household would

¹²In the past also ADA was present, making it the most contested large favela complex in Rio.

be interviewed (as would happen with random sampling in a common area of the community since the communities are relatively small).

The collection of the survey was challenging and encountered several obstacles. Although Providência is considered a small favela among the ones selected for this study, the geography inside the favela, including very steep hills, imposed some difficulty in the transit of researchers between different locations inside Providência. The team experienced some armed conflicts in that locality, which led to the resignation of some researchers. However, the questionnaires were collected without major delays. In September 2015 – three months before this study – three police officers from the UPP Providência killed a young man and were caught forging the evidence to change the crime scene. The scandal had large visibility in social media.

Rocinha is the largest favela of Rio de Janeiro and known for its complex territorial geography. During the data collection, interviewers complained about fatigue, as they had to climb up and down the alleys to contact respondents previously selected on the list. Another fieldwork issue was the difficulty of finding addresses, since the ones listed on the National Address Book (data source for the research), were not the same as those that the residents knew and used in their daily lives. This fact required a great effort by the interviewers and local facilitators. In Rocinha, local residents were hired to conduct the survey, since access to that locality was distant from other parts of the city - from downtown to Rocinha by bus it takes an average of 1 hour and 10 minutes.

The favela Batan was one of the easiest communities to map and survey. Observatorio de Favelas partnered with some local institutions to select the researchers. There was a low dropout rate of researchers (only 4) and this facilitated the data collection in Batan.

The Complexo do Maré was the first territory chosen to test the methodology and begin fieldwork (November of 2015). Some factors may explain lesser challenges in the study in Maré compared to the other areas: a) greater permanence/stability of the team (only 3 withdrawals, throughout the research); b) the expertise of the Redes and Favelas Observatory with data collection in that territory; c) the recognition and trustworthiness of these institutions among the inhabitants of that territory; and, d) the existence of a former local team, which was familiar with the territory and had the skills required to conduct fieldwork in favelas.

Cidade de Deus is one of the largest territories studied. It corresponds to a Split regime where the UPP had a large impact reducing homicides and killings by the police. However, some months prior the collection of our survey, a battle among rival factions erupted, which only reveals how fluid violence can be. The battle resulted from the displacement of CV and ADA drug traffickers to that area. Due to the complexity of the territory, the enumerators were relocated near the main roads of Cidade de Deus

to prioritize their safety and guarantee study continuity. In these areas, interviewers perceived greater openness to participation in the research - as reported by the researchers the previous week. During this period, nine researchers gave up participating in the research, due to the great instability of the territory. After shootouts subsided, enumerators were able to collect surveys in the entire area.

A12 Results for survey analysis

In our paper we study police legitimacy using an original survey conducted in four UPP areas. The details of the data collection for this survey are summarized in section A12 of this Appendix. Here, we present the details of the analysis for this survey. We estimate the following model:

$$y_i = \alpha + \beta F_i + \sum_{j=1}^J (\gamma_j V_i) + \sum_{k=1}^K (\eta_k E_i) + \sum_{d=1}^D (\theta_d X_i) + \epsilon_i \quad (7)$$

Where y_i is a measure of police legitimacy at individual level. To measure police legitimacy we use three different approaches. First, the answer to the question "How much do you agree with the following phrase: The UPP should stay in the favela?". The variable takes three values: 1=No, 2=Partially, 3=Yes. In the paper, we ran the model using an OLS regression where the dependent variable is expressed as continuous variable that goes from 1 to 3. To address concerns of model dependency we also run this model as an ordered probit and transformed this variable to a binary indicator where the answer "Yes" takes the value of one and zero otherwise.

The second approach was building an additive index using the following variables:

- Whether or not the UPP is perceived as a positive institution.
- Whether or not citizens believe that the UPP improved life.
- Whether or not citizens believe that the UPP should stay or leave the favela.
- Whether or not citizens believe that the UPP improved relationships between the police and residents.

For this index, the cumulative score is divided by the number of items over which the sum is calculated. The scale was constructed by using standardized (mean 0, variance 1) values of the individual items. The resulting scale was also standardized. This index has a scale reliability coefficient (Cronbach's alpha) of 0.7641, revealing that the measure has internal consistency.

A limitation of the index is that a score is created for every observation for which there is a response to at least one item. In this case we could be assuming a misleading score for those cases in which the respondent decided to skip the question. For this reason we calculated a second index using Principal Component Analysis. The correlation between both indexes is 0.707.

One of our main explanatory variables refers to differences between criminal governance. For this reason, we include a favela fixed effects for our four locations: Batan (Predatory), Cidade de Deus (Split), Providencia (Bandit) and Rocinha (Symbiotic), which is the coefficient β in our model. Our second set

of explanatory variables relate to the nature of everyday interactions between residents and UPP police officers. We included the following interactions:

- Whether or not the police invaded the house of the respondent.
- Whether or not the respondent has experienced physical aggression by police.
- Whether or not the police has killed a family member or a friend of the respondent.

We also include a set of questions related to the evaluation of the UPP. In particular, the level of agreement of the respondents to the following statements (the η coefficients in our model):

- The UPP decreased armed conflicts with the police.
- The UPP decrease ostensible use of weapons
- The UPP increased robbery, theft and rape.
- The UPP increased police corruption.

Finally, we also control for a set of individual characteristics (the θ coefficients in our model):

- Sex of the respondent
- Monthly income
- Age

The results for our four models are presented in table A13. The first column displays the OLS results for the question of whether the UPP should stay. Column 2 presents the OLS results for the standardized score. Models 3 and 4 also use the the question of whether the UPP should stay as a dependent variable but using an ordered probit and a logistic model respectively. Finally, Model 5 shows the results for the second indexation approach using PCA. For simplicity, we exclude the coefficients for individual controls. Overall, the results are strongly consistent both across models and with our theoretical predictions.

Table A13: Effects on support for the UPP

	<i>Dependent variable:</i>				
	UPP should stay (OLS) (1)	UPP support additive index (OLS) (2)	UPP should stay (oprobit) (3)	UPP should stay (logit) (4)	UPP support PCA index (OLS) (5)
Split	0.141*** (0.0306)	0.0956*** (0.0361)	0.213*** (0.0669)	0.404*** (0.124)	0.121*** (0.0448)
Bandit	-0.0853*** (0.0303)	-0.0294 (0.0358)	-0.207*** (0.0657)	-0.534*** (0.125)	0.109** (0.0443)
Symbiotic	-0.269*** (0.0290)	-0.340*** (0.0343)	-0.534*** (0.0625)	-0.805*** (0.119)	-0.154*** (0.0424)
Police invaded home	-0.277*** (0.0276)	-0.190*** (0.0327)	-0.512*** (0.0543)	-0.905*** (0.124)	-0.0207 (0.0403)
Police inflicted harm	-0.261*** (0.0533)	-0.440*** (0.0630)	-0.480*** (0.108)	-0.889*** (0.274)	-0.338*** (0.0775)
Police killed family or friend	-0.0889*** (0.0238)	-0.109*** (0.0281)	-0.189*** (0.0494)	-0.271*** (0.0994)	-0.105*** (0.0347)
UPP decreased conflict (in part)	0.0453 (0.0297)	0.263*** (0.0350)	0.0514 (0.0591)	-0.127 (0.118)	0.320*** (0.0435)
UPP decreased conflict (yes)	0.143*** (0.0388)	0.560*** (0.0457)	0.312*** (0.0812)	0.640*** (0.153)	0.441*** (0.0569)
UPP decreased weapons (in part)	0.175*** (0.0288)	0.351*** (0.0340)	0.308*** (0.0573)	0.161 (0.114)	0.419*** (0.0423)
UPP decreased weapons (yes)	0.407*** (0.0401)	0.635*** (0.0471)	0.940*** (0.0868)	1.402*** (0.163)	0.557*** (0.0587)
UPP increased crime (in part)	-0.188*** (0.0230)	-0.215*** (0.0271)	-0.384*** (0.0488)	-0.698*** (0.0913)	-0.0185 (0.0337)
UPP increased crime (yes)	-0.212*** (0.0287)	-0.387*** (0.0340)	-0.441*** (0.0602)	-0.801*** (0.120)	-0.180*** (0.0419)
UPP increased corruption (in part)	-0.142*** (0.0261)	-0.236*** (0.0308)	-0.407*** (0.0587)	-0.874*** (0.109)	-0.0456 (0.0383)
UPP increased crime (yes)	-0.359*** (0.0316)	-0.562*** (0.0373)	-0.778*** (0.0671)	-1.450*** (0.131)	-0.288*** (0.0462)
Constant	2.350*** (0.0472)	-0.210*** (0.0558)		0.873*** (0.198)	-0.610*** (0.0690)
Observations	4,669	4,688	4,669	4,669	4,617
Adj. R^2 /Pseudo R^2	0.342	0.516			0.265
Individual controls	Y	Y	Y	Y	Y

*p < .1; **p < .05; ***p < .01

NOTE: Models for the survey analysis. The dependent variables are: i) The individual response of whether the respondent agrees to the statement "the UPP should stay" (Model 1 and 3), coded as 1=No, 2=Partially, and 3=Yes; ii) A binary transformation of the previous variable where Yes=1 and 0 otherwise (Model 4); iii) An additive index of support for the UPP (Model 2), and iv) A PCA score for support of the UPP (Model 5). All variables include a fixed effect for the location of the survey, a set of variables related to relationship with the police, a set of variables related with the individual evaluation of the UPP, and a battery of individual controls.

A13 The Relocation of criminal organizations

Our paper is about the local effects of the UPP on favela complexes. However, as we explain in the paper, OCGs respond to police interventions with a repertoire of strategies, including bribing and corrupting the police, fighting back and killing police officers, or relocating to areas where they can hide from the police. In this section we present statistical evidence that the UPPs had the effect of pushing OCGs to relocate to other areas of the city, which largely increased the challenges for the Rio de Janeiro state to maintain order and made the problems of crime and violence more visible for the middle class.

In the beginning of the UPP reform security officials in Rio de Janeiro did not anticipate that drug traffickers would reorganize their operations outside the targeted favelas. Secretary of Security Mariano Beltrame explained to us:¹³

Drug traffickers depend on homegrown criminals to operate. Their criminal operation heavily depends on territorial control of the favelas. To run their business elsewhere, drug traffickers would need to rebuild an entirely different criminal organization.

Drug traffickers reorganized to run their business from other corners of Rio de Janeiro, hiring labor from other locales and using other strategies to sell drugs. In this section, we analyze whether the UPP had the effect of displacing criminal organizations to other areas of the city using publicly available data on crime incidents at the battalion level. The data on these occurrences is not available at the street-level, so we are not able to offer an equally fine-grained statistical analysis as for homicides and killings by the police.

There are various indicators we can use to detect whether drug trafficking organizations shifted their operations to other areas. First, unusual apprehensions of guns and automatic weapons, which are key instruments drug traffickers use to run their business, can serve to infer whether crime syndicates are moving their operations. Second, an upsurge in vehicle thefts because, according to our police informants, after the UPPs were installed cars emerged as a favorite mean for moving drugs across the city. Cargo theft also appears to have become a new source of income for some of the criminals that left the favelas. Finally, more frequent violent and lethal robberies, which will suggest the increased presence of armed criminal groups in these areas.

We offer statistical evidence using a DID strategy. In this case, our unit of analysis is the police battalion during the 2005 to 2015 period. In this case we also include areas surrounding the Rio municipality, in particular the suburban area of Baixada Fluminense and the neighboring city of Niteroi, where informants in the police told us that crime had migrated.

¹³This interview was held in 2012, before it had become obvious to policy makers that crime was increasing in other areas of the city.

The intervention of Complexo do Alemão is a watershed moment in the pacification process that affected CV in its headquarters. We specify this intervention as a reference point for the analysis. To focus on spillover effects in battalions that were not part of the UPP program, we specify our model as follows:

$$y_{b,t} = \beta PostComplexo_t + \gamma PostComplexo_t * NoUPP_s + \lambda_b + \alpha_t + \epsilon_{s,t} \quad (8)$$

Where $Y_{s,t}$ is the measure of criminal activity for battalion b in month t . We present models for homicides, killings by the police, weapon seizures, drug seizures, general theft, and vehicles theft. The dependent variables are measured in rates of 100,000 inhabitants. *Complexo* is a binary variable that takes value of 1 after the Complexo do Alemão intervention, that is November 2011. *No-UPP* is a binary variable that takes a value of 1 for those battalions that never received an UPP. The parameter of interest is γ , which is the effect in those places without UPP after Complexo do Alemão was intervened. All models control for battalion and month fixed effects. Standard errors are clustered at the battalion level. All regressions are for the 2002-15 period with battalion-month as the unit of analysis.

Table A14: **Spillover effects**

	<i>Dependent variable:</i>					
	Homicides	Killings by the police	Weapons	Drugs	Violent Theft	Vehicle Theft
	(1)	(2)	(3)	(4)	(5)	(6)
Post Complexo	-3.559 ⁺ (1.890)	-1.794 ⁺ (1.890)	-11.648 ⁺ (6.701)	1.272 (9.151)	-37.041 ^{***} (10.594)	-0.371 [*] (0.170)
Post Complexo x No UPP	4.244 ⁺ (2.421)	2.381 ⁺ (2.421)	16.699 [*] (8.120)	0.953 (12.177)	50.041 ^{***} (13.254)	0.462 [*] (0.193)
Battalion FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Clustered SE	Y	Y	Y	Y	Y	Y
Number of units	41	41	41	41	41	41
Observations	6,393	6,393	6,393	6,393	6,393	6,393
Adjusted R ²	0.069	0.069	0.106	0.049	0.204	0.009

Note:

+ p<0.1; * p<0.05; ** p<0.01; *** p<0.001

All regressions are for the 2005-15 period with battalion-month as the unit of analysis. The dependent variables are measured in rates of 100,000 inhabitants. The dependent variables are (in order): homicides, killings by the police, seizures of weapons, seizures of drugs, thefts, and vehicle regular thefts. *Post Complexo* is a binary variable that takes the value of one after the occupation of Complexo do Alemão in November 2011. *No UPP* is a binary variable that takes value of one for those battalions that never received an UPP. All models include police battalion and year fixed effects. This information was provided by the Civil Police of Rio de Janeiro only for those favelas with UPP presence. Standard errors (in parenthesis) are clustered at Battalion level.

The results in Table A14 show significant decreases after the Complexo intervention for almost all crime indicators in battalions that received an UPP. For the rest of the battalions, we observe increases

of criminal activity after the intervention in Complexo do Alemão. This data provides evidence that drug traffickers shifted their operations to other areas of the city as a result of the UPPs. The results also reveal that homicides and armed confrontations between OCGs and the police increased outside the favelas as a result of the UPP. Violent theft and vehicle theft also increased outside of UPP areas.

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