

# Killing in the Slums: An Impact Evaluation of Police Reform in Rio de Janeiro

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<sup>1</sup> This research is based on three and a half years of fieldwork. The research draws from a lengthy effort to geo-code more than 22,000 homicides and police killings in the City of Rio de Janeiro from 2005 to 2013. For sharing their knowledge and trusting us with invaluable information, we want to thank Secretary Mariano Beltrame, the top commander of the Military Police, including Col. Paulo Henrique Azevedo, Col. Rogerio Seabra, Col. Robson Rodrigues da Silva, and Col. Luis Claudio Laviano, as well as Majors Alexadre Leite, Leonardo Nogueira, Glauco Schorch, and Sidnei Robson Pazini. We also want to thank Terine Coelho from SESEG for all her support. Versuzka Delfino, Ignacio Cano, Eliana Souza Silva, Jailson Souza, Marcus Faustini, and numerous residents of the favelas who chose to remain anonymous provided invaluable insights about the pacification process, politics and violence in Rio. We want to thank a research team of students from ITAM who helped with the geo-coding of the data (particularly to Montse Trujillo) as well as Veriene Melo, who collaborated with the authors in conducting interviews. Discussion of preliminary findings largely benefited from comments by Lisa Blaydes, Alberto Diaz-Cayeros, Karen Jusko, Francisco Garfias, Dorothy Kronick, David Laitin, Phillip Lipsy, and Jonathan Rodden.

## Introduction

Violence remains one of the most fundamental challenges for development. Even though violent deaths have declined, not just in the long-term historical record but even within the past few decades (Pinker, 2011), a very large share of the world's premature deaths are still caused by intentional injuries of one human being over another. A sustained increase in per capita GDP is one of the clearest ways in which societies have escaped from premature death (Fogel, 2004 and Deaton, 2013). Premature deaths, particularly those caused by infectious diseases, tend to decrease as poor countries become developed. But in the case of premature deaths caused by homicides, countries at intermediate levels of development suffer from some of the highest homicide rates (Magaloni, 2015).

Much attention has been concentrated on the human suffering and devastating impact of civil wars. Armed conflicts with at least 25 battle deaths (as defined by the Uppsala Conflict Data Program (UCDP)) have sharply declined after the end of the Cold War. Although always difficult to quantify, battle deaths are perhaps between 20 and 50 thousand deaths per year since the 2000s. These numbers pale in comparison to the numbers of deaths that occur in non-conflict settings from intentional homicides, which are around half a million deaths each year, or twenty times more than deaths caused by war<sup>2</sup>.

Violent crime constitutes a neglected global development challenge that affects Latin America disproportionately. With over 30% of the world's homicides and less than 8% of the world's population, Latin America is the most violent region of the world, home to 43 of the 50 most dangerous cities.<sup>3</sup> In Brazil alone more than 60,000 people were murdered in 2013. Violence imposes serious human costs in terms of life lost, human suffering and abuse of human rights - the rights to life and security. Criminal violence increases social polarization, undermines social cohesion and trust in institutions, and perpetrates social exclusion. Violent crime also hinders economic development (e.g., Londoño and Guerrero; 2000; Lora and Powell, 2011; Dell, 2015; and Pshiva and Suarez, 2010).

The central questions that motivate our research are what causes societies to be trapped in criminal-violence epidemics and how can they escape spirals of murder? The paper seeks to contribute to our knowledge on urban violence by focusing on Rio de Janeiro<sup>4</sup>. Between 2005 and 2013 there were 17,392 homicides

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<sup>2</sup> The Geneva Declaration report on the Global Burden of Armed Violence noted a few years ago that "by far the largest aspect of the global burden of armed violence is the deaths and injuries that occur in non-conflict or non-war settings" (Geneva Convention, 2008:67).

<sup>3</sup> According to data for 2014 from the Mexican NGO *Consejo Ciudadano para la Seguridad Publica y la Justicia* (CCSP).

<sup>4</sup> From now on this report will refer as Rio de Janeiro to the area comprised by the municipality of Rio de Janeiro. When it includes the northern area of Baixada Fluminense it will refer as the metropolitan area of Rio de Janeiro; and when it talks about the State it will refer as the State of Rio de Janeiro.

in the city of Rio and 4,707 police killings for a total of 22,099 violent deaths. Lethal violence predominantly affects young black men living in the slums (favelas). In that period, homicides decreased by 42% and police killings by 66%. One of the central goals of the paper is to evaluate the causal impact of the introduction of the Pacifying Police Units (UPPs) in various favelas. We are interested in understanding the process through which governments supply a basic public service - the police - in poor urban neighborhoods that have long been abandoned to the arbitrary rule of non-state armed actors, and to measure the impact of government interventions vs. drug trafficking gangs.

The main goals of the UPPs were: 1) to regain control of territories previously dominated by armed criminal groups; and 2) to improve security and ensure peace for these communities through reduction of shootouts and lethal violence. The UPPs marked an important departure from the militarized policing of the favelas that has terrorized citizens for decades. Since 2008, the UPPs have been introduced in over 100 favelas as a form of “proximity” policing. This paper focuses on the period of 2005-2013 for which we have geo-coded data on more than 22,000 violent deaths. During this period a total of 35 UPP’s were set in place with almost 9,000 police officers serving around a half million people.

According to Gary Becker’s crime and punishment classic theory, police are essential to reduce crime because they increase the probability of perpetrators being caught. Evaluating the validity of this simple proposition is not trivial.<sup>5</sup> Police are not deployed randomly, which makes causal inference challenging. Using different identification strategies, Levitt (1997) shows that when police are present there is less crime in US cities, and Di Tella and Schargodsky (2004) show a similar finding for Buenos Aires. Although important, police presence is not the only relevant question to consider. Police strategy and behavior matter as well. In the US there is an important debate about various police strategies, including Broken Windows (Weisburd, Telep, and Lawton, 2015); Ceasefire (Braga, et al, 1999 and 2001; Braga, 2013; Cook and Ludwig, 2006; Morgan and Winship, 2007; Wellford et al, 2005); and Hot Spot policing (Pierce et al. 1988; Shermann et al. 1989; Weisburd et al, 1992).

Experimental evidence from US cities demonstrates that targeting police resources against the highest-crime “hot spots” can help prevent criminal activity (Durlauf and Nagin, 2011; Skogan and Frydl, 2004; Weisburg and Eck 2004). Moreover, targeting the most violent individuals is critical. With Operation Ceasefire, the police reached out to gangs and other community organizations – parents, churches, community leaders – to deliver a message through town halls and direct patrol encounters that murders would evoke an immediate response and would send the offender --and potentially his friends -- directly to jail (Kennedy, 1997, 2006, 2008 and Kennedy et. al., 1996).

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<sup>5</sup> Focusing on a simple question, whether police presence reduce crime in the US, Cameron (1988) reports in his summary of 18 papers that some report a positive effect and others no effect at all.

With the exception of Di Tella and Schargodsky (2004), all of these previously mentioned findings come from studies about the US and tend to overlook the larger institutional context. Hot spot policing can do more harm when the police are violent and abusive. Police officers are an armed wing of the state and if not properly constrained, they can become a source of oppression, human rights abuses, torture and murder. Abusive police can easily undermine citizen trust and community proximity, both of which are essential to contain crime.

A focus on police violence has finally come to the forefront in the US context triggered by recent events in Ferguson, Missouri and many other cities.<sup>6</sup> Our paper is relevant for this discussion because it provides the first comprehensive analysis of police killings, filling an important void in the literature that has tended to overlook issues of police use of deadly force. Our paper documents Rio de Janeiro's painful trajectory of police violence, illuminating some of its major institutional facilitators. Furthermore, by painstakingly geo-coding police killings from 2005 to 2013, we provide answers to some of the most critical questions about police use of lethal force, including the determinants of variations in who is targeted by police repression and how different strategies for policing the slums have impacted police killings.

Moreover, our paper also relates to the emerging comparative literature on drug wars (Dell, 2015; Calderón, et al, 2015; Lessing, 2015). Existing work on the US police does not consider large-scale organized crime. Paul Collier (2000) claims that the critical distinction between criminal violence and rebellion lies on a substantial divergence in the industrial organization of crime and insurgency, "the former organized according at a small scale and the latter at a large scale" (853). This is because the industrial organization of violent rebellion, according to Collier, is organized to predate against natural resources instead of household wealth. But we argue that when the potential profit of the illicit activity is extremely large, as is the case with international drug trafficking, criminals possess incentives to organize into larger organizations that can operate at very large scale.<sup>7</sup> The capacity for violence of this type of criminal industrial organization can equate or even surpass that of civil war.

What are the best strategies to deal with large-scale organized crime? Existing literature is limited and does not offer satisfactory answers. One of the most interesting propositions is that of Kleiman's (2011), suggesting that "brute force strategies" to fight crime often backfire, and that strategies that focus on "crime-control" are more effective. He proposes what he labels "surgical strategies" to contain drug trafficking that aim to selectively target the most violent drug cartels.

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<sup>6</sup> The use of lethal force by the police rose to the national discourse following the fatal shooting of 18-year old Michael Brown.

<sup>7</sup> The U.S. State Department estimates that the American drug market is worth about \$60 billion a year, of which about half of the total, or \$30 billion, goes to Mexican drug cartels (Grillo, 2012).

Building on this insight, Lessing's (2015) comparative study of Brazil, Mexico and Colombia emphasizes that state crackdowns on drug traffickers are more likely to succeed when the state follows a "conditional approach," where repression is conditional on cartels' use of violence. He claims that Rio de Janeiro's recent pacification was "successful" relative to Mexico's drug war during the Felipe Calderon's presidency (2006-2012) because in Mexico, cartels were hit "without distinction." Calderon et al (2015) demonstrate the negative externalities of drug kingpin arrests in Mexico by modeling the effects of these arrests or killings on violence across Mexico's more than 2,400 municipalities. In a similar vein, this paper will empirically evaluate the relative success or failure of state interventions against drug traffickers, as well as the micro-spatial dynamics of particular interventions.

Lastly, our work seeks to advance our understanding of the socio-economic dynamics of violence in urban slums. The widespread proliferation of urban slums in the developing world has resulted from rapid urbanization -- 54 percent of the world's population lives in urban areas, and by 2015 the world could add another 2.5 billion people to urban populations. Urban slums are typically characterized by poverty, isolation, and overcrowding. Slums lack access to basic public service provision, including paved streets, lighting, sanitation, garbage collection, education and health.

In the absence of the state, governance in the slums is usually exercised by powerful local leaders --including drug kingpins and militias -- and order is enforced through informal conflict resolution that might entail cruel sanctions. A recent stream in the development literature is beginning to focus on urban migration and slums. As Tachil (2015) argues, for many migrants in the slums the police become the state's most prominent face. Our work is relevant for understanding the dynamics of violence and the provision of security in these areas of the world, as well as illuminating broader issues about economic inequalities, social exclusion, discrimination and injustice that characterized urban dynamics of 'divided cities' such as Rio de Janeiro<sup>8</sup>.

This paper advances our existing knowledge on police and drug-related violence by focusing on a city where drug factions, militias and a violent militarized police have for years fought bloody battles terrorizing citizens. One of the challenges of causal identification is that the UPPs were not randomly assigned, making causal inference challenging. After uncovering the motives for spatial and temporal location of the UPPs, we employ a variety of identification strategies. First, we use a Difference-in-Difference (DD) methodology that contrasts favelas with and without UPPs. An advantage of our modeling strategy is that not all UPPs were introduced at the same time. In assessing the causal effects of the UPPs, comparisons should be made across time and space. First, within each UPP, we must compare violence before and after an intervention. Second, we must compare favelas where a UPP was

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<sup>8</sup> Rio de Janeiro is famously called Divided City (Cidade Partida) (Ribeiro, 2000)

placed to other favelas of the city where no UPP was situated. The identifying assumption in our strategy is that there is no omitted variable that changes at the same time and space as the inaugurations of UPPs and that directly affects the occurrence of homicides and police killings.

To complement our results we construct credible counterfactuals of the policy interventions using a variety of methodologies. First, we take advantage of the granularity of our data to compare homicides and police killings contrasting violent trends in the streets that are 100 meters from the border inside and outside each UPP. The rationale for our analysis of police precincts' buffers is given by the fact that streets around the UPP borders share many spatial and socioeconomic dynamics in common – including the presence of a common criminal faction – that allows us to construct reliable counterfactuals to the streets that get treated.

Finally, we focus on various paradigmatic UPP interventions, selecting for each comparable control units for a specific UPP or group of UPP's based on characteristics that can be inferred from Rio's spatial and socioeconomic urban dynamics. We chose three cases for in-depth analysis: 1. The small favelas embedded in the hills of the wealthy South Zone that were intervened early in the process; 2. Cidade de Deus, one of the few territories in the much poorer North-West where a UPP was introduced; and 3. Rocinha, the largest favela in Brazil and home to the most profitable cocaine market in the city. The objective of the case studies is to provide a deeper understanding of the mechanisms underlying the heterogeneous effects across interventions, and to further support our main conclusions.

Our results provide a surprising conclusion: the introduction of the UPP had very little impact diminishing homicides between favela inhabitants, but it had powerful effects decreasing police killings. The results uncover a reduction of 2.4 police killings per 100,000 inhabitants every month that the UPP was present in a treated favela, that is, around 29 fewer police killing incidents for every 100,000 people per year. Police killings, according to our model, would have been 60 percent larger without the UPP intervention. This is an impressive result suggesting that the UPPs represented, more than anything, an instrument for reducing police violence. Our results also demonstrate that not all the UPPs were equally successful. In fact, the UPP has failed in some of the most problematic favelas, including Complexo do Alemão, which is the headquarters of the most violent criminal faction, the Red Command.

In terms of the null effect of the UPP on homicides, models testing for heterogeneous treatment effects demonstrate that socioeconomic factors, and in particular illiteracy, mediate the impact of police interventions. The empirical results suggest that the UPPs that were installed in favelas with higher literacy levels are more effective preventing homicides than UPPs that were installed in high illiteracy favelas. Overall, this empirical evidence provides support to the vision that lack of educational and economic opportunities are significant factors hindering the

work of the UPPs, and suggest that the pacification process can't be exclusively about police. Unfortunately Rio de Janeiro's government has failed to expand social welfare programs to the favelas and these seem to be critical for the "pacification" process to succeed.

The paper is organized as follows. In the first section we discuss the literature on the recent history of violence in Rio, focusing on the origins and characteristics of the various criminal factions and militias. The second section provides an overview of policing in the city. The third section describes the police reform process and discusses the motives driving the spatial and temporal targeting of UPPs. The following sections after these present our empirical results. We end up with a conclusion.

## **2. Violence in Rio de Janeiro**

### **2.1 The drug factions**

In the 1990s, the city of Rio de Janeiro was one of the most violent in the world, with homicide rates above 80 per 100,000. Although the violence affected the entire city, residents of some favelas were subjected to murder rates that were two times higher or more. After slavery was abolished at the end of the 19th century, the city's favelas began to develop as "irregular" agglomerations inhabited predominantly by black immigrants arrived from the Northeast. The government made an explicit choice not to regulate these agglomerations and abandoned its residents to poverty. The state refused to provide public services such as paved streets, electricity, sanitation, water, health and education to the slums, many located in the city's numerous hills or *morros*. Given Rio's topography and the massive rural to urban migration, unusual patterns of urban development was generated as some of the city's favelas are located right next to the wealthiest neighborhoods in the South Zone, a favorite tourist destination and where many businessmen and government officials live.

In the 1980s, drug trafficking gangs began to take control of the favelas, from where they inaugurated a lucrative business. In the absence of state presence and a functioning police, the drug lords assumed a policing role and violence became endemic. Some of the so-called *Donos do morro* - drug kingpins - exercised their power tyrannically, leaving their heavily armed soldiers unchecked to extort, rape, and terrorize citizens. Other drug lords were more enlightened, providing a form of order in their communities, harshly punishing rapists, burglars, and thieves and keeping their heavily armed soldiers from terrorizing their communities. Some drug kingpins even shared some of the profits with favela residents in the form of credit and financial support for health and education, among other benefits (Glenny, 2015).

The profitable drug trade business and the War on Drugs policies – firmly embraced by Rio's police – created a vicious cycle of murder that has particularly



affected the favelas. Three main drug factions fought each other for control of the most valuable spots in the city to sell and refine drugs, especially cocaine. The most belligerent of these organizations, The Red Command (Comando Vermelho, CV) formed in the early 1970s in the infamous prison of Candido Mendez located in an island south of Rio the Janeiro. The prison incarcerated political prisoners and guerilla organizations such as the M-18 and the Alianza Libertadora Nacional (ALN) that formed to challenge the military dictatorship next to some of the most toughened armed robbers of Rio. When these prisoners were released into the streets, they formed the CV with newly acquired notions of hierarchy, organization, and armed tactics that gave them unseen power of destruction.<sup>9</sup> CV engaged in drug trafficking as well as kidnappings, bank robberies, and terrorist activities (Abreu, 1988; Arias, 2006; Barbosa, 2015; Glenny, 2015).

A second drug faction, Amigos dos Amigos (Friend of Friends), opposed CV's domination of the drug market in Rio and their preference for running the drug business used a strategy of open violent confrontation with the police. Amigos dos Amigos had a preference for trafficking drugs by accommodating the police through corruption and sharing some of the drug profits. A third group of prisoners who refused to recognize the leadership of CV formed a new criminal gang, O Terceiro Comando, the Third Command. Semi-autonomous drug pins formed criminal networks across various favelas, joining one of these criminal federations to organize drug trafficking across the city and beyond. These criminal factions constantly fought each other for control of the most profitable spots and largest favelas. Moreover, factions within these organizations also formed and were resolved through execution and murder. In some favelas, (e.g., infamously in Complexo de Maré) the three criminal factions compete for control and militias were also present, subjecting its residents to constant threats of violence, including murder (Souza Silva, 2012).

The state abandoned the more than 800 favelas - which comprise approximately 20% of the city's population - to these drug gangs. In other favelas, militias formed. Vigilante groups emerged among well-organized armed men made up of former police officers, firemen, and prison guards (Blikman, 2010; Cano et al, 2012). These militias promised to remove drug gangs and provide security to citizens in poor urban neighborhoods, but in reality the ultimate goal of the militias, Ribeiro and Oliveira (2010) argue, are economic profit, levying heavy security taxes on inhabitants and business, and charging for services such as electricity, cable, gas, etc. The militias violently fought the traffickers to gain territorial control and managed to establish themselves as a dominant force, especially in many favelas located in the North Zone (Cano et al, 2012).

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<sup>9</sup> For example, in the late 1970s there were series of bank robberies. In one of these, there was an all-night shootout with the police where a handful of CV men held hundreds of officers at bay. The gangsters' arsenal was far beyond what the police could access. The episode came to be known as "four hundred against one," which is regarded as the debut of the CV (Barbosa, 2015).

## 2.2. The police

For the residents of the favelas the state is either missing or when present it is with the face of its repressive agencies such as the police. The favelas have very limited and deficient provision of public services. Garbage piles in the streets, there is lousy sanitation, and potable water is of poor quality or lacking. Residents resorted to unorthodox solutions to access services. In the case of electricity, the solution was to steal it directly from the overhead cables at the risk of electrocution. Schools are deficient and often close due to shootouts.

The Military Police in Rio is structured in the form of precincts (called territorial battalions) and special operation units. The territorial battalions are in charge of patrolling boroughs composed of various neighborhoods. Decisions to invade a favela or confront a drug faction or druggin were most often made at the top. The Drug War policy embraced by the city government and the top command of the police led to periodic 'invasions' of the slums with heavy armed weaponry and vehicles. The military police resorted to specialized units for these periodic invasions in the favelas. The most important of these is the Battalion of Special Operations (BOPE), an elite squad trained in counterinsurgency and urban warfare tactics. Only around 4 percent of the aspiring police officers graduate to join the elite unit.<sup>10</sup> BOPE men are known for their physical and tactical superiority and for their mystical-like corporate spirit that emphasizes its invincibility, self-control, and discipline.<sup>11</sup> BOPE's symbol is a skull with two crossed pistols and a knife penetrating a skull. BOPE performs its operations with heavy armed weaponry, including a specially designed tank used to overpower barricades, as well as sniper rifles, ballistic shields, stunt grenades, and advanced night vision optics. BOPE cops seldom get injured - or die - and their operations are known for violence and 'efficiency'.

Hence, for the most part, favela residents experienced the police as part of a military-like occupation force. Police behaviour varied between violence and corruption. Many police officers, particularly from the territorial battalions, engaged in extortion receiving monthly payments, known as 'mensalão', from drug dealers, so that they would allow the drugs to flow freely. Other police officers, most notably BOPE, are uncompromising and use excessive violence in their frequent invasions to the favelas. Far removed from the communities, the police distrusted residents and considered them as "enemies of the state" associated with the traffickers. Police officers aggressively stop and search (*abordar*) favela residents. Police mistreatments have ranged from unwarranted searches, beatings, torture (asphyxiate and drown victims in an effort to obtain information about traffickers), and summary executions (Desmond, 2006: 101).

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<sup>10</sup> Personal interviews with BOPE sub-commander in 2012.

<sup>11</sup> Personal interviews with BOPE police officers.

This militarized strategy resulted in the same outcome as the turf wars between criminal gangs: death and insecurity. In 2007 alone, official records (ISP) acknowledged more than 1,300 fatal victims of police interventions in the state of Rio. Furthermore, police have often been accused of human rights violations, including torture, and summary executions (Report of the UN Special Rapporteur for Summary Executions, 2009; Amnesty International Report, 2015). Indeed, the relationship between poor communities and the police has been so strained that slum inhabitants often fear police officers more than gang members (Magaloni and Cano, 2015).

The Military Police has justified police killings on the basis of legitimate defense or “resistance to arrest” (*Auto de Resistência*), and the criminal justice system seldom investigates these killings. Moreover, police killings have been vindicated by the larger society, which has trivialized violence, especially when this affects black people in the favelas. A common phrase in Brazil, “Bandido bom é bandido morto” (A good criminal is a dead criminal) is a reflection of the existing racial stereotypes, and a recent survey among cops in Rio shows that more than 35% agree with this notion (Magaloni and Cano, 2015).

The city’s police joined the war as if it were another warring faction (Glenny, 2015). Throughout the 1990s and early 2000, various massacres by the police took place in the city. Some of the most infamous ones were the massacre in the Church of Candelaria, where a police death squad exterminated six children and six adolescents. A month later another massacre took place in Vigário Geral following the murder of a police officer. Around 50 police officers came to the favela and murdered a total of 21 unarmed people (Glenny, 2015). After the massacre of Vigário Geral a “Day of Silence” was declared and the entire city stopped to commemorate the death.

Soon the sympathy for the death was forgotten and the next right-leaning governor of the City, Marcello Alencar, would unleash one of the most violent moments in the history of Rio’s Police. First, he gave police semi-automatic weapons to compete with CV’s previously unmatched weaponry. Second, he instituted a very controversial policy known as the “bravery bonus”, which rewarded officers with salary bonuses for engaging in lethal shootouts with suspects. Research using forensic evidence suggests that police killings had signs of summary executions with wounds to the back or the head (Cano, 1997). The law was revoked at the end of 1998, but those police officers who were awarded their salary bonuses continue to receive them until today<sup>12</sup>.

### 2.3. A war unleashed

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<sup>12</sup> Personal interviews with police officers.

Right-wing politicians and the media often speak of the conflict between drug traffickers and the police as a war. By the turn of the 21st century, three events made it clear to citizens in Rio how far the chaos had gone. First was the assassination of a reporter, Tim Lopes. He was kidnapped, tortured, and then executed, his body quartered and burned inside a stack of tires doused with gasoline –a gruesome device called “microwave” (Barbosa, 2015: 29). As the drug gangs grew stronger, the state responded with more bullets and police invasions of the slums, raising the death toll.

The second event was a terrorist attack by CV in December 2006. Drug traffickers attacked various targets in the city with heavy weaponry, including vehicles and stations of the Military Police. They also burned a bus in Rio’s main artery, Avenida Brasil. The traffickers soaked it in gasoline and set it on fire, killing seven passengers (Glenny, 2015). Gang offensives and police raids after that incident left many more people dead.

These attacks seem to have been a response to encroachment by the militias in Red Command’s territory, in particular Adeus, a favela that borders Complexo do Alemão, the headquarters of the drug cartel (Glenny, 2015: 209). The government responded by attacking the CV in Complexo do Alemão. The conflict devolved into daily gun battles between the police and the CV, and many traffickers were arrested.

Within weeks of the Pan-American Games of 2007, the Minister of Security, Mariano Beltrame, decided to attack Alemão for a second time. The government reasoned that they had a potential disaster in their hands. Intelligence reports brought news that Red Command had received a huge shipment of semi-automatic weapons. In addition to pressure from the middle class and the business community, the government feared that the games would be jeopardized with terrorist attacks. These reports also suggested that the CV was interested in using the chaos of the city to confront its rival ADA gang in Rocinha, located in the city’s South Zone where international visitors were expected.

The Alemão attack took place sixteen days before the Games when 8,000 soldiers from the National Force and the Federal Police flooded the city to assist Rio’s military police. The government used armoured vehicles, helicopters, machine guns, and hand grenades, producing a high death toll. Many of the dead had signs of extrajudicial execution. The operation was strongly criticized by human rights organizations.

### 3. Police Reform: The Pacifying Police Units (UPPs)

Although the attack allowed the government to regain control, there were serious concerns about the scale of the violence in the city. Brazil won the bid to hold the 2016 Olympic games, which would take place in Rio de Janeiro. The country also was planning to host the 2014 FIFA World Cup. Security could no longer be enforced

through human rights abuses, summary executions and terror in the slums, if the world was going to be watching.

The governor of Rio de Janeiro, Sérgio Cabral, enacted a significant police reform with the explicit intent to “regain control of the territories” from drug traffickers. One of the driving motivations of this reform, as mentioned above, was the anticipation of the Olympic games and the World Cup. But the reform’s mastermind, Secretary of Security Mariano Beltrame, also claims that the government had a long-standing debt with residents in the favelas, who had been abandoned to the tyranny of the traffickers and an abusive police (Beltrame, 2014).

Since 2008, the city has engaged in one of the most ambitious police reform projects enacted in the developing world. The reform consists of two related and far-reaching interventions. The first one was the introduction of the Police Pacifying Units (UPPs). After a pilot experience in Santa Marta in December of 2008, the UPPs were launched in 2009 and between 2008 and 2015, more than 40 UPPs were installed. A group of police officers are permanently assigned to a specific favela or group of favelas, which results in an intense police presence that attempts to recover territorial control at the hands of armed groups and to eliminate armed shoot-outs (Cano et. al., 2012). Initial ‘invasion’ - or takeover - has been in most of cases carried out by Special Operation Forces (BOPE) and in some cases – such as the invasion of Complexo de Alemão — the army has been summoned.

A key difference from ‘invasions’ in the past is that favela residents are warned that the police will enter. The intention is to avoid armed resistance from the first moment. After an initial stage of ‘stabilization’ that in some cases can last for various months, the community is handed over to UPP officers. The initial intention was that UPP officers would be freshly recruited to try to diminish corruption and to promote a new security paradigm based on the notion of “proximity” policing. These officers are trained in a new policing model and are expected to improve the relationship with the community. However, as we will see below, as the “pacification” process progressed, police officers from other specialized battalions, including BOPE, would also join.

The main goals of the project were to regain control of territories previously dominated by armed criminal groups, and to improve security in the favelas. It is important to highlight that the UPP was not meant to eradicate drug trafficking, but to weaken criminal organizations and their dominance of the favelas.<sup>13</sup> On top of these major goals, the UPPs were seen by many, both inside and outside the police, as a chance to leave behind the ‘war on drugs’ as the prevailing policing model in Rio de Janeiro. Indeed, official project documents spread the concept of ‘proximity policing’, i.e. a style of policing which is closer to the communities (Magaloni and Cano, 2015). UPP commanders have employed varying strategies to gain proximity,

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<sup>13</sup> Personal interviews with Secretary Beltrame, two Chief Commanders of the UPP, and various UPP commanders.

including holding community meetings; providing judo or soccer courses to children and teenagers; participating in community events; and assigning police to engage in informal conflict resolution.

The second major element of the police reform was 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. Crime incidents are given a numerical weight according to their relevance (3 for lethality, 2 for car thefts, and 1 for street robberies). The system calculates historic crime tendencies for each battalion and then defines their “goals” aiming for a gradual reduction from the historic tendency. Battalions that keep crime incidents under the goals receive a monetary reward on a monthly, six-month, and yearly basis. The system rewards with salary bonuses all police officers both in the military and civil police within the battalion (AISP) who meet the goal, and additional bonuses are given to the 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> places.

The new system of incentives offers a sharp contrast to the controversial “bravery bonus” reward policy, active from 1995 to 1998. It is worth emphasizing that under the *Sistema de Metas*, police killings or previously called “*Auto de Resistência*” were added to the set of goals in January 2011. *Auto de Resistência* are defined as a police homicide that occurs in action, allegedly because of self-defence or with the objective of preventing criminal suspects from fatally injuring others. Police chiefs,<sup>14</sup> investigative police, and the civil police, seldom investigate the circumstances surrounding police killings, allowing police to engage in summary executions that are covered as “*Auto de Resistência*” (Amnesty International Report, 2015).

A central goal of this paper is to evaluate the causal impact of the UPPs on lethal violence. One difficulty in isolating the causal impact of the UPP is that lethal violence is decreasing in the entire city because of exogenous factors, including a booming economy during the government of Luiz Inacio Lula da Silva and the expansion of better-targeted social policies (Chioda et al, 2013). Another challenge of identification is that the UPPs were not randomly assigned. We turn to this problem below.

### **3. Selection into UPP: its spatial and temporal targeting**

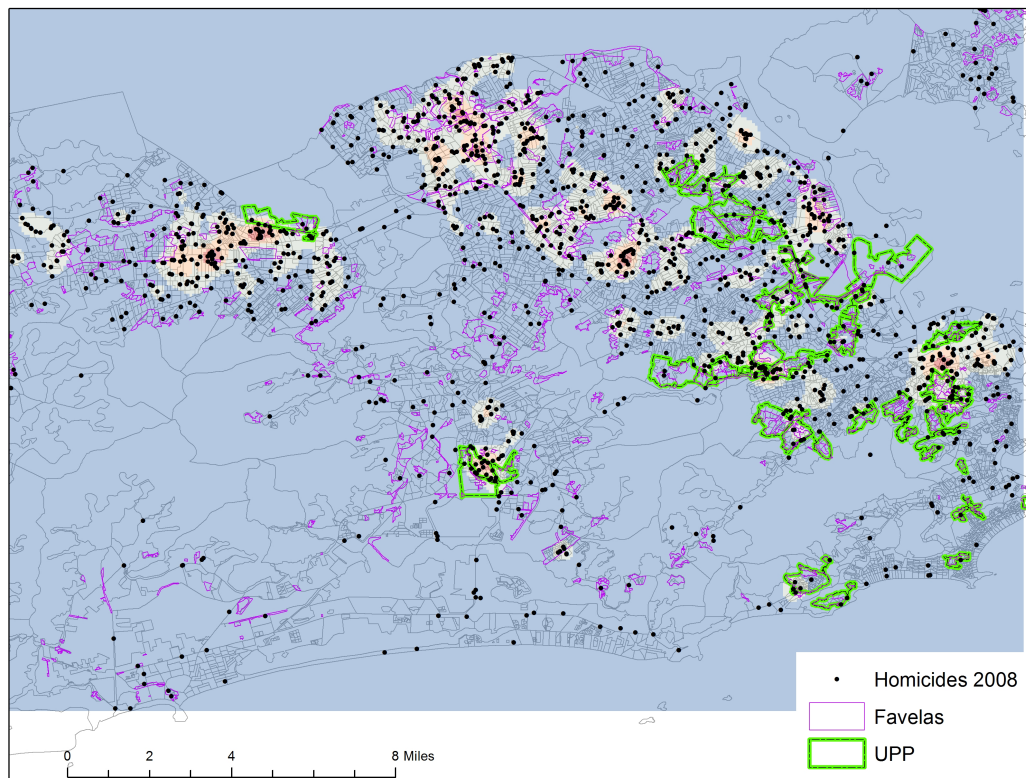
This section explains why and when certain favelas were targeted for pacification. The UPPs draw inspiration from a combination of problem-oriented policing strategies and hot spot policing. Problem-oriented policing challenges officers to identify and analyze the causes of criminal problems. Once the underlying conditions that give rise to crime are known, police officers develop appropriate responses. The officers reach out to the community to understand the problems and

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<sup>14</sup> Personal interviews police commanders.

devise the most-effective strategies to control crime (Eck and Spelman, 1987; Goldstein, 1979, 1990). Hot spot policing strategies are based on the observation that crime is concentrated on relatively small places that generate the majority of all criminal events (Pierce et al. 1988; Shermann et al. 1989; Weisburd et al, 1992).

Although the UPPs were assigned to favelas, which are high crime areas, one critical difference between this approach and hot spot policing is that selection into the treatment was not based on the higher incidence of violence. The relatively more peaceful favelas located in the South Zone were a priority. Figure 1 presents a map of Rio. It also geo-codes homicides during 2008, as well as the location of the UPPs that would be introduced between 2008 and 2013. The map also displays the city's more than 800 non-pacified favelas. An important aspect to consider is that the UPPs are predominantly located in the South, near the beaches of Copacabana, Ipanema, Leblón, and Botafogo, and in the Center parts and in the neighborhoods near the famous Maracaná stadium. Only two UPPs were inaugurated in the West – Batam in battalion 14 and Cidade de Deus in battalion 18. The North and West are among the poorest and most violent areas in the city and these have not been a priority for ‘pacification’.



**Figure 1. Homicides in 2008, UPPs and non-pacified favelas**

Table A1 in the appendix shows the chronology of the interventions, the served population, the number of police officers, and the median income of those areas. We uncover three differing motivations behind the location of the UPPs. The first is an “economic motivation”. Favelas that are located in the South Zone were a

priority for UPP assignment. The first UPP was installed in the favela of Santa Marta in December 2008. With only around 4,000 inhabitants, Santa Marta is a small, relatively peaceful community located near Copacabana beach. Other pacified favelas in the South Zone include Cantagalo, Pavão-Pavãozinho, Babilonia Chapéu Mangueira, Prazeres-Escondinho, Cerro Corá, and Vidigal-Chácara, all small communities located just footsteps from the most affluent streets of Rio. The logic behind these interventions was to serve the business and economic elite, as well as protecting the profits from tourism, which is concentrated at the beaches of Copacabana, Ipanema, and Leblon.

In the battle against drug traffickers, the government has paid close attention to the fears of the business community and the middle class, who want to keep their neighborhoods safe and free of burglars, thieves, and other violent crimes. Although violent deaths in Rio predominantly affect the poor, crime and violence inevitably spills to the rest of the city, especially around the vicinity of the favelas. “Pacification” was intended to undercut the power of criminal gangs, and the government did not want these to be entrenched near the wealthy and touristic areas of the city. The advent of the World Cup and the Olympic games was an additional motivation to increase security near the beaches. This first stage of pacification was relatively easier because many of the favelas located near these rich neighborhoods are much smaller, although these favelas had some of the highest cocaine sales due to their proximity to middle class customers.

**Table 1: Criminal Factions and UPPs**

	<b>Comando Vermelho (CV)</b>	<b>Amigos Dos Amigos (ADA)</b>	<b>Contested</b>
<b>UPP's</b>	24	3	6
<b>Favelas</b>	94	6	31
<b>Population</b>	279,994	100,539	84,812
<b>Median income</b>	652.50	658.48	673.86
<b>Police per every 1,000 inhabitants</b>	20.14	53.65	59.83
<b>Average monthly homicides before intervention</b>	0.41	0.58	0.78
<b>Average monthly homicides after intervention</b>	0.18	0.16	0.30
<b>Average monthly police killings before intervention</b>	0.32	0.32	0.38
<b>Average monthly police killings after intervention</b>	0.05	0.06	0.07

Note: Contested favelas those controlled by two or more criminal factions or by criminal factions and militias. In only one of the pacified favela were militias are present.



The second motive for UPP selection is tactical. Table 1 reports which criminal factions controlled the favelas that got a UPP.<sup>15</sup> It can be seen that CV territories were disproportionately targeted. This drug faction was excessively targeted for two tactical reasons. As explained by Beltrame in his memoirs, the CV was the most belligerent of the drug factions, inclined to confront the police violently and to display its power with terrorist attacks targeted against the entire city (Beltrame, 2014). Importantly, CV controlled many of the favelas in the South Zone that were a critical priority in the pacification because of their proximity to the middle class.

Third, there are political motives or “pacts” explaining why certain favelas were not intervened. Favelas controlled by the militias seldom get chosen for pacification. The police tend to tolerate militias. As Glenny (2015) explains “the freelance activities [of the militias] enjoy the tacit support of their commanders, as well as a large part of the middle class frightened by what they regarded as the menace of the favelas (p. 83).” Moreover, Amigos Dos Amigos (ADA) favelas were more invulnerable because, as explained above, this criminal faction favored accommodation over confrontation. Having more cops and government politicians under its payroll, ADA could negotiate agreements to protect its favelas from pacification. The pacification in Rocinha in 2012 marks the end of a pact between one of the most powerful drug kingpins, Nem, and a group of corrupt cops and government officials in the high echelons of power. We explain below how this pact unraveled.

The first stage of pacification was relatively easier because it included many favelas in the South Zone –although Cidade de Deus and Batan, in the North and the West, are clear exceptions. In November 2010 the UPP started a different stage when the Complexo Alemão -a conglomerate of more than 22 favelas with a population of more than 100,000- was occupied by a force of 1,200 military police, 400 civilian police, 300 federal police and 800 members of the Brazilian army. This prominent display of law enforcement had no precedents in Brazil and settled the precedent for a transition of the UPP interventions. The Brazilian army resided in the Complexo for around 14 months until the UPP’s were finally inaugurated by mid-2012.

The UPP intervention in Complexo Alemão was not part of the original plan. In mid-November 2010, members of the CV emerged from the favelas, stopping traffic, opening fire, and setting buses in flames. The motive for the violent invasion appears to be related to the pacification of Borel, and as a protest against the government, which had predominantly intervened in favelas controlled by the CV. This display of force that paralyzed the city convinced the government and Secretary Beltrame that the pacification would not progress if the CV was not confronted and disarmed (Beltrame, 2015). The largest favela of Rocinha, also located in the South Zone, was intervened in 2012.

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<sup>15</sup> The Chief Command of the UPP provided the information under a confidentiality agreement.

The interventions in Complexo Alemão and Rocinha, as we further document below, were significantly more difficult; our informants tell us that these also unleashed a fundamental reorganization of the criminal groups, which found new ways to move drugs and arms in less visible ways across the city, re-establish drug trafficking gangs in the outskirts of Rio in more distant neighborhoods, such as Baixada Fulminense and Nueva Iguazú, and fight the police with more targeted and selective violence. We come back to some of these challenges at the end of the paper.

## 4. Empirical Analyses

### 4.1 Data

This paper uses geocoded data of violent deaths in Rio de Janeiro for the 2005-2013 period. The Ministry of Security in Rio de Janeiro (SESEG) provided the original data on homicides and police killings that we painstakingly geo-coded. These occurrences are recorded by the Civil Police with some description of their location. One of the main challenges was to retrieve the address manually of each of the more than 22,000 lethal violence incidents and obtain its latitude and longitude to map it within the city. Moreover, to our knowledge this is one of the few datasets of geocoded criminal activity for cities in developing countries.<sup>16</sup>

Some prior attempts to evaluate the UPP have used the publicly available data at police unit level (AISP) (Frischtak & Mandel 2012; Ferraz & Ottoni 2013). Using the publicly available data is problematic because the UPPs were assigned to favelas, which are clearly demarcated smaller areas within AISPs. Only the microdata that we have coded allows measuring lethal violence in the UPP precinct before and after the intervention. Furthermore, the microdata allows us to measure lethal violence in pacified and non-pacified favelas, which is not possible with the publicly available data. Hence, our analyses compare pacified to non-pacified favelas rather than comparisons across significantly larger neighborhoods (Frischtak & Mandel 2012). Not surprisingly the results of our impact evaluation are superior and markedly different from existing work.

To assess the quality of our geocoding process, we compare the total number of occurrences by year published by the *Instituto de Seguranca Publica of Rio de Janeiro* (ISP) in its webpage at police unit level (AISP), the total number of occurrences in the original microdata that SESEG provided us, and the total number of occurrences that we were able to geo-locate. The difference between these three sources of data is marginal, which means that our geocoded dataset is an appropriate representation of violence in the city (see Appendix).

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<sup>16</sup> Other cases of geocoded crime data include Ciudad Juarez (Vilalta & Muggah, 2012) and various cities in Colombia (Mejia et al, 2012).

An important concern for these discrepancies between our geocoded dataset and the other two sources is that these are not randomly distributed across the city. For example, if areas with UPPs are more likely to improve the quality of their reports, our geo-located dataset would include less missing values in those areas thus underestimating the effect of the UPPs. In order to test for this non-random differentiation we regress the difference between the original micro data and the geo-located data set on UPP. Here, the estimates are non-significant which imply that the improvement in the occurrence registering is not related to UPP assignment but homogeneously distributed across the city (see Appendix).

To control for confounding factors associated to homicides and police killing rates we use the 2010 census data at precinct level (*sector censitário*) from the Instituto Brasileiro de Geografia e Estatística (IBGE). The IBGE produces data regarding population characteristics, access to public services, income, and many other aspects. Using a GIS we summarize socio-demographic characteristics at different geographical levels. Moreover, the IBGE provides a definition for those census tracts considered favelas,<sup>17</sup> which allow us to differentiate those particular areas. Finally, in our analysis we included data regarding the criminal factions linked to each of the favelas with a UPP presence.

## 4.2 Spatial dynamics and victims of violence

Before we proceed to our econometric analyses, we provide the reader with a description of the spatial correlates of violence and who are being killed in Rio de Janeiro. To explore who gets killed and where, we first analyze the socio-economic correlates of lethal violence by regressing the accumulated violent deaths between 2005 and 2013 on socio-demographic variables such as income, overcrowding, population, and percentage of the population who are non-white. The regressions also add a variable indicating if the lethal violence incident took place in a favela.<sup>18</sup> The regressions are reported in the appendix.

The main results are that lethal violence is significantly higher in poor areas and in the favelas. By including income deciles in the regressions, our results suggest a complex relationship between income and lethal violence. Figure 2 depicts these estimates. Here, we observe that homicides are more likely in blocs with a medium level of income. The same representation for police killings show that police kill more people in blocs with lowest income deciles.

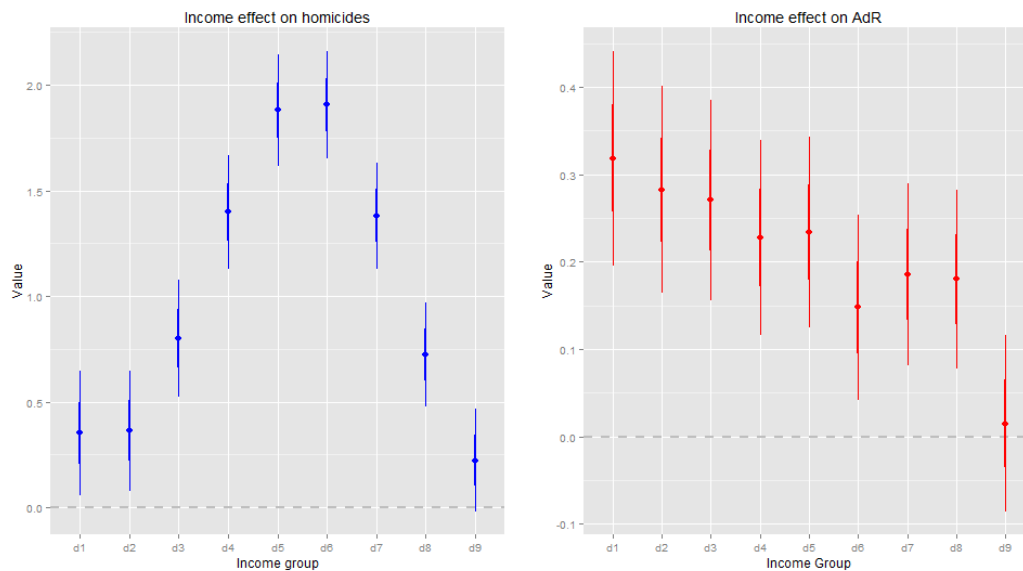
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<sup>17</sup> The IBGE define these agglomerations as a group of 51 or more households with at least one of the following characteristics: 1) Irregularities in the streets or in the shape and size of the units, or 2) Limited provision of essential public services (garbage collection, sewers, running water, electricity and public lighting).

<sup>18</sup> The unit of analysis is the census tract, which is equivalent to a city bloc. There are 10,504 census tract areas in the city of Rio de Janeiro and each unit has on average around 600 inhabitants, which allow us to have a large number of observations with varying characteristics. Table 2 in the Appendix shows the regression for the more than 10,000 blocs in the city of Rio de Janeiro. A more detailed representation of income is presented by including indicators for decile levels..

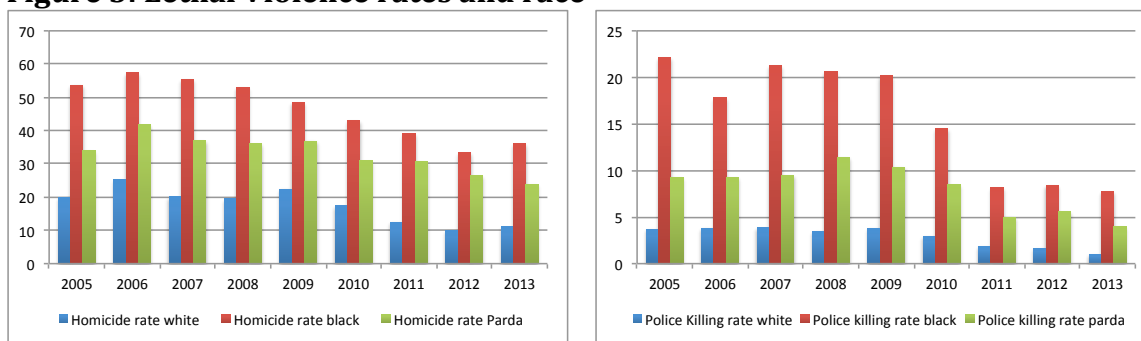
In addition to income, the data allows us to explore the race and age of the victims. Between 2002 and 2012 most of the victims were young men (93 percent). The young die in disproportionate proportion: 39 percent were between 21 and 30 years and 19 percent were under 20 years old. The data also specifies the race of the victims, as shown in figures 2 and 3, which graph the homicide and police killing rates by race from 2005 to 2013.

**Figure 2. Income effects of lethal violence**



Homicide rates are almost one and a half times larger for blacks than for whites, while their police killings rates are more than three times higher. Homicides drop for all races in this period, although the fall is even larger for whites (almost 50%) than for blacks (34%), making the disparities between races even more pronounced by 2013. Police killing rates fall more sharply than homicide rates in this period and the fall is particularly noticeable for blacks: their death rate at the hands of the police falls from 20 to 7 or more than 65% between 2005 and 2013. Below we explore how much of the decrease in homicide and police killing rates can be causally attributed to the UPPs.

**Figure 3: Lethal Violence rates and race**



### 4.3 Unit of analysis

Our approach is to aggregate lethal violence occurrences at favela level. The main reason to aggregate at favela level is to obtain a unit of analysis closer to the treatment level while maintaining comparability across control and treatment groups.<sup>19</sup> This is critical given that the UPP was an intervention that was explicitly conceived for favelas or irregular agglomerations. The universe for comparison in our Difference-in-Difference (DD) approach is favelas with and without UPP. Since many favelas lack street names or house numeration, violent deaths inside favelas are often located by the police reporting the incidents in the closest street to a favela's border. For this reason, we added as a favela-related lethal violence incident those that are registered around a 100 meter buffer to the closest favela. Importantly, the borders of UPP precincts are also bigger than the borders of their favelas.<sup>20</sup>

In total, there are 763 favelas in Rio de Janeiro, 155 of which were treated during this period. Table 2 shows comparisons between treated and non-treated favelas. Favelas with UPP treatment are, on average, larger and had a lower income. We also observe that treated favelas have a slightly larger black and mixed population than non-treated favelas. Dwellings in treated favelas also tend to be more overcrowded than dwellings in non-treated favelas. Finally, the table shows that the illiteracy rate among population over 15 is similar in both groups. We use these covariates to explore the heterogeneous effects of the UPP intervention.

<sup>19</sup> We thank Jens Hainmueller for the suggestion to group data at the favela level.

<sup>20</sup> Our decision to add the occurrences in 100 meters zones outside of the favelas was discussed with the police, who corroborated that they register many of the favelas' violent occurrences in this zone.

**Table 2. Characteristics by treated and non-treated favelas**

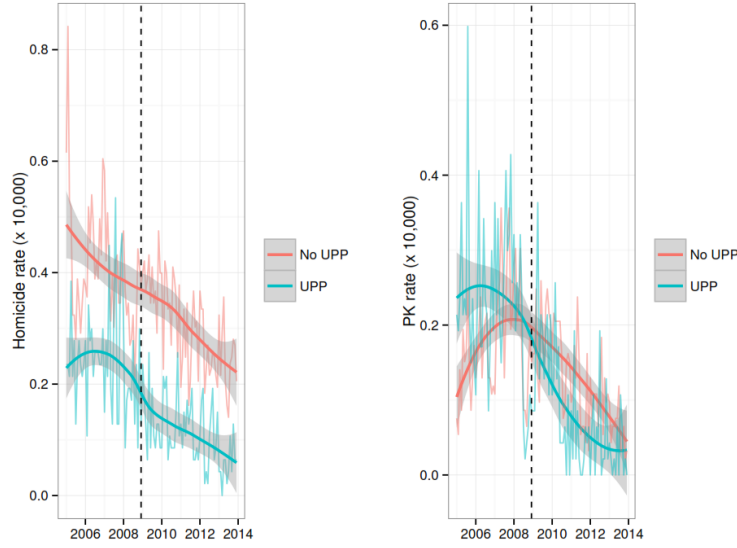
Table 1: Characteristics of Treated and Non-treated Favelas			
	Treated	Non-treated	Diff.
Population	3018.39 (6506.17)	1523.82 (3142.33)	<b>1494.57</b>
Income	659.06 (108.11)	701.88 (169.74)	<b>-42.82</b>
Non-white population	0.68 (0.08)	0.66 (0.08)	<b>0.02</b>
Illiteracy rate	0.07 (0.02)	0.07 (0.03)	0.00
People per household	3.36 (0.37)	3.27 (0.29)	<b>0.09</b>
N	155	608	

Columns 1 and 2 show the average of each covariate across favelas in a given group. All figures are weighted by population. Standard errors are shown in parenthesis. Column three is the difference between treated and non treated favelas, bold numbers represent significance at 95 percent.

In terms of their incidence of lethal violence, figure 4 shows the trend of homicide and police killings rates in treated and non-treated favelas. We observe that in the period previous to the first UPP intervention of 2008, treated favelas had a *lower* homicide rate. The data corroborates our argument that the UPPs were not selected according to a hot-spot policing logic that targets the most violent areas. In terms of police killings, previous to the UPP intervention treated favelas had a *higher* rates, suggesting that the police had more frequent and violent incursions in these areas.

It should be noted that whereas homicides reduced in treated favelas in the post-2008 period, this change appears to be part of a secular trend given that non-treated favelas also experienced similar reductions in homicide rates. On the contrary, the second panel suggests that whereas treated and non-treated favelas both experienced less police killings in the post-2008 period the reduction was steeper in favelas with UPP. These insights are explored formally in the next section.

**Figure 4: Homicide and Police Killing rates in treated and Non-Treated favelas (2005-2008)**



#### 4.4 Estimation of the UPP effect in treated and non-treated favelas

To measure the effect of the UPP on violent deaths we exploit the panel structure of the data and estimate the following fixed-effects model:

$$y_{it} = \gamma UPP_{it} + \lambda_i + \alpha_t + \varepsilon_{it} \quad (1)$$

Where the dependent variable is the homicide or police killings rate for the Favela in the month  $t$ . The treatment is the binary variable UPP, which takes value 1 after the introduction of the UPP, and the controls include favela fixed effects and time fixed effects. The identifying assumption in our strategy is that there is no omitted variable that changes at the same time and space as the inaugurations of UPPs and that directly affects the occurrence of homicides and police killings. More specifically, by using favela and time fixed effects this strategy will control for: i) observed and unobserved characteristics common to all treated places in a specific period of time; and ii) observed and unobserved characteristics for every treated territory that are constant over time. Additionally, we cluster the standard errors at favela-group level, which allows controlling for internal correlation patterns inside each UPP.

A critical challenge of the identification is that violence is decreasing in Rio for factors exogenous to the UPPs. It is hence critical to consider the secular decline of lethal violence in the specification of our models. We specify time in different forms, including monthly fixed effects, a linear time trends, and a time polynomial. The most stringent of the models will use favela-specific time trends.

The UPP treatment was designed to connect a number of favelas in a given area. For example, the UPP Turano inaugurated in October 2010 connects 10 different favelas into a single jurisdiction. This design integrates favelas with common characteristics. For this reason, the natural specification of the standard errors using only treated units would be a clustering at UPP level. However, since our analysis includes non-treated favelas as a comparison group this specification becomes futile. To address this issue we clustered the standard errors by defining groups of favelas that have common borders. This clustering structure follows closely the UPP design and recognizes the correlation of unobserved events for favelas with common borders.

Table 3 shows the effects of the UPP on homicide and police killings rates using different specifications of model 1. The base model includes only a post treatment binary indicator for those favelas with UPP and favela specific fixed effects to control for all time-invariant covariates. However, as shown above, since both homicides and police killings experienced a decline in the period these coefficients are likely to overestimate the effect of the UPP. That is, the time effect is an omitted variable. Column 2 includes a linear time trend to control for this temporal effect. Here, we observe that the effect of the UPP on homicides by 100,000 people becomes non-significant, whereas the effect for police killings remains strongly significant. Column 3 provides a polynomial specification of this time trend with similar results. Column 4, which corresponds to model 1, includes monthly fixed effects, thus controlling for time and unit specific shocks. The model in column 5 allows for an individual time trend at favela level by interacting the linear time trend with favela dummies.

Overall, the results of Table 3 show that the UPP had a substantial effect to reduce police killings in this period. This effect is significant at the 95% level even with fairly stringent specifications. On the contrary, the effect for homicide rates - although negative- is non-significant once controlling for time. The size of the estimate for police killings averages -2.4 across models 2-5, which implies a reduction of 2.4 homicides per 100,000 inhabitants every month that the UPP was present in a treated favela, that is, around 29 less homicides for every 100,000 people per year. During the period of analysis there were 155 treated favelas with a total population of 467,850 inhabitants. These estimates imply that there was a yearly reduction of around 135 police killings that can be attributed to the UPP treatment. Considering that there were 224 killings by the police in Rio de Janeiro during 2013, the model suggests that this figure would have been 60 percent larger without the UPP intervention.



**Table 3: DD estimations of UPP effect**

	(1)	(2)	(3)	(4)	(5)
	Homicide rate	Homicide rate	Homicide rate	Homicide rate	Homicide rate
UPP	-2.766*** (0.539)	-0.360 (0.705)	-0.414 (0.741)	-0.325 (0.744)	-1.610 (0.883)
Observations	81432	81432	81432	81432	81432
	PK rate	PK rate	PK rate	PK rate	PK rate
UPP	-3.777*** (0.561)	-2.858*** (0.581)	-2.612*** (0.600)	-2.644*** (0.598)	-1.502* (0.763)
Observations	81432	81432	81432	81432	81432
Unit fixed effects	✓	✓	✓	✓	✓
Linear time trend		✓			
Cubic time trend			✓		
Time fixed effects				✓	
Favela specific time trends					✓

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

The unit of observation is the favela at a given month. Standard errors are clustered by favela complex, which were defined as favelas that share common boundaries. In total there are 530 clusters. The dependent variable in the first panel is the homicide rate (homicides by 100,000 people) and the dependent variable in the second panel is the police killings rate (by 100,000 people). For both cases the occurrences include the violent deaths inside the favela and within a 100 meters buffer area. The independent variable is a dummy that takes value after the UPP was introduced in a given favela. All models include favela fixed effects. Model 2 also includes a linear time trend. Model 3 includes a polynomial version of the time trend. Model 4 adds a time fixed effect term. Finally, model 5 specifies an individual time trend by favela.

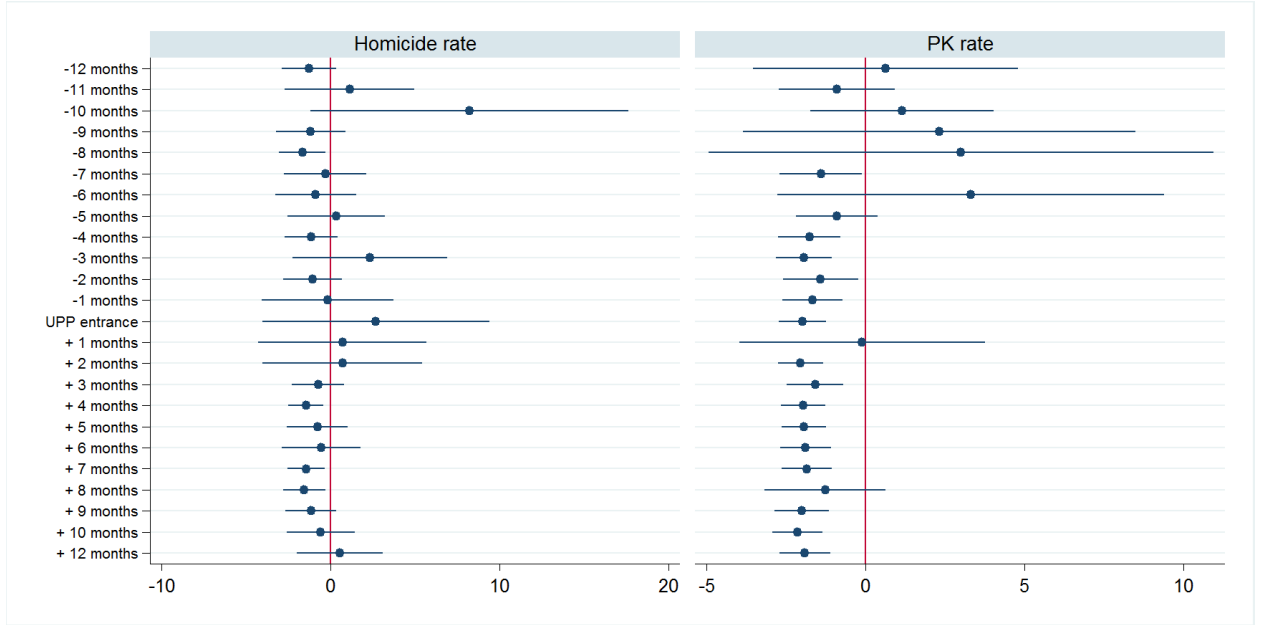
The null effect on homicides raises the important question about what drives the secular decline in murder rates during this period in Rio de Janeiro. Various “exogenous” processes related to economic development, social policies and reductions in income inequality are likely producing the decline in homicides. During the government of Luiz Inacio Lula da Silva (2003-2011), Brazil experienced its most pronounced decline in poverty due to a combination of factors, including rapid economic growth fueled by the commodity boom and the expansion of social policies. In 2006, Brazil expanded its Conditional Cash Transfer program, *Bolsa Familia*, which in addition to lifting people out of extreme poverty, has been shown to reduce incentives for young adults to engage in criminal activities by allowing them to stay engaged in school longer (Chioda et al, 2014). The UPP had no statistically discernable additional impact on reducing homicide rates in the favelas.

#### 4.5 The BOPE effect

The ‘pacification’ intervention followed a process in which the favelas were occupied by BOPE and other Specialized Battalions – and on occasions the armed forces - before the UPP was actually established. The first occupation occurred months before the introduction of the UPP and had an obvious impact on the dynamics of violence because it triggered drug traffickers to escape. Some traffickers were apprehended during the first invasion but many more took refuge in other favelas controlled by their same criminal faction. During this first

intervention the police apprehended drug kingpins and, seized weapons with the intention to weaken the criminal organization and curtail its military dominance of the favela.

**Figure 5. The BOPE Effect**



For this reason, we are interested in testing if the observed changes in violence trends come as a result of the initial ‘invasion’ or what we call a BOPE effect. To model this effect we incorporate a series of dummy variables for the 12 months before the intervention and for the 12 months after the intervention in the following form:

$$y_{it} = \gamma_{-12} UPP_{it-12} + \dots + \gamma_0 UPP_{it} + \dots + \gamma_{12} UPP_{it+12} + \lambda_i + f(date) + \varepsilon_{it}$$

Where the dependent variable is the homicide or police killings rate for the favela  $i$  in the month  $t$ .  $UPP_{it}$  is a binary indicator coded 1 if favela  $i$  switched from control to treatment between  $t$  and  $t-1$  and coded as zero otherwise. Lags  $\gamma_1, \gamma_2, \dots, \gamma_{12}$  test for long run effects; leads  $\gamma_{-1}, \gamma_{-2}, \dots, \gamma_{-12}$  test for anticipation effects. Note that including time fixed effects would produce multicollinearity in this model, for this reason we specify a model with cubic time trends. Figure 5 depicts these estimates for homicide rates and police killings. As observed, the reduction in police killings rates started around five months before the intervention, whereas there is no effect for homicides in the period.

The existence of this effect does not, however, threaten our assumption that homicide and police killings rates are affected in the treated favelas only by the introduction of the UPP and not by other unobserved factors. The reason is that the initial ‘invasion’ is part of the UPP treatment. Unfortunately precise dates for when Specialized Operation battalions entered each pacified favela were not available. But we know that on average the BOPE intervened around 4 to 5 months prior to the introduction of the UPP.

Importantly, our results demonstrate that the UPP can’t be understood without focusing on the entire package, including the critical role the BOPE and other specialized battalions played in the intervention. The results suggest that Rio’s government could not have attempted to ‘pacify’ the favelas without first threatening to confront the drug factions with superior military might. What is unique about the ‘pacification’ intervention is that, for the first time in the history of Rio, the initial invasion was performed without having a sweeping armed confrontation. This is critical for making the first militarized invasion of the slums less violent. Because drug traffickers did not want to confront the BOPE, they chose to escape to other areas of the city.

## 5. Heterogeneous treatment effects

### 5.1 Socioeconomic effects

The UPP effect might not be constant across units. There is anecdotal evidence that suggests that some communities received the UPP presence better than others. Informants tell us that the UPP tends to be better received when the community has alternative sources of income and favela residents are not as dependent on drug traffickers to make a living. Moreover, some UPP were easier to implement because of the geographic characteristics of the favelas, routes of access and socioeconomic characteristics. Moreover, success of the UPPs largely depends on the commanders’ leadership. Some UPP commanders are highly motivated and inspired by the principles of proximity policing, while others are prone to corruption and to treat favela residents with disdain. To assess for potential heterogeneous effects we interact the UPP treatment by specific characteristics of the favela in the following model:

$$y_{it} = \gamma UPP_{it} + \mu(UPP_{it} * X_i) + \lambda_i + \alpha_t + \varepsilon_{it} \quad (1)$$

Here, the coefficient  $\mu$  identifies the heterogeneous effect of the UPP.

Table 5 shows the interaction of the UPP treatment with four socioeconomic variables: income, illiteracy rates, population size and percentage of dwellings that report garbage in the streets. We take this last variable as a proxy for state presence in the favela. These variables were obtained using the 2010 census data and aggregating it at favela level. The hypothesis is that the impact of the UPP might be attenuated in favelas with lower income, higher illiteracy rates and a reduced state presence.

Columns 1 and 2 show the results of this interaction. Here, the estimates do not support the hypothesis of the differentiated effect in poorer favelas. Columns 3 and 4 shows a similar interaction but using the levels of illiteracy instead. In this case, the interaction is positive and significant at 95% for homicide rates. This suggests that the UPP has some effect reducing homicides in certain favelas with lower levels of illiteracy.

Columns 5 and 6 show the interaction with population size and columns 7 and 8 interact with percentage of dwellings that report garbage in the streets. None of these interactions are significant for homicides but they are for police killings. The results point to the fact that the UPPs were significantly less effective in reducing police lethal force in larger favelas and in favelas with less presence of the state.

In sum, in terms of heterogeneous effects, educational opportunities seem to be an important mediating factor in the case of homicides. Without access to education, a path of criminality is an attractive option for young men in the favelas. To have a sense of the magnitude of the effect of literacy, figure 6 plots the predicted values for literacy. For clarity of interpretation, we use a dummy variable that equals one for favelas with above average literacy rates. It is clear that homicide rates are lower in lower illiteracy UPP favelas.<sup>21</sup>

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<sup>21</sup> The results also point to the potential importance of one of Lula's main social welfare initiatives in 2012, by which he created Public University Quotas reserving half of all admission slots in public universities for students who attended public primary and secondary schools. This quotas where meant for black or mixed-race students, who despite constituting 50% of the population, only 10% of that group, which is the segment of the population with the highest poverty rate, makes it to university.

**Table 5: Heterogeneous socioeconomic effects**

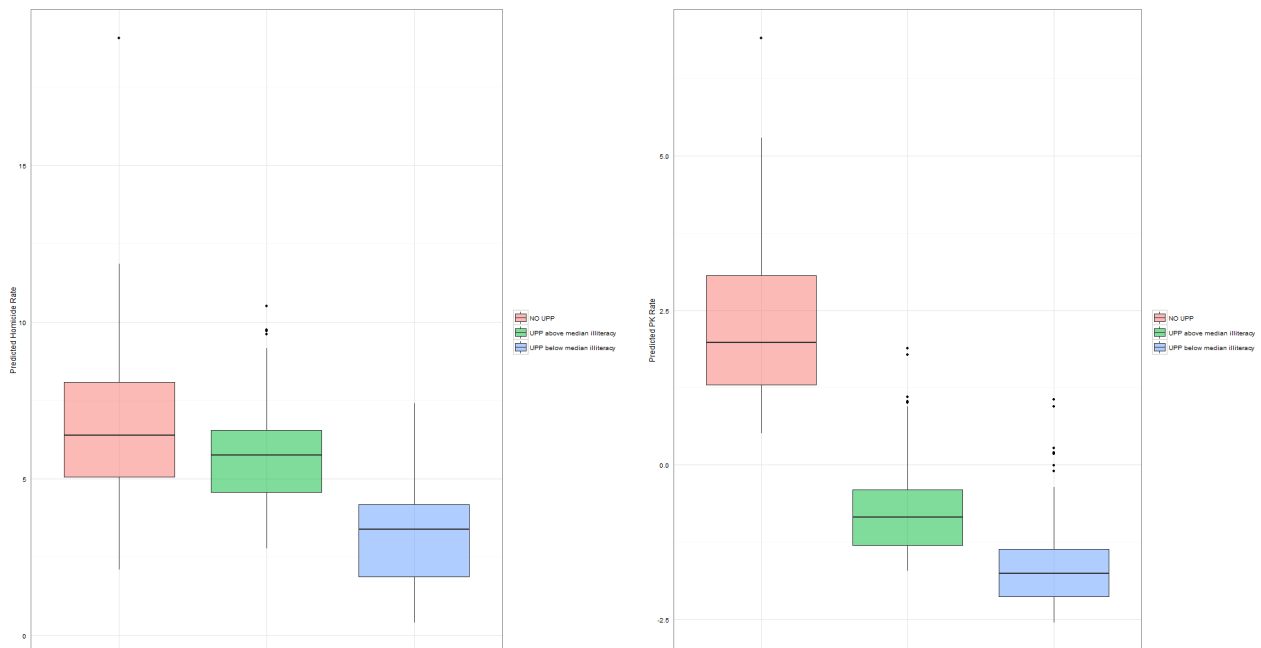
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hom. rate	PK rate	Hom. rate	PK rate	Hom. rate	PK rate	Hom. rate	PK rate
UPP	-0.610 (3.418)	-2.601 (2.834)	-3.257* (1.548)	-3.999** (1.335)	-0.619 (0.821)	-3.046*** (0.679)	-0.226 (0.749)	-2.731*** (0.609)
UPP x Income	0.0422 (0.484)	0.00410 (0.407)						
UPP x % illiterate pop.			44.84* (17.97)	21.65 (15.29)				
UPP x Pop.					0.103 (0.0575)	0.140* (0.0649)		
UPP x % Garbage							-3.800 (3.684)	4.533*** (1.261)
Observations	81432	82404	81432	82188	81432	81432	81327	81327

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

The unit of observation is the favela at a given month. Standard errors are clustered by favela complex, which were defined as favelas that share common boundaries. In total there are 530 clusters. The dependent variables are homicide rate (homicides by 100,000 people) and the police killings rate (by 100,000 people). For both cases the occurrences include the violent deaths inside the favela and within a 100 meters buffer area. For all models independent variable is a dummy that takes value after the UPP was introduced in a given favela. Column 1 and 2 interact the effect of the favela with monthly income (measured in thousands of reais). Columns 3 and 4 interact UPP with illiteracy levels in the favela. Columns 5 and 6 interact UPP population. Columns 7 and 8 interact UPP with the percentage of dwellings in the favela that report garbage in the streets. All models include favela and month fixed effects.

**Figure 6. Plot of predicted values by illiteracy**



## 5.2 Effects of dominant criminal factions

As shown above, citizens in Rio's favelas have been caught in between violent struggles between rival criminal gangs, the gangs and the police, and the militias have added another wave of violence (Blikman, 2010). These patterns of extortion and violence are only beginning to change after 2008 with the recent "pacification" process.

The main criminal factions – CV, ADA, TC as well as the militias – differed in the way they organize violence and how they relate to the community. CV is the most belligerent criminal group, which has confronted the state through repeated terrorist attacks. While, ADA believes that a profitable drug business is better run by co-opting the police through corruption. Militias have established their dominance in many favelas of the North and West and the police tolerate their activities, which include extorting citizens. We test for heterogeneous effects of criminal group dominance.

Table 6 shows the interaction of the presence of each of the criminal factions and the militias with the UPP treatment. It is important to notice that, since we have no information about the criminal groups present outside UPP areas these estimates only use treated units. The comparison group is presence of two or more criminal groups inside the UPP area. Our results demonstrate that UPP areas where the CV and the militia are present have a much larger number of homicides than areas controlled by ADA and with a combined presence of criminal groups.

**Table 6: Effects of UPPs according to Criminal Faction and Militias**

	(1)	(2)
	Homicide rate	PK rate
UPP	-3.781 (2.141)	-1.654 (1.276)
UPP x ADA	2.267 (1.951)	1.834 (1.407)
UPP x CV	4.149* (1.683)	-0.913 (1.489)
UPP x Militia	6.897* (2.747)	-3.013 (2.422)
Observations	14364	13932
Unit fixed effects	✓	✓
Linear time trend	✓	✓

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

The unit of observation is the favela at a given month. Standard errors are clustered by favela complex, which were defined as favelas that share common boundaries. In total there are 530 clusters. The dependent variable in the first panel is the homicide rate (homicides by 100,000 people) and the dependent variable in the second panel is the police killings rate (by 100,000 people). For both cases the occurrences include the violent deaths inside the favela and within a 100 meters buffer area. The independent variables are: a dummy that takes value after the UPP was introduced in a given favela and its interaction with criminal groups inside the UPP areas Amigos dos Amigos (ADA), Comando Vermelho (CV) and Militia; the reference groups are favelas controlled by two or more groups. All models include favela fixed effects. All models include favela and time fixed effects. Models 2 and 3 are weighted regressions using synthetic weights.

## 6. Robustness test

This and the following two sections present various robustness tests with the use of a variety of quasi-experimental empirical designs. To evaluate the UPP we find a comparison group that allows us to understand how lethal violence would have evolved had the UPP not been present. Our strategy is to try to mimic an

experimental research design using observational data by selecting a credible counterfactual with which to compare 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 where the UPPs were installed. Once we find this comparison group, we can compare the average change over time in lethal violence for the treatment group (the UPP) to the average change over time for the comparison group.

We exploit the granularity of our data to analyze the evolution of violence in specific UPP interventions. The objective of this section is twofold. First, we seek to offer additional support to our main results by comparing units that are similar in several dimensions by stratifying -or sub-classifying- cases based on observed characteristics. To perform this stratification we follow a theory-based approach rather than a data-driven approach -such as matching algorithms. In particular, we select natural breaking points that include comparable control units for a specific UPP or group of UPP's based on characteristics that can be inferred from Rio's spatial and socioeconomic urban dynamics. The second objective of this section is to provide a deeper understanding of the mechanisms underlying the heterogeneous effects across interventions.

### 6.1. Census tracks in UPP's geographic borders

In line with Cano et al (2012), our first quasi-experimental approach focuses on a small set of census tracts next to each other in the border of pacified favelas. The motivation for this strategy that analyzes criminal dynamics in UPP buffers is given by the fact that streets around its borders share many spatial and socioeconomic dynamics in common -including the presence of a common criminal faction --that allow us to construct a reliable counterfactual.

Our comparison groups will be along the UPP's borders, looking at lethal violence incidents in a buffer of 100 meters inside and 100 outside a given UPP. Each census track inside the UPP is compared to the census track right outside the UPP. The analysis will compare the difference in death rates in the area inside a given UPP to the difference in death rates in the area outside the UPP after its inauguration, thus estimating:

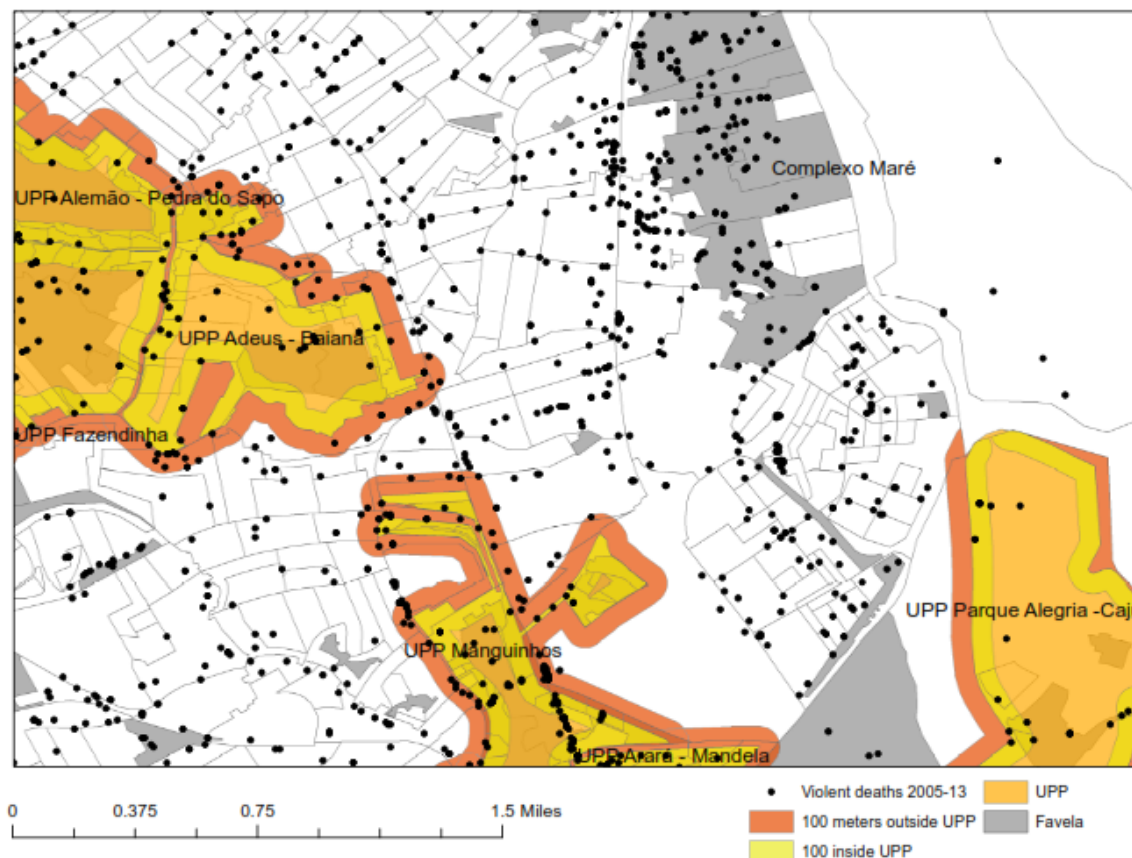
$$y_{it} = \beta Post + \lambda Post \times UPP_{100m} + \mu_t + \gamma_i + \varepsilon_{it}$$

Where the dependent variable is the homicide or police killings rate for the census tract  $i$  in the month  $t$ .  $UPP_{100m}$  is a binary indicator coded as one if the given census tract is inside the UPP area;  $Post$ , is a binary indicator coded as one after the UPP was installed. The coefficient of interest is  $\lambda$ , corresponding to the interaction between  $UPP_{100m}$  and  $Post$ , that is, the effect in the UPP area after this was installed.



This model controls for time and census tract fixed effects. The standard errors are clustered by specific UPP (note that since  $UPP_{100m}$  does not change across time it disappears with the inclusion of fixed effects).

**Figure 8. 100 meters boundaries around UPPs**



A key identifying assumption of this Difference-in-Difference (DD) strategy is that the outcome in treatment and control groups would follow the same time trend in the absence of the treatment. This does not mean that they have the same mean or magnitude of violence, but that they have similar trends. The results of the DD buffer zones strategy are presented in table 8. This table shows two coefficients, the first one measures the change in homicides and police killings after the UPP started; this measure reflects changes in places inside and outside the UPP after the treatment. The second coefficient is the coefficient of interest, that is, the effect of the UPP in places that actually had a UPP. The quasi-experimental evaluation of buffer zones yields the same conclusion: the UPP has a statistically significant effect for police killings but marginal effects at best for homicides.

**Table 8: DD estimations in geographic borders**

	(1)	(2)
	Homicide rate)	PK rate
Post	-0.542 (0.651)	0.219 (0.257)
Post x UPP	-0.784 (0.789)	-1.579** (0.446)
Observations	149688	149688

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

## 6.2 Case studies with stratified comparison groups

Our second quasi-experimental strategy is to explore three paradigmatic cases that can be clearly delineated in terms of spatial location and timing of the intervention. Not all UPPs are alike. The pacification in the South Zone seems to have been more successful than pacification in the larger and more complicated favelas, such as Rocinha and Complexo do Alemão, which are the headquarters of the ADA and the Red Command (CV). Hence, in this quasi-experimental approach we will seek to compare treated favelas that are reasonably similar to non-treated ones based on our knowledge of Rio's urban dynamics.

Below, we provide a descriptive account for each case and a discussion of the individual effects. For each of these cases we find a comparison group or set of favelas that serve as plausible counterfactual to assess the effect of a given UPP intervention.

### 1. *Cidade de Deus*

Cidade the Deus (City of God)<sup>22</sup> is one of the few UPPs that were installed in the western part of the city. Cidade de Deus refers to a group of favelas and complexes built in the 1960s in the neighborhood of Jacarepagua to provide household dwellings to families forcefully removed from favelas in the southern area of the city. Although formally only a small area is defined as a favela by the IBGE, the more urbanized area of the community is also referred as a favela by Rio's inhabitants. The CV dominated the lives of the more than 60,000 residents.

<sup>22</sup> Cidade de Deus became famous with a novel by Paulo Lins, which was later turned into a film by Fernando Meirelles. The film portrays life in the favela dominated by rival drug gangs.

On February 16, 2009 the UPP of Cidade de Deus was installed. A force of 318 officers is now based in the community. According to Cano et al. (2012) this decision was mostly related to the initiative of a local commander. This is relevant because together with Jardim Batan it represents a pattern that differs from the common practice of installing UPP's closer to touristic and more affluent areas.<sup>23</sup>

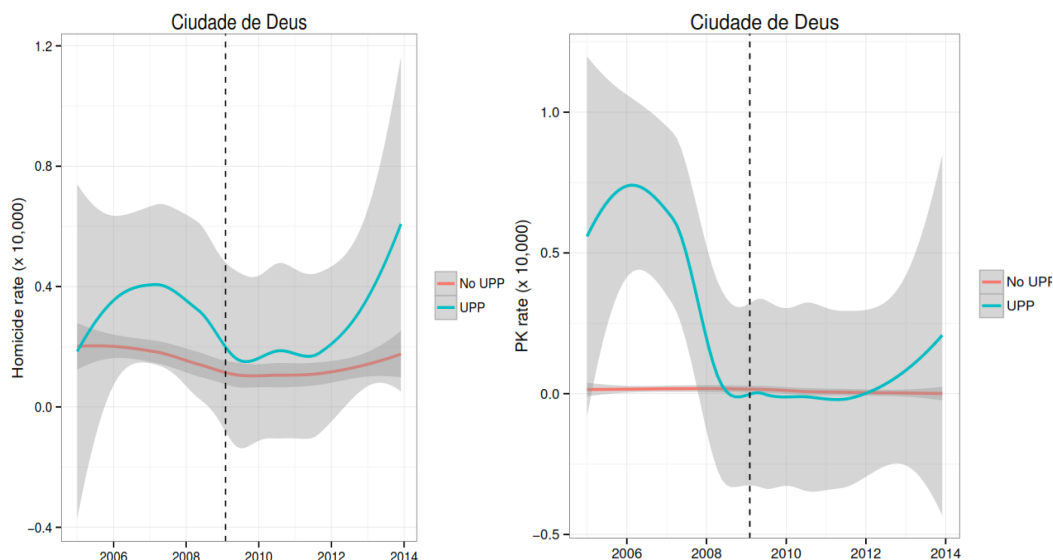
The comparison of using a difference-in-differences method for Cidade de Deus is relatively clean because the control group can be easily defined as all the favelas located in the same police battalion (AISP 18) that did not receive the UPP. Figure 6 shows the evolution of homicides and police killings inside the UPP area and in the non-treated favelas located inside battalion 18. Here it is noticeable that before the UPP, homicide rates are much larger inside its perimeter; and after the intervention homicides inside the UPP drop to the level in non-UPP areas. Police killings, for their part, are radically different in favelas with and without UPP. Here we observe that before 2008, police killings were highly concentrated inside the favelas that would receive the UPP. Confirming our previous results, the reduction of police killings after the installation of the UPP is significantly more noticeable than homicide reductions.

It should be noted, moreover, that the UPP in Cidade de Deus was successful at reducing homicides during the first two and a half years after its introduction. After 2013 homicides and police killings start to increase. The police carried out a major operation in 2014 in response to an attack to the local UPP station in Cidade de Deus, allegedly in retaliation for shooting a drug trafficker. That police officer represented the 118<sup>th</sup> officer shot in 2014, of which six died. Similarly after 2013, other pacified favelas became scenes of frequent shootouts between the police and drug traffickers, a worrisome pattern to which we turn at the end of this section.

## Figure 7.

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<sup>23</sup> According to Cano et al. (2012) Jardim Batam was installed as a response of the state against the militia groups that tortured journalists from O Dia.

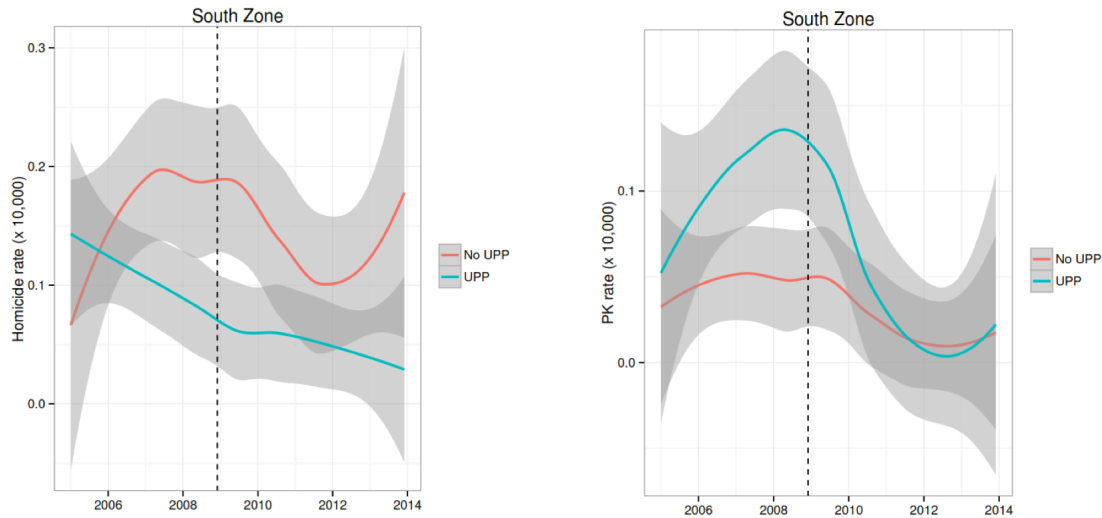


## 2. South Zone

With the exception of Rocinha, the pacified favelas in the South Zone are hardly comparable to the rest of the city's favelas. These favelas are relatively wealthier and better served by public services. Given the proximity to Copacabana, Ipanema and Leblon, residents in these favelas have more interactions with middle class citizens and many provide them with services- i.e., nannies, doormen, gardeners, bar attendants, hairdressers, taxi drivers, etc. Although the rich never venture into these slums because they were considered by outsiders as exceedingly dangerous, in reality they had lower murder rates than most other favelas.

Since these favelas are so close to Rio's wealth and power, the police had regular incursions in these territories to keep crime from spilling outside favela borders. Moreover, most of these favelas are small territories located in hills (*morros*) and have very few access streets, making it easier for the police to control movements in and out of the favelas. For these reasons, the dynamics of violence in these South Zone favelas are hardly comparable to the more problematic, poorer and isolated favelas in the North and West. Residents are wealthier and relatively better interconnected to the rest of the city in the South Zone, the police have more incentives to patrol these territories because of their proximity to the rich, and their small size and topography makes them easier to control. Furthermore, the land in these favelas is extremely valuable given their spectacular views of the ocean and their location, making them attractive for speculators.

**Figure 8. Violence trends in Cidade de Deus and counterfactual favelas (2005-2013)**



We focus on a few favelas in the South Zone, particularly those near the Copacabana, Ipanema and Botafogo neighborhoods. As a counterfactual we use the small favelas located in the comparably wealthy Barra de Tijuca neighborhood.<sup>24</sup> Since the UPP intervention in the South Zone favelas occurred across a certain period rather than in a specific point in time, it is difficult to establish pre-treatment and post-treatment periods

Figure 7 shows how homicide and police killings rates vary before and after the introduction of the South Zone UPPs (excluding Rocinha and Vidigal). The dashed vertical line is located in December 2008, when the first UPP (Santa Marta) was installed in the South Zone. After 2008, three more UPP were installed in this region: Pavao-Pavaozinho in December 2009, Ladeira dos Trabalhas in January 2010 and Babilonia in June of the same year. The data seem to confirm our results about a noticeable reduction of police killings. With respect to homicides, there is not a significant drop after the UPPs are introduced, although importantly homicides are increasing only in the favelas that do not have UPPs in the post-2013 period, when we observe a spike in violence in the entire city. The data indicates a relative success of the pacification in the South Zone.

### 3. Rocinha vs. Mare

<sup>24</sup> Formally, we include all the Favelas in Battalions 19, 2, 23 and 31, with the exception of Rocinha and Vidigal.

The intervention of Rocinha was a critical turning point in the pacification process. Rocinha has more than 100,000 inhabitants, the largest favela in Brazil. It is located in the South Zone. The UPP in Rocinha was introduced in September of 2012 and currently has 800 police officers. We will contrast lethal violence tendencies in Rocinha with Complexo da Maré, a large network of favelas that has not yet been pacified. We select Maré because together with Rocinha and Complexo da Alemão, these three territories are the most challenging territories for the PMERJ. Complexo da Maré is somehow different from Complexo da Alemão and Rocinha because the three factions –CV, ADA, and TC – plus the militias are present (Souza, 2013). Located in a strategic area of the city along its main entry artery, Complexo da Maré moves large quantities of drugs and arms, supplying a number of other favelas. Complexo da Maré will soon be “pacified”.

Rocinha was known for running the most profitable cocaine trade in the city. Prior to the pacification, the favela’s drug lord known as Nem followed markedly different strategies from those of the CV. Aligned with the ADA, Nem thought that violence was bad for the trafficking business. In a comprehensive book about Nem’s story, Glenny (2015) describes that for him the three elements of a successful leader of a criminal organization were “reputation within the community; acceptability to the local police; and authority within his organization” (p. 167).

Nem allegedly had under his payroll many police officers and probably also various politicians. Additionally, he understood that the police were responsive to the business elite and the middle class, whose fears of insecurity and criminals often inspired violent government crackdowns. He hence kept his armed soldiers under strict control and was determined to sanction robbers and thieves from his favela, especially when they wandered to the South Zone (Glenny, 2015).

A period of relative stability characterized Nem’s rule in Rocinha. He gained power after a major internal war between CV factions fighting for control of the favela. The “War for Rocinha” produced a huge police intervention that sent over 1,000 police officers, including 650 from the BOPE (Glenny, 2015: 134). In a second operation, the war culminated in the execution of the then drug lord, Lulu, after a hundred officers occupied Rocinha. The killing of the leader of the criminal organization further created bloodshed among the factions. After short leadership successions, each ending with violent executions, Nem managed to gain control.

During Nem’s rule, “pacification” in Rocinha might not have taken place when it did had it not been for the events at the Intercontinental Hotel in August 2010. A group of traffickers from Rocinha were intercepted by the police as they left a party in a nearby favela, and they took refuge in this hotel, holding tourists hostage for hours until they were instructed by Nem to give themselves up peacefully (Glenny, p. 230-239). In anticipation of the World Cup and the Olympics, the events made it difficult for the government to justify not targeting Rocinha for pacification. Nem was arrested in November 2011 without the police firing a bullet. After an invasion by the regular military police, the UPP was introduced in 2012.

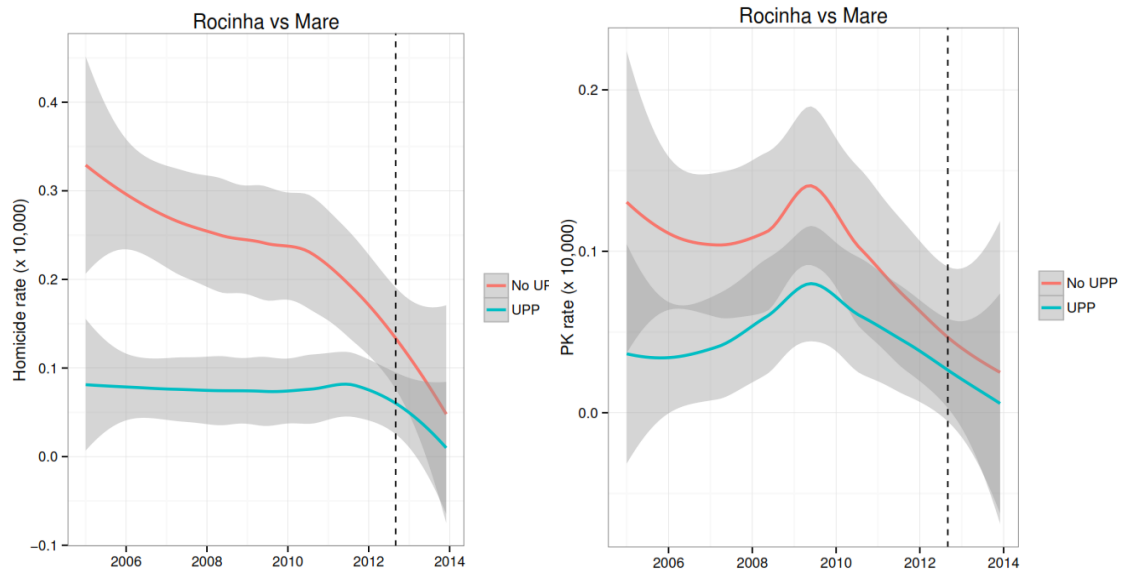
The summer of 2013 marked the beginning of the current period of decay of the pacification process in Rio due to the *Amarildo* scandal. For over two months, Amarildo de Souza was classified by the authorities as ‘missing’. As the case began to gain public attention, further details were revealed that Amarildo, a bricklayer, had been seized and taken to police barracks where he was interrogated, but officers proceeded to beat and torture him with electric shocks and plastic bags over his head. Attempting to salvage the legitimacy of the UPP, the Military Police detained 10 officers in October, and the State Prosecutor’s Office reported the involvement of an additional 15 military policemen in the torture and death of Amarildo. Major Edson Santos, the then commander of the UPP in Rocinha, and Lieutenant Luiz Medeiros, former deputy commander of the unit, were also put in custody.

The Amarildo case was a major setback for the government efforts to construct a good image for the UPP as resident-friendly police units. The qualitative evidence suggests that the UPP in Rocinha has failed. On the one hand, there continue to be frequent armed confrontation between police and traffickers, and these confrontations tend to terrorize favela residents, who are jointly victimized by the criminals and the police. On the other hand, the UPP has not been able to gain the community’s trust. After the Amarildo scandal, three UPP commanders have been assigned to Rocinha, giving them little opportunity to build connections to members of the community. Our informants describe an environment of fear taking over the favela. One resident told us: “I have so much fear, even to talk. We are caught in between the drug traffickers and the police. I have market freedom – I can buy a cell phone or food – but I have no freedom to talk.”

To further support the claim that this pacification has failed in Rocinha, we contrast lethal violence tendencies in this favela with tendencies in Complexo da Maré, which had not been pacified during the period of study. The figures below suggest that there are no discernable differences in the pre-treatment lethal violence tendencies between Rocinha and Maré. Homicides are three times higher in Maré than in Rocinha, probably reflecting the fact that there are so many armed factions competing for control in Maré. But in both areas homicides are decreasing in the pre-treatment and post-treatment periods. Police killings are also higher in Maré, although in both areas they are falling. As can be seen in the figures below, the UPP intervention in Rocinha does not appear to further decrease lethal violence.

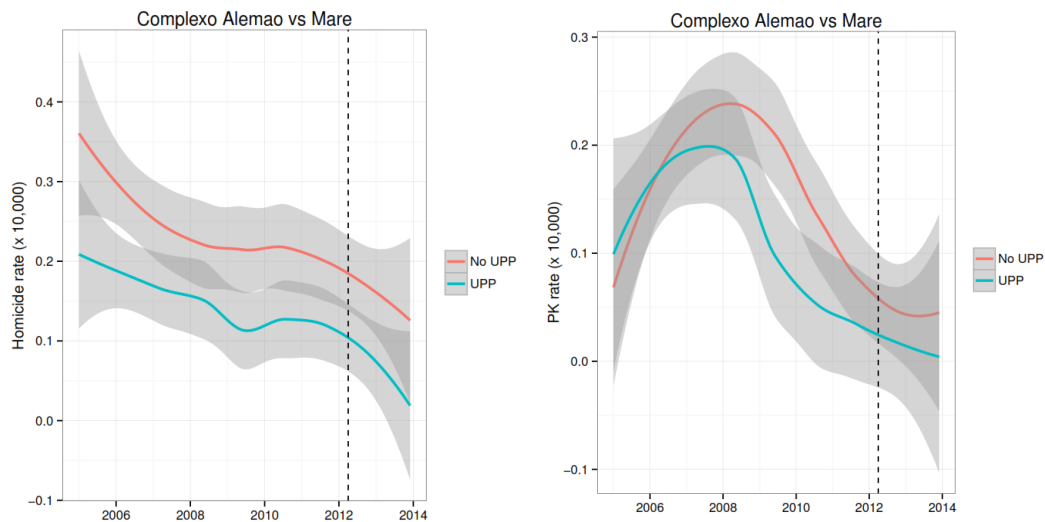
To conclude our analysis, we perform more systematic Difference-in-Differences (DD) analyses among our pair comparisons. The results are provided in the appendix and confirm the failure of Rocinha’s UPP as it relates to the Maré comparison, and the relative success of pacification in Cidade de Deus and the South Zone. As in our previous models, we find discernable effects for police killings but not for homicides in these UPPs.

**Figure 9. Violence trends in Rocinha and counterfactual favelas (2005-2013)**



Similar dynamics are found when comparing Complexo and Maré, as can be seen in the following figures.

**Figure 10. Violence trends in Complexo Alemão and counterfactual favelas (2005-2013)**





## 8. The last stage of the UPPs

The interventions in Complexo Alemão and Rocinha would produce a hardening of the UPP. After these interventions took place, violent confrontations between police and traffickers became more frequent in the city, significantly increasing the rate at which UPP police are killed<sup>25</sup>. The Military Police came to realize that UPP police officers – mostly young men and women with little experience – are poorly trained and vulnerable in difficult terrains. The vision that favelas were “pacified,” the new command of the UPP reasoned<sup>26</sup>, was naïve because powerful and well armed drug dealers were still present in these territories. Police officers with better training – including BOPE cops – started to be assigned to the difficult UPPs. The mission of “proximity” became increasingly difficult to implement as the UPPs started to battle with heavily armed groups in the pacified favelas.

The Amarildo case produced a serious backlash in the pacification process by damaging the legitimacy of the UPP among favela residents and the public at large. Without trust and support from the community the police is intended to serve, the UPP is weak. This case highlights one of the paradoxes of “pacification”. Major Edson Santos was a BOPE police officer, and many of his police officers in the UPP of Rocinha were also from this specialized battalion. Prior to the Amarildo scandal, Major Edson was mounting one of the largest anti-narcotics operations in Rio, and it is believed that he was about to dismantle drug trafficking in the favela. The operation would have hurt powerful interests at the highest echelons of power, including politicians and several police officers from the UPP in Rocinha who were receiving large amounts of money from the drug traffickers.<sup>27</sup> Major Edson Santos had also given Rocinha traffickers a big blow by regulating the moto taxis, which generated large profits for the drug traffickers as they taxed these and many other commercial activities.

How can a “proximity” policing unit be staffed with BOPE cops and engage in such a large anti-narcotics operation? This case highlights one of the most serious

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<sup>25</sup> In 2012 two cops died in Complexo do Alemão and these murders triggered a change of the UPP Chief Command to Coronel Paulo Henrique, a BOPE police officer who commanded the Coordenadoria de Operações Especiais, COE. Additionally, in that year the UPP of Mangueira a group of criminals attacked a UPP police car in Mangueira.

<sup>26</sup> Personal interview with the Commander of the UPPs in 2013.

<sup>27</sup> Some residents of the favelas claim that the traffickers together with various police officers inside the UPP in Rocinha framed Major Edson. Major Edson has given interviews from prison claiming that this was the case. A further paradox is that many of our informants in Rocinha reported been satisfied with Major Edson because he had managed to curb the power and abusive behavior of the traffickers. Many of our informants reported feeling significantly more vulnerable and victimized by gangs, constant shootouts, and extortion after Edson was jailed. This information comes from various personal interviews with favelas residents and cops that chose to remain anonymous.

challenges facing the UPP reform. The UPP was not designed to eradicate drug trafficking but to weaken criminal organization and their dominance in the favelas. There is evidence that point to a different stage in the post-2013 period with a spike in lethal violence across the city, possibly, inside UPP areas as well. On the one hand, police victimization is increasing. The drug traffickers have understood a key weakness of the UPP – the police themselves. Since 2011, the number of police officers deaths in action has doubled.<sup>28</sup> A more vulnerable police is also tempted to use more violence. Police killings have increased since 2013, going from 222 to 319. With increased scrutiny – to a large extent because of social media – police killings will further delegitimize the reform.

## 8. Conclusion

One of the main goals of this paper was to evaluate the causal impact of the UPP, probably the largest-scale police reform initiative taking place in the developing world. In the course of six years, more than 9,000 police officers were permanently assigned to the UPPs, servicing close to half a million residents in the favelas whom for decades had been ruled by drug trafficking gangs and militias. The reform marks an important departure from the militarized policing strategy that had shed so much blood in the favelas of Rio.

To evaluate the UPP impact on lethal violence, we used a variety of causal identification strategies that leverage spatial and temporal variation in the introduction of the UPP, as well as geo-referenced data of more than 22,000 incidents of lethal violence from 2005 to 2013. Grouping our lethal violence data at the favela level, we used a difference-in-difference methodology contrasting, first, violence before and after an intervention within each UPP, and violence tendencies in favelas where a UPP was placed relative to other favelas where no UPP was situated. This provides a critical improvement to existing analyses that use publicly available data at the AISP level (Frischtak & Mandel 2012). As a robustness test, we complemented this strategy with an analysis of 100 meters buffer zones that contrast violence tendencies inside and outside the UPP's borders. These streets are highly comparable in socio-demographic characteristics and spatial dynamics, including the presence of a common drug faction.

Secondly, since there is a significant heterogeneity in the UPPs, we isolated three paradigmatic cases that reflect very differing urban and crime dynamics: i. pacified favelas of the wealthy South Zone; ii. Cidade de Deus, one of the few territories pacified in the poorer North-West; iii. Rocinha, the most profitable cocaine market in the city and the largest favela in Brazil. For each of these cases, we find comparable favelas to contrast violence trends before and after the treatment. The goal of these analyses is to provide more contextual insight into the UPP reform.

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<sup>28</sup> In 2011 there were only 8 death police officers in Rio de Janeiro, the lowest number in recent history. Between January and October 2015 there were 15 death police officers.

Our empirical models reveal that the UPP had mixed results. First, the UPP had little impact to diminish homicides. Between 2005 and 2013, the period of study, homicides in the city decreased by over 40%. The introduction of the UPPs did not play a significant role in reducing any additional murders in the favelas that were pacified. The UPP's failure to reduce homicides implies that the poor in the slums continue to be subject to two or three times higher murder rates than the white middle class. Nonetheless, the UPP is breaking long-held practices of extreme use of police lethal violence. Our empirical results convincingly demonstrate that police killings would have been 60 percent larger without the UPP intervention. Considering Rio's long history of police violence this effect is noteworthy. Police killing rates for black males have dropped from more than 25 to less than 7 per 100,000 from 2007 to 2013 and, as our results demonstrate, the UPP deserves a lot of credit for this reduction.

Analyses of heterogeneous treatment effects suggest one reason the UPPs have failed to reduce homicides. We observe that socioeconomic factors, and in particular illiteracy, mediate the impact of police interventions. The empirical results demonstrate that the UPPs that were installed in favelas with higher literacy levels are effective at preventing homicides, whereas UPPs in high illiteracy favelas are not. The results make sense as to why residents of many pacified favelas complain that the government betrayed their expectations because the pacification did not bring highly needed public services such as schools and health clinics. The main takeaway is that pacification of the slums cannot be about policing only. Indeed, without access to educational opportunities, a path of criminality will continue to be attractive, especially to boys and adolescents above fifteen years old. These results are in line with previous work that shows that Conditional Cash Transfer programs can reduce crime because they allow adolescents to remain engaged in school longer (Chioda, et al 2013).

A significant and somehow paradoxical empirical finding is that reductions in police killings can be clearly attributed to the moment militarized police interventions take place or when BOPE and other specialized battalions 'invade' the favelas. The entrance of the UPP does not produce further reductions of police killings -- although we must note that the pacifying police are able to sustain lower levels of police killings than historic trends. The reason this first militarized intervention has such a large impact on the dynamics of violence is because it triggers drug traffickers to escape. Furthermore, during this first intervention the police seize weapons with the intention to curtail drug faction's military supremacy in the favela. Importantly, the initial invasions in soon to be pacified favelas have been relatively peaceful, as opposed to the very violent interventions of the past. It is noteworthy that a reason drug trafficker's offer no armed resistance is because of BOPE's military might.

The UPP is breaking long-held practices of extreme use of police lethal violence. The history of interactions between the police and favela residents has

been plagued with disrespect, racial stigmatization, human rights abuses, and summary executions. Moreover, police killings have been vindicated by the larger society. Many continue to perceive poor people from the slums as dangerous and associated with the criminals, and perceive no need for restraining police killings directed against this sector of society. The UPP is having a large impact in supplying the poor a less violent police force.

But there are signs of concern. There is evidence that points to a spike of lethal violence across the city, possibly, inside UPP areas as well. Police victimization is increasing because drug traffickers have understood that the police themselves are the weakest point of the UPP. Since 2011 the number of police officers deaths in action has doubled, and police killings are starting to spike again.

The fragile equilibrium raises important questions about the elements of the UPP that need to be rehabilitated. One critical weakness of this reform is crime diffusion. Drug traffickers have re-organized and adapted their strategies to confront the UPPs. Drug trafficking continues, but now it is run from many corners of Rio, and not, as before, from well localized “bocas de fumo” inside the favelas. Moreover, drug traffickers now carry light weapons that are easier to conceal instead of semi-automatic rifles. The reorganization of criminal groups and drug trafficking is spreading violence to other areas of the city, especially Baixada Fulminense and Nueva Iguazu. There are simply no resources to introduce UPPs in the more than 800 favelas, and many “chronic hot spots” in the North and West have very limited police presence (Magaloni et al, 2015).

Another weakness of the reform is that the UPP might work in less dangerous favelas, but has not worked in the larger more difficult terrains such as Rocinha and Complexo de Alemão. Our results demonstrate that the UPPs of the South Zone were relatively successful because these are smaller, less problematic favelas that have been a priority for the government to a large extent because they are located footsteps from the wealthiest streets of Rio.

Furthermore, lack of community trust is one of the main challenges the UPP currently confronts. The Amarildo scandal was a big blow to the reform because it contributed to undermining citizen trust. Corruption scandals have further implicated UPP officers who in various favelas have been caught extorting citizens – for example, demanding cash not to take drug dealers away, or monthly payments to allow the drugs to flow freely. Arguably, with increased scrutiny, driven to a large extent due to social media, killings and corruption by police will further delegitimize the reform.

Lastly, our evaluation provides a source of pessimism to the proposition that drug violence can be handled through ‘conditional state crackdowns,’ which use violence selectively against the most violent cartels (Lessing, 2015). The government in Rio followed a strategy of targeting the most belligerent drug faction, the Red Command (CV), but not targeting the most violent places in Rio. Although

some improvements can be observed, violence was not sufficiently curtailed. Our qualitative work tells us that the decision to target drug cartels selectively is hard to implement and to enforce for various reasons.

First, since a government or the police that ‘negotiates’ with criminals is not well received, public opinion will stand in the way for police officers to negotiate “selective enforcement” deals with drug traffickers, and will push governments to target all criminal organizations equally, often irrespective of their behavior.

Second, police officers tell us that in their everyday routines it is very difficult to find the right balance between ‘tolerance’ and ‘enforcement’. Many UPP commanders tacitly tolerate drug traffickers as long as they remain non-violent, but our informants tell us that when the police become too lenient, traffickers regain power and become a threat to citizens and police alike.

Third, conditional enforcement approaches can be subverted on the ground by violent or corrupt police, as the case of the UPP suggests. A paradigmatic case was Rocinha, where a BOPE-trained commander of the UPP orchestrated one of the most far-reaching anti-narcotic intelligence operations ever to be run inside a favela. The operation was arranged despite the fact that the UPP, according to its Chief Command, is not supposed to fight drug trafficking.

This brings us to what we see as the principal flaw of the police reform effort in Rio de Janeiro. In principle the UPPs were not intended to eradicate drug trafficking, but to guarantee peace and security in the slums. This is contradictory given that heavily armed drug gangs are precisely the main threat to security inside favelas. Moreover, given that drugs are illegal, many police officers consider an essential part of their job to fight drug gangsters, even with the use of excessive lethal force (Magaloni and Cano, 2015). The goal of “proximity” policing gets distorted when drugs are a priority. Since politicians and regulators have decided that drugs are illegal, drug traffickers become violent because police are mandated to enforce the laws, and many are trained to do so even with the use of excessive violence. Drug traffickers, in turn, will continue to buy arms and reorganize to evade and to confront the police. These violent spirals will persist as long as drugs remain illegal. Since conditional enforcement is not a stable equilibrium, societies in Latin America that are most affected by violence should push for the full legalization of drugs.

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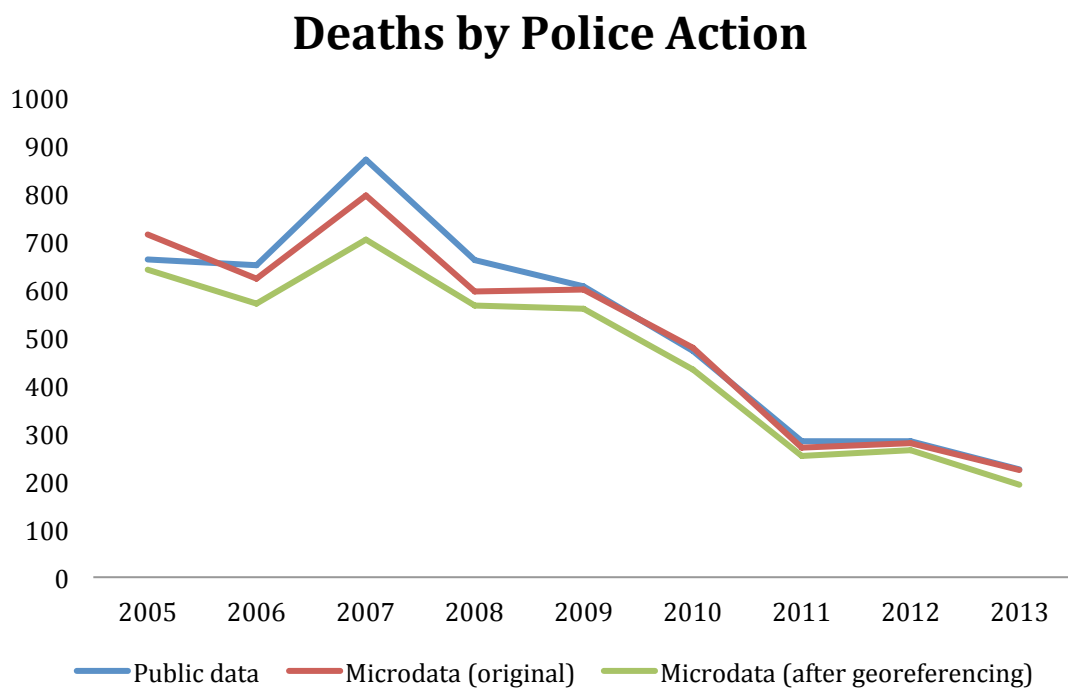
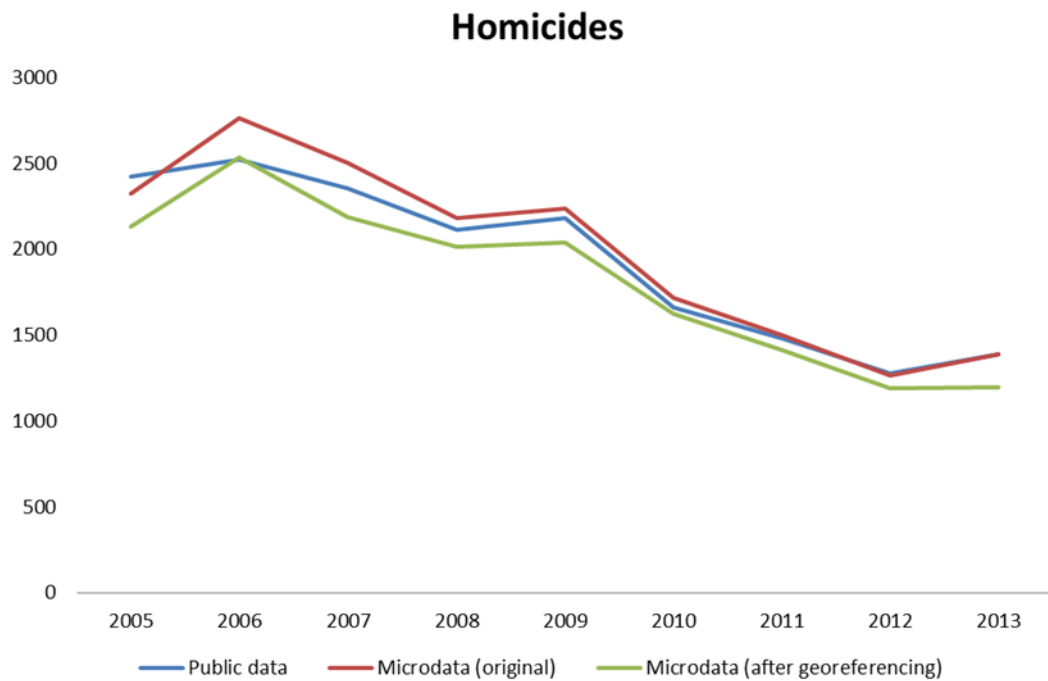
## 10. Appendix

**Table 1A. UPPs**

UPP	INTERVENTION DATE	REGION	FAVELAS	POPULATION (PEREIRA PASSOS)	MEDIAN INCOME (FAVELAS ONLY)	POLICE OFFICERS	POLICE PER EVERY 1,000 INHABITANTS	AVERAGE MONTHLY HOMICIDES BEFORE INTERVENTION	AVERAGE MONTHLY HOMICIDES AFTER INTERVENTION	AVERAGE MONTHLY POLICE KILLINGS BEFORE INTERVENTION	AVERAGE MONTHLY POLICE KILLINGS AFTER INTERVENTION
UPP SANTA MARTA	Dec-08	Zona Sul	1	3,913	765	123	31.4	0.04	0.00	0.13	0.00
UPP CIDADE DE DEUS	Feb-09	Zona Oeste	9	47,021	614	343	7.3	2.67	0.83	2.00	0.07
UPP BATAN	Feb-09	Zona Oeste	4	28,000	599	107	3.8	1.06	0.58	0.33	0.07
UPP BABILONIA - CHAPÉU MANGUEIRA	Jun-15	Zona Sul	2	3,740	953	107	28.6	0.08	0.02	0.04	0.00
UPP PAVÃO-PAVÃOZINHO	Dec-09	Zona Sul	2	10,338	876	189	18.3	0.22	0.06	0.22	0.06
UPP LADEIRA DOS TABAJARAS	Jan-10	Zona Sul	3	4,243	762	144	33.9	0.12	0.08	0.52	0.00
UPP PROVIDÊNCIA	Apr-10	Centro	4	4,889	588	251	51.3	0.98	0.60	0.44	0.09
UPP BOREL	Jun-10	Zona Norte	6	12,815	686	287	22.4	0.71	0.19	0.75	0.05
UPP FORMIGA	Jul-10	Zona Norte	1	4,312	534	111	25.7	0.18	0.02	0.24	0.02
UPP ANDARAÍ	Jul-10	Zona Norte	6	9,704	709	219	22.6	0.42	0.07	0.77	0.02
UPP SALGUEIRO	Sep-10	Zona Norte	2	3,345	577	140	41.9	0.07	0.03	0.21	0.00
UPP TURANO	Oct-10	Zona Norte	10	12,218	705	173	14.2	0.42	0.16	0.83	0.03
UPP MACACOS	Nov-10	Zona Norte	2	19,082	606	221	11.6	0.83	0.24	0.55	0.00
UPP SÃO JOÃO	Jan-11	Zona Norte	3	NA	643	NA	NA	0.68	0.26	0.38	0.06
UPP FALLET-FOGUETEIRO	Feb-11	Centro	5	9,013	731	259	28.7	0.85	0.29	0.35	0.20
UPP PRAZERES-ESCONDINHO	Feb-11	Zona Sul	4	5,586	815	182	32.6	0.25	0.03	0.12	0.00
UPP SÃO CARLOS	May-11	Centro	5	15,244	654	244	16.0	1.38	0.26	0.42	0.10
UPP MANGUEIRA	Nov-11	Zona Norte	5	17,946	671	332	18.5	0.43	0.32	0.34	0.12
UPP VIDIGAL-CHÁCARA	Jan-12	Zona Sul	2	10,372	706	246	23.7	0.30	0.13	0.19	0.00
UPP NOVA BRASÍLIA	Apr-12	Zona Norte	3	28,661	575	340	11.9	0.25	0.10	0.11	0.15
UPP FAZENDINHA	Apr-12	Zona Norte	4	12,399	655	314	25.3	0.44	0.05	0.26	0.00
UPP ADEUS - BAIANA	May-12	Zona Norte	3	4,354	641	245	56.3	0.71	0.25	0.21	0.00
UPP ALEMÃO - PEDRA DO SAPO	May-12	Zona Norte	2	15,094	568	320	21.2	0.17	0.11	0.11	0.00
UPP CHATUBA	Jun-12	Zona Norte	3	10,205	576	230	22.5	0.35	0.17	0.06	0.00
UPP FÉ -SERENO	Jun-12	Zona Norte	3	3,574	577	170	47.6	0.04	0.00	0.08	0.00
UPP VILA CRUZEIRO	Aug-12	Zona Norte	2	17,170	549	300	17.5	0.59	0.18	0.48	0.06
UPP PARQUE PROLETÁRIO	Aug-12	Zona Norte	2	18,661	653	220	11.8	0.07	0.12	0.04	0.00
UPP PARQUE ALEGRIA - CAJU	Sep-12	Zona Norte	9	16,000	607	350	21.9	0.63	0.50	0.41	0.00
UPP ROCINHA	Sep-12	Zona Sul	2	71,085	666	700	9.8	0.62	0.13	0.23	0.19
UPP MANGUINHOS	Jan-13	Zona Norte	8	35,000	650	588	16.8	0.94	0.17	0.61	0.08

<b>UPP JACAREZINHO</b>	Jan-13	Zona Norte	9	36,000	574	543	15.1	1.26	0.58	1.02	0.17
<b>UPP BARREIRA - TUITI</b>	May-13	Zona Norte	4	10,404	886	NA	NA	0.49	0.88	0.18	0.25
<b>UPP ARARÁ - MANDELA</b>	May-13	Zona Norte	5	NA	730	273	NA	0.37	0.00	0.28	0.00
<b>UPP CERRO CORÁ</b>	Jul-13	Zona Sul	5	4,500	753	232	51.6	0.30	0.00	0.10	0.00
<b>UPP LINS</b>	Dec-13	Zona Norte	15	8,850	612	250	28.2	1.23	NA	0.62	NA
<b>TOTAL</b>			<b>155</b>	<b>513,738</b>							
<b>AVERAGE</b>					<b>670</b>	<b>8,753</b>	<b>25</b>	<b>0.58</b>	<b>0.22</b>	<b>0.39</b>	<b>0.05</b>

**Figure 1A: Homicides and Deaths by Police Action, 2005-2013**



Source: Authors with data from ISP

	<i>Dependent variable:</i>					
	Homicides 2005-2013		Police killings 2005-2013		Ratio (PK/Total deaths)	
	(1)	(2)	(3)	(4)	(5)	(6)
Income (log)	−0.334*** (0.075)		−0.133*** (0.029)		−0.010 (0.031)	
Overcrowding	−0.099 (0.076)	0.076 (0.077)	−0.069** (0.028)	−0.077*** (0.030)	0.058 (0.038)	0.022 (0.039)
Favela	0.214*** (0.070)	0.403*** (0.073)	0.354*** (0.026)	0.354*** (0.027)	0.107*** (0.017)	0.089*** (0.017)
Population	1.184*** (0.121)	0.944*** (0.121)	0.391*** (0.053)	0.389*** (0.054)	0.006 (0.034)	0.025 (0.034)
Non White Pop. (%)	−0.049 (0.303)	−0.716** (0.311)	−0.060 (0.122)	−0.076 (0.131)	0.009 (0.107)	0.139 (0.121)
D1 (poorest)		0.689*** (0.199)		0.367*** (0.082)		−0.004 (0.112)
D2		0.668*** (0.191)		0.311*** (0.082)		−0.078 (0.113)
D3		1.103*** (0.181)		0.309*** (0.080)		−0.131 (0.106)
D4		1.689*** (0.183)		0.263*** (0.073)		−0.195* (0.102)
D5		2.139*** (0.164)		0.263*** (0.066)		−0.267*** (0.098)
D6		2.114*** (0.158)		0.167*** (0.055)		−0.242*** (0.093)
D7		1.544*** (0.123)		0.190*** (0.050)		−0.201** (0.093)
D8		0.825*** (0.093)		0.180*** (0.040)		−0.129 (0.087)
D9		0.247*** (0.058)		0.011 (0.023)		−0.020 (0.111)
Observations	10,158	10,158	10,158	10,158	5,728	5,728
<i>Note:</i>				*p<0.1; **p<0.05; ***p<0.01		

## Difference-in-Differences of our case studies

To round up our discussion of our case studies, we perform more systematic Difference-in-difference (DD) analyses among our pair comparisons. With clearly delimited pre-treatment and post-treatment periods, we can employ the traditional diff-in-diff formulae:

$$y_{it} = \beta_0 + \beta_1 T_2 + \beta_2 UPP \times T_2 + \lambda_i + \varepsilon_{it}$$

Where the outcome is either homicide rates or police killings.  $T_2$  is the post-treatment period for each case and UPP indicates if the favelas were assigned to treatment. The parameter of interest in this case is  $\beta_2$  which indicates the additional change for those favelas receiving UPP treatment after the UPP started. Notice that the UPP term is not included since our model controls for favela fixed effects. Similarly to our base models the standard errors are clustered at group of contiguous favelas level.

**Table 3A. Stratified Difference-in-differences estimates**

	(1) Hom.	(2) PK	(3) Hom.	(4) PK	(5) Hom.	(6) PK	(7) Hom.	(8) PK
Post (Cidade)	-0.596 (1.405)	0.293 (0.284)						
UPP x Post (Cidade)	0.329 (2.351)	-5.218* (1.999)						
Post (Complexo)			-3.011 (2.315)	-1.387 (0.942)				
UPP x Post (Complexo)			2.518 (2.147)	1.160 (1.219)				
Post (Rocinha)					-4.368 (3.458)	-1.849 (1.507)		
UPP x Post (Rocinha)					4.345 (3.899)	1.167 (1.659)		
Post (Zona Sur)							-2.844 (3.777)	0.700 (0.614)
UPP x Post (Zona Sur)							0.944 (1.847)	-2.420*** (0.603)
Observations	9288	9288	7992	7992	3780	3780	7128	7128

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

The unit of observation is the favela at a given month. Standard errors are clustered by favela complex, which were defined as favelas that share common boundaries. The dependent variables are the homicide rate (homicides by 100,000 people) and the police killings rate (by 100,000 people). For both cases the occurrences include the violent deaths inside the favela and within a 100 meters buffer area. Each panel estimates a Difference-in-differences model using the date of entrance of the first UPP in each stratified group. The stratified group uses all the favelas inside the police battalion 18. The Complexo group uses all the favelas inside the police battalions 16 and 22, excluding those favelas with UPP treatment but that are not part of Complexo Alemão. The Rocinha group uses the favelas inside the police battalions 23 and the subsampling of untreated favelas in battalion 22. The Zona Sur group subsamples police battalions 2, 19, 23 and 31.