

State Presence and Urban Violence:

Evidence from the Pacification of Rio's *Favelas**

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Abstract

Urban violence has increased dramatically in many countries in the developing world. This paper examines the effects of a large intervention aimed at regaining territory under the control of drug gangs in the city of Rio de Janeiro. We use the differential timing in the implementation of the Pacifying Police Units (UPPs) to assess how it affects crime and violence both inside and outside the Favelas. We find that the occupation and presence of the police decreased violent crime significantly.

JEL: D73, I21, H72

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1 Introduction

While violence has decreased in rich countries during the last two decades, it has increased dramatically in many developing countries. Urban violence is now one of the main challenges facing countries such as Brazil, Mexico, and Venezuela despite the significant reduction in poverty and inequality achieved during the last decade. Many cities in Latin America rank among the most violent regions in the world and the number of gun related deaths are comparable to the worst civil wars. High levels of violence creates large costs to society, especially for the urban poor who are disproportionately affected (WB 2011).

In most countries, high levels of violence are caused by non-state armed groups who control sizable parts of the territory. The existence of massive areas of slums, where the state has been absent for many years, allowed for the emergence of non-state armed groups who control drug-dealing and use violence to enforce contracts and maintain power. The problem is magnified by the fight between non-state armed groups for territory control and by the response of the police through high levels of violence towards the population.

What policies are effective in reducing violence in developing countries? Despite the widespread growth in urban violence across the developing world, there is little evidence on the effectiveness of policies that aim at controlling the actions of non-state armed groups.¹ Traditional policies that have been shown to be effective in rich countries such as increasing the police in the streets, might not work in countries with weak institutions where corruption is widespread.² Moreover, even if these policies succeed, they might generate negative spillovers to other regions (Dell 2012; Gonzales-Navarro 2012).

This paper examines the effects of an ambitious pacification policy implemented in the city of Rio de Janeiro aimed at regaining territory control of Favelas (slums), that have been under the control of armed groups for decades. We use a difference-in-differences strategy that exploit the differential phase-in of the police across the city to estimate the effects on crime and violence.

¹Large debate on the effects of police on crime (Levitt 2002; Di Tella and Schargrodasky 2004; Draca et al 2011; Chalfin and McCrary 2012)

²Banerjee et al 2012 for the case of India and Dell (2012) for Mexico.

2 Background

2.1 Favelas and Urban Violence

A Favela is a slum where households live in poor conditions and dense agglomerations with no formal property rights over their land. Historically, the Favelas of Rio accommodated the large number of migrants that arrived in the city during the 1960s and 1970s. Over time, they have expanded to become large areas of urban poverty concentration with the lack of basic infrastructure such as water, sanitation, and electricity. There are approximately 800 Favelas in the city of Rio and they occupy 17.9 squared miles with a population of 1.4 million or 23% of the city.

The state has been absent from the Favelas not only in terms of public service provision, but also in terms of the enforcement of the rule of law. Most Favelas do not even have basic services such as street names, garbage collection, or postal office delivery.³

Over time, the lack of state presence in those areas allowed for the emergence of local bosses that exercise political patronage and use coercion and violence to rule. Drug trade in the city of Rio de Janeiro is historically related to the favelas. In the early stages, drug trade consisted of marijuana trading in small scale. Violence increased dramatically in the mid-1980s as Brazil transitioned to democracy and Rio became a major exporting port of cocaine to Europe and the US (Leeds 1996). Cocaine increased drug-dealing profitability and allowed criminals to purchase heavy guns. Most Favelas were controlled by drug-dealers who impose their own rule of law.

In the early 1980s only one faction had the control of Favelas where they could distribute drugs and secure their territory with guns. New gangs were created following the death of important leaders of the Comando Vermelho (CV), which was the only criminal group operating in the city at the time. The Terceiro Comando (TC) and the Amigos dos Amigos (ADA) were formed in this period. Violence increased as the result of the more competitive drug market, the newly available guns and the large profits generated by dealing cocaine. Geographic conditions make favelas well suited for military defense which, in this scenario, turned them into perfect headquarters for the drug trade (Dowdney 2003). The homicide rate in the city of Rio almost tripled in a decade from 30 per 100,000 in the early 1980s to 80 per 100,000 in the mid 1990s.

³The *Instituto Brasileiro de Geografia e Estatística* (IBGE) defined *favelas* (slums) in the census of 1950 as a group of rustic shacks, that lack formal recognition by the state, with poor access to public services and located on unpaved streets.

Property crime spilled over into wealthier areas of the city. These types of crimes are forbidden in favelas (Dowdney 2003). This law is enforced by traffickers because they recognize the importance of gathering community support (Arias 2006). Additionally, because average income of favela residents is significantly lower than average income of individuals that live in other areas of the city. Hence, crimes against property in the areas surrounding favelas provided an opportunity to increase the income of the criminals operating in these communities (Misse 1997). As a result the situation of crime and violence in the city of Rio de Janeiro reached alarming levels during the late nineties. Between 1997 and 2000 more people died due to gun related violence in the city of Rio de Janeiro than in the conflicts in Uganda, Israel, Afghanistan and Sierra Leone (Dowdney 2003).

2.2 The Pacification of Favelas

Drug dealers have dominated sizable areas of the city of Rio de Janeiro since the 1980s. While crime and security is considered among the top priority for many citizens, it is the most challenging local policy issue. Thus, governors have cut deals with politicians and local leaders over time instead of directly fighting organized crime. In 2007 the governor Sergio Cabral was elected and chose Jos Mariano Beltrame as his secretary of security. He was an ex-federal police and hard liner from Rio Grande do Sul with no connections to local interests and corruption schemes.

In early 2007, the police, together with special forces, invaded the Favela do Alemo, one of the largest Favela complexes in Rio and the main redoubt of Comando Vermelho– Rio's largest drug cartel– after the killing of two policemen by drug dealers. In few months more than 43 persons were killed and 81 seriously injured in confrontations with the police. The operation lasted until the end of the Pan-American games that were held in Rio and was also developed to support the execution of a large infrastructure project financed by the federal government. Despite the long occupation and excessive use of violence by the police, no one was arrested and drug-dealing activities went back to normal after the police left.

In October 2007 Brazil was chosen to host the 2014 World Cup. Large public investments were needed to prepare the country to participate in the event. Several games and the final were scheduled to occur in Rio and both national and international authorities expressed concern with the situation of public security.⁴

⁴The Inspection Report prepared by the Federation International Football Association (FIFA) in 2007 clearly stated that “security is a concern”. In the same report Brazilian authorities promised to invest U\$ 3.3 billion between 2007 and 2012 in an effort to reduce crime. This report is available on line at the link http://pt.fifa.com/mm/document/affederation/mission/62/24/78/inspectionreport_e_24841.pdf.

One year later, a conflict between drug dealers of the Favela Santa Marta and the police in November 2008 resulted in the occupation of the area. This experience was deemed as relatively successful by the media, the local population and the government (Cano et al 2012). The positive results of the pilot project in Santa Marta and the need to take action, inspired the development of a new plan to fight crime in the City of Rio de Janeiro.

The innovative strategy called Unidades de Policia Pacificadora or Unities of Pacifying Police (UPP) was designed to regain territory control of the favelas. According to Piquet (2012), the pacification policy was based on four aims (1) the use of police coercion against the drug gangs; (2) increase in police activity to a level where it was no longer worth engaging in criminal activities; (3) the permanent presence of the police in pacified communities (4) support given by police officers for the introduction of local social policies.

The implementation followed several steps. First, the government would announce the occupation of Favelas in advance to allow drug dealers to leave the area and reduce civil casualties. As a consequence, there was very little conflict when police entered most Favelas which helped to gain the support of the population as a whole. Second, the government established a police unit with permanent police officers in the favela. Approximately 1 to 3 policeman were used per 100 persons. The policemen allocated to the UPPs were newly hired officers and the government trained them to interact with community and reduce possibilities of corruption. Finally, the policy was supposed to be complemented with new social services to communities (the so called social UPP).⁵

In October 2009, almost one year after the beginning of the Pacification policy, Rio de Janeiro was chosen to host the 2016 Olympic Games. The working group report of the International Olympic Committee, printed in 2008, clearly stated that “Crime in parts of Rio de Janeiro was considered to be an issue for the safety of people attending the Olympic Games”.⁶ This accelerated the implementation of the pacification police. From December 2008 to October 2012, 30 UPPs have been inaugurated benefiting approximately 600,000 individuals.

In Figure 1 we show four different measures of the phase-in of the pacification policy between 2008 and 2012. We use information of number of permanent police units that were inaugurated, number of police officers allocated to these units, total pacified area and total pacified population. As it can be seen from the Figure, there is a large increase between 2009 and 2010 irrespective of the measure considered. The UPPs were implemented in

⁵Law number 42787 from January 2011 states the main objectives of the program and the stages of implementation.

⁶The report is available on line at the link http://www.olympic.org/Documents/Reports/EN/en_report_1317.pdf

approximately 100 Favelas that were pacified between November 2008 and October 2012. In Figure 2 we show the geographic distribution of the UPPs. The Pacified Favelas are concentrated in the south and north part of the city in areas that are strategic to the international events based on the location of important roads, stadiums, and tourist centers (Cano et al 2012).

3 Empirical Strategy

We evaluate the effects of the Pacification using a Poisson regression model given the incident-based nature of the crime data at the police precinct level.⁷ Specifically we estimate the following model:

$$\log(c_{jt}) = \alpha_j + \beta_t + \lambda_j * t + \gamma P_{jt} + \log(pop_{jt})$$

where c_{jt} is the count of a crime episode in precinct j in month t , α_j is a police precinct fixed-effect, β_t is a month-year fixed-effect, and P_{jt} measures whether the police precinct j has been Pacified in month t . In some specifications we also add a police precinct specific time-trend $\lambda_j * t$ which controls for potential different trends in crime and violence before the pacification across police precincts. When estimating regressions at the Favela or neighborhood levels, we estimate similar regressions with a different number of cross-section units depending on data availability. In all specifications the poisson model is estimated with a constrained coefficient of one for the $\log(pop_{jt})$ which is equivalent to use the rate of the dependent variable (Osgood 2000). Moreover, in all estimated regressions standard errors are clustered at the police precinct level to account for the serial-correlation of the monthly crime data.

Our empirical strategy compares changes that occur in the number of crime episodes before and after a Favela is pacified. Our identification assumption is that Favelas that were pacified later serve as an appropriate counterfactual for Favelas that were pacified early on in the process. We use three alternative measures of Pacification. First, we use an indicator that equals one in the month that a favela is invaded and occupied by special police forces in the area of the police precinct.⁸ Because a police precinct can have more than one favela in the area, another alternative is to use a continuous treatment variable that would capture variation in the intensive margin. Thus as more Favelas located in a Police precinct are

⁷Some recent applications of count data models to crime and violence cdata include Card and Dhal; Dube; and Gonzalez-Navarro.

⁸All favelas are first occupied before the official installation of a pacification unit, which can take several months. We also estimated models where we use the installation of a pacification Unit instead of the invasion of the Favela.

pacified, this measure increases. We use two alternative measures: the percentage of the favela population pacified and the percentage of the favela area pacified.

Given our empirical strategy, there are three broad classes of factors that are likely to affect our ability to interpret causally the effects of the Pacification policy. First, Favelas were not chosen at random to be pacified. If the Favelas where drug dealers were losing power were pacified first, our estimates would overestimate the effects of the police occupations. Alternatively, if the pacification policy was targeted at favelas where violence was increasing the most, we would also have biased estimates of the pacification policy. In order to assess the trends in crime and violence prior to the pacification we plot average crime and violence over time for pacified and non-pacified police precincts in Figure 4. Moreover, we undertake an event-study analysis. We initially estimate regressions using quarter to quarter variation and plot the coefficients of the interaction of the pacified police precincts with quarters before and after the pacification. In Figure 5 we plot the coefficients with its respective confidence intervals. The top figures show that, on average, prior to the pacification there was not a clear trend with respect to violent crime and robberies, and both decrease significantly after the pacification. The bottom figures show no effects for non-violent types of crime, and a slight increase, although not statistically significant, for total number of thefts.

Our second concern is that the occupation of violent Favelas by the police will induce drug dealers to relocate. Dell (2013) shows that in Mexico, the crackdown on drug cartels generated considerable displacement effects. If these relocations take place within the city, violence is likely to increase in the control group police precincts and our estimates of the policy will be overestimated. Alternatively, if drug dealers decide to relocate outside the city, crime and violence might also decrease in control group locations and this general equilibrium effect is likely to affect our estimates. In order to deal with this we estimate two alternative models. First, instead of comparing pacified police precincts in Rio with non-pacified precincts within the city, we use police precincts located within the state but away from the city limits. Second, we estimate spillover effects to other police precincts within the city and to police precincts in border cities.

Finally, our third concern has to do with measurement error and potential manipulation of crime statistics. Because official crime statistics from the ISP only record crimes when the victims go to the police stations, crime might be significantly underreported. The exceptions are homicides, which are always recorded and car thefts which are recorded due to insurance policies. To deal with this issues we use an alternative dataset that collects crime complaints and tips based on a toll-free number called Disque Denuncia. This is similar to Crime

Stoppers in the US.

4 Data

Our empirical analysis combines several different data sources. First, we use official information from the Instituto de Seguranca Publica (ISP)– the statistical branch from the Rio e Janeiro Secretariat of Public Security. These are official data collected for crimes registered at police stations. The ISP provides us with two different datasources: we have monthly data desegregated by different categories of crime and violence for police precincts from january 2005 to October 2012. There are 142 police precincts in the state of Rio de Janeiro and 39 precincts within the city of Rio.⁹

The ISP also built a dataset at the level of Favelas within police precincts. They used the crime registries that include the address of crime events to retrospectively build a dataset of crime and violent events that occurred inside 18 pacified Favelas from January 2007 to December 2012. The addresses of crimes reported to police stations were used to assign crimes to each Favela. The crime categories are similar to the crime categories available at the police precinct level.

In order to account for different population size across police precincts and favelas, we matched census tracts to the location of the 136 police precincts using GIS and the shape files provided by the Brazilian Statistical Office (IBGE). We used census tracts information from the 2000 and the 2010 censuses and the total population for each year.¹⁰ We then estimated monthly population by interpolating the population from the 2000 and 2010 census using the IBGE interpolation approach as described with details in Appendix A. We used a similar procedure to calculate the population and the area for each Favela in 2000 and 2010 and performed a similar interpolation to generate monthly data.

The third dataset used is based on data collected from a non-profit organization called Disque Denuncia (Call and Denounce). It is a joint project created in 1995 by civil society organizations, representatives of the private sector and secretariat of security. It consists of 24 hour toll free number for anonymous information about criminal activity similar to Crime Stoppers in the US. The data includes monthly crime and violence reporting information

⁹Six police stations were opened during the period and were aggregated with the existing police stations responsible for their respective area prior to their existence. The resulting database consists of 136 police precincts across the state. A detailed list of the police stations that were aggregated is provided in Appendix B.

¹⁰In Appendix B we describe in detail how we matched the census tracts to the police precincts.

from January 2005 to December 2011.

We obtained a list of crime and violence statistics aggregated at the neighborhood level with 139 neighborhoods in the city of Rio de Janeiro. We then matched the neighborhoods to census tracts in order to determine the population living in each neighborhood. We calculated monthly population estimates using the procedure described above for police precincts based on the 2000 and 2010 censuses.¹¹

This database provided by Disque Denuncia has several advantages. First, it contains information on crime categories that are not available in the official crime records provided by the ISP. These categories allow us to better understand the changes in violence that are caused by the control of drug gangs. The denounces categorized include carrying and shooting guns illegally and conflicts between drug gangs. Second, Disque Denuncia has no incentive to manipulate crime statistics since it is not directly responsible for public safety. Third, because the complaints are anonymous, people might feel less threatened to complain about violence compared to official statistics where you actually have to go to a police station to denounce a crime or act of violence. The data, however, is not rich enough outside the city of Rio. Thus, it cannot be used for the analysis of spillover effects to other regions.

Table 1 reports summary statistics based on the 2010 census tracts located inside and outside favelas and across regions that were and were not pacified. The UPP census tracts are richer than the comparison group, specially outside the Favelas. Inside the Favelas, those located in UPP and non-UPP areas have similar characteristics.

5 Results

We begin by presenting estimates of the effects of police occupation on measures of crime and violence inside Favelas. We then use data for police precincts to estimate neighborhood level effects. Finally, we show the effects using the Disque Denuncia- Crime Stoppers measures.

5.1 Police Occupations and Crime Inside Favelas

Table 2 reports the Poisson regressions using monthly data for 18 Favelas. In Panel A we show the effects on measures of police activities. The police occupation is associated with large increases in arrests and drug seizures. The occupation of favelas increase arrests by 100 percent and drug seizures by close to 120 percent. Interestingly, there is a decline in

¹¹Appendix C describes the methodology used to match census tracts to the neighborhoods of the city of Rio de Janeiro.

gun seizures although this result is less precisely estimated when we include favela specific trends in column 6. This can be explained by the announcement of the police invasion and the potential flight of drug dealers to other locations carrying their guns. In Panel B we show the effects on aggregated measures of crime and violence. The police occupation is associated with a decline of 75 to 60 percent in violent crime (homicides and police killings) with no significant effect on non-violent crime and property crime (once we include Favela specific trends).

In Table 3 we further disaggregate the three measures into sub-components. We split different the categories into different types of homicides and property crimes in Panel A, and a series of crimes that are largely affected by reporting and trust on the police in Panel B. In columns (1)-(4), Panel A, we show that the reduction in violent crime inside Favelas is induced by a (marginally) significant reduction in homicides of approximately 40 percent and by a massive reduction in police killings by close to 150 percent. Reports of property crime inside the occupied Favelas increase significantly, but mainly reports related to theft (increase in 30 percent (column (8))). In Panel B we show that reports on larceny, threats, aggressions, and rape all increase significantly with the police occupation of Favelas. The magnitudes vary from a 30 percent increase in larceny (column (2) panel B) to close to 80 percent increase in reported rapes (column (8) panel B). Note that reports of the incidence of larceny also increase by approximately 30 percent (column (10)). Because there is no reason for the incidence of larceny to increase significantly with the police occupation and because the reported increase is similar in magnitude to reported theft, we believe these results are driven by households increasing their notification of crimes to the police once security increases with the presence of the state.

There are two alternative explanations for the increase in threats, aggressions, and rapes following the police occupation. First, drug dealers kept the control of crime and violence inside the Favelas through their own rule of law as argued by Dowdney (2003) and this control was lost when they left before the police occupations. While some increase in crime might occur due to this, it is more likely that citizens are now reporting to the police situations that were not reported before.¹²

¹²Soares (2004) show that official crime data tend to underreport crimes in poorer countries. Across countries, the incidence of assault and threat is more likely to be reported to the Police in richer countries than in poorer countries (Gibson and Kim 2008).

5.2 The effects of Pacification across Police Precincts

In Table 4 we show the results from estimating a Poisson model using police precinct data. The crime and violence measures include events reported to the police that occur both inside and outside the favelas. Panel A shows that drug seizures increase in police precincts that had a Favela pacified, while the effects on arrests are less precisely estimated. In Panel B, columns (1) and (2) show a significant reduction in violent crime of approximately 20 percent. Columns (3) and (4) show no significant reductions in property crime and non-violent crime.

In Table 5 we disaggregate the crime and violence statistics by type similar to the exercise that was done for the Favelas. In columns (1) to (4) we show that homicides across police precincts were reduced in approximately 12 percent when a Favela in the precinct was pacified. The effects on police killings, driven mainly by killings that occur inside the Favelas, decrease by approximately 60 percent. Finally, the occupation of Favelas also reduce robberies by 10 percent. Because the effects inside the Favelas of robberies were non-significant, these are robberies that occur in the police precinct, but outside the Favelas.

Different from the results that we observe inside the Favelas, there are no significant increases in reported theft or larceny once we use variation across police precincts. The results in columns (3) to (8), Panel B, show however a significant increase in other reported violent events such as threats, aggressions, and rape, but in magnitudes that are close to 10 to 15 percent. We believe these results are consistent with a small increase in other violent events with the Pacification policy and with a large increase in reporting inside the Favelas.

Up to now we have only estimated the effects with a dummy that equals one when the Favela was invaded and occupied by the police. But as we previously mentioned, several favelas might exist within police precincts and the share of favelas pacified and population affected might increase over time. In order to take the intensity of the treatment into account, we estimate a Poisson model following equation XXX, but we use the percentage of population resident of favelas that have been affected by the police occupation.

In Table 6 we present the crime and violence results with this alternative treatment variable. The results are qualitatively similar from those obtained with the police occupation indicator in Table 5. An increase in the share of favelas pacified (measured as the share of favela residents affected by the pacification within a police precinct) reduces violent crime significantly. All three measures of violent crime—homicides, police killings, and robberies—are significantly affected by the Pacification of Favelas. For instance, an increase in one standard deviation in the share of the favela population affected (0.28) decreases police killings by approximately 40 percent and robberies by close to 7 percent. Split homicides in

violent and robbery followed by homicides.¹³

In Panel B we show the results for other reported crimes such as larceny, threats, aggressions, and rape. Similar to the results shown in Table 5, we find a statistically significant increase in reported threats, aggressions, and rape as the share of the pacified population of favela residents increase. But again we believe that these results are driven in part by an increase in reporting that occurs as the population increase their trust in the police with the pacification policy.

5.3 Police Occupations and Crime using Toll-Free Calls Data

The previous results use official crime statistics collected by police stations. But the lack of trust on the police is widespread across Brazil due to its excess violence, corrupt practices, and low levels of crime resolution. Thus underreporting is a common practice. In this section we use an alternative measure of crime from the Disque Denuncia (crime stoppers), where individuals can call to give tips about crime and violence in an anonymous setting. As described in the data section, the information is more geographically disaggregated as it is available at the neighborhood level and not police precincts.¹⁴

We estimate Poisson regressions similar to the specification shown above. Because some variables have a large number of zero values and small number of counts, we also transform them into an indicator variable and estimate linear probability models with neighborhood and month fixed-effects.

Table 8 shows the results for measures of gun use and conflicts between drug gangs. Each count is a call to the Disque Denuncia that mentions people carrying and shooting guns (column 1) or conflict between drug gangs. The Poisson regressions show a significant reduction in both variables. After the pacification calls relating to people carrying and shooting guns decreases by approximately 33 percent and the incidence of drug gang wars is reduced by 13 percent. Because these variables have small counts and many zeros, we also transform them into a discrete indicator and in Panel B we estimate linear probability models. The pacification reduces the probabilities of people shooting guns and drug gang conflicts by 13 percentage points. In columns (3) and (4) we show the effects of the pacification on calls relating to drug dealing and the incidence of police corruption. There are no statistically significant effects on both measures, either in the count data model or in the linear probability

¹³Results are very similar if we use the percentage of the area of the pacified favela as a share of the total area of favelas in the police precinct.

¹⁴In many parts of the city one police precinct covers many neighborhood.

models. These results are consistent with the general perceptions and news reports that despite the reduction in guns and gun related conflicts in the Favelas, drug dealing still takes place in most locations.

In Table 9 we use measures of robberies, thefts and aggression from Disque Denuncia to evaluate the effects of the pacification on crime with alternative measures. Because these variables have less zeros we only show the Poisson regression results. Similar to the results show using police precinct data, we find a significant reduction in car and street robberies after the pacification (coefficients indicate effects of approximately 30 percent reductions). Differently from the official crime statistics, however, we find a significant increase in the robberies of residences. This result could be due to criminal substitution between drug dealing and other forms of crime with the police presence in the Favelas.

Finally, we also investigate the effects of the pacification on aggressions and domestic violence in columns (4) and (5). We find increases in calls related to aggressions and domestic violence of approximately 15 percent, although the effects on domestic violence are imprecisely estimated. These effects are similar in magnitude to the effects found using the police precinct data and again they could reflect both underlying changes that occurred with the pacification or simply changes with respect to police trust that affect the reporting of crimes.

5.4 Spillovers to other Regions

One of the main concerns of large crackdown policies is that criminals will move to other regions. In the case of the pacification in Rio, it is important to understand whether the pacification of favelas displaced drug dealers to other regions nearby the city. In this section we test this by comparing the changes in crime incidence in cities that are border with Rio with the incidence of crimes in the rest of the state. Because the pacification policy started in the end of 2008, we estimate a Poisson model where we only include police precincts outside the city of Rio and treat the precincts located in border municipalities as treated precincts and compare them with police precincts located in the rest of the state. We allow the treated indicator to vary over the years so we estimate different coefficients for 2009 until 2012.

These results are shown in Tables 10. We do not find any spillover effects to neighboring municipalities with respect to homicides. But we find significant increases in property crime as measured by total robberies and thefts. We also find significant increases in reported aggressions although no effects for Rape, as found inside the Favelas. These results are

consistent with drug dealers and criminals that left the Favelas looking for alternative sources of revenues and increasing property crimes in neighboring municipalities.

6 Conclusions

To be written

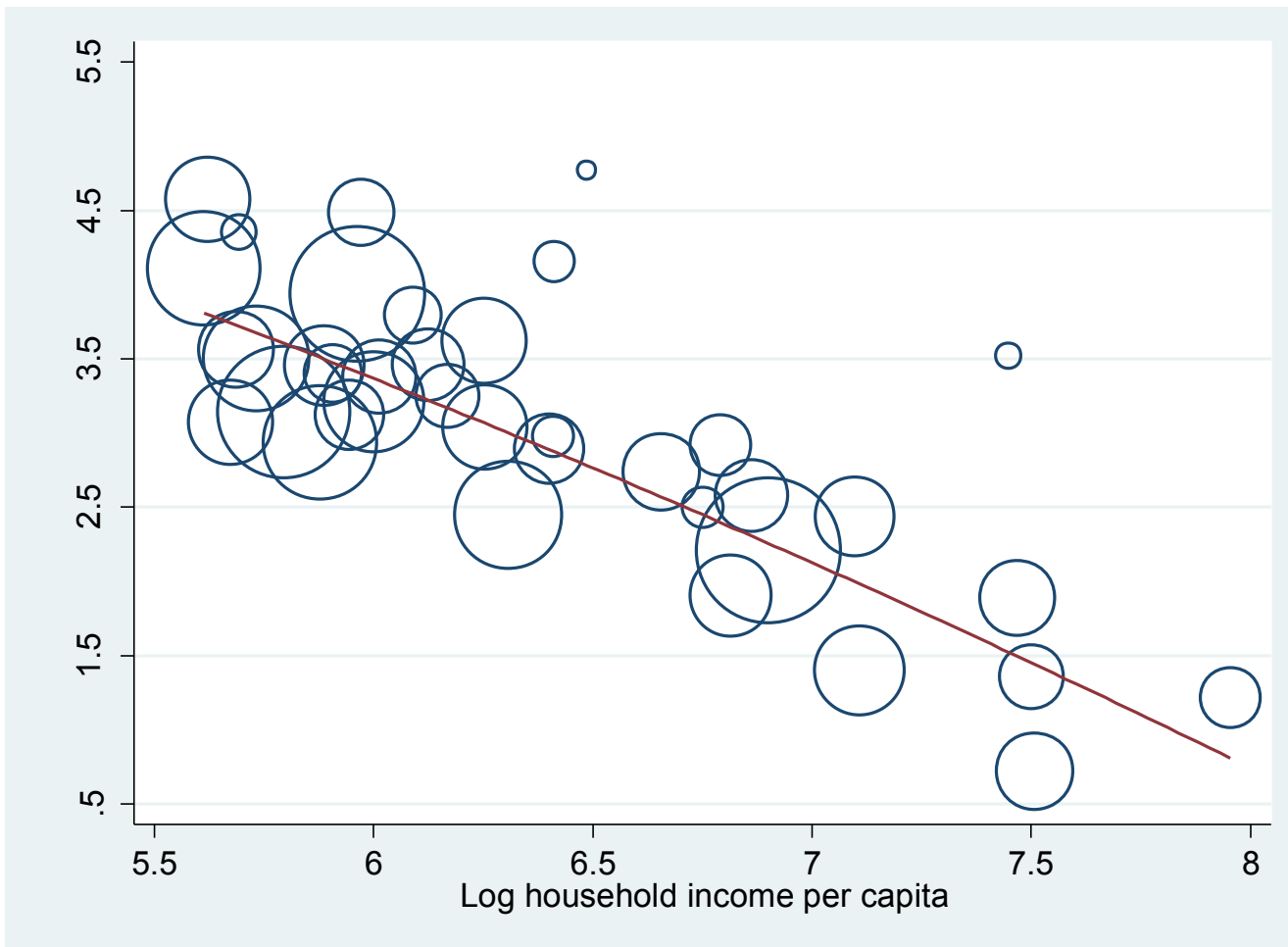


FIGURE 1: ASSOCIATION BETWEEN LOG HOMICIDE RATE AND LOG HOUSEHOLD INCOME PER CAPITA ACROSS NEIGHBORHOODS IN THE CITY OF RIO

Phase-in of Pacification Policy

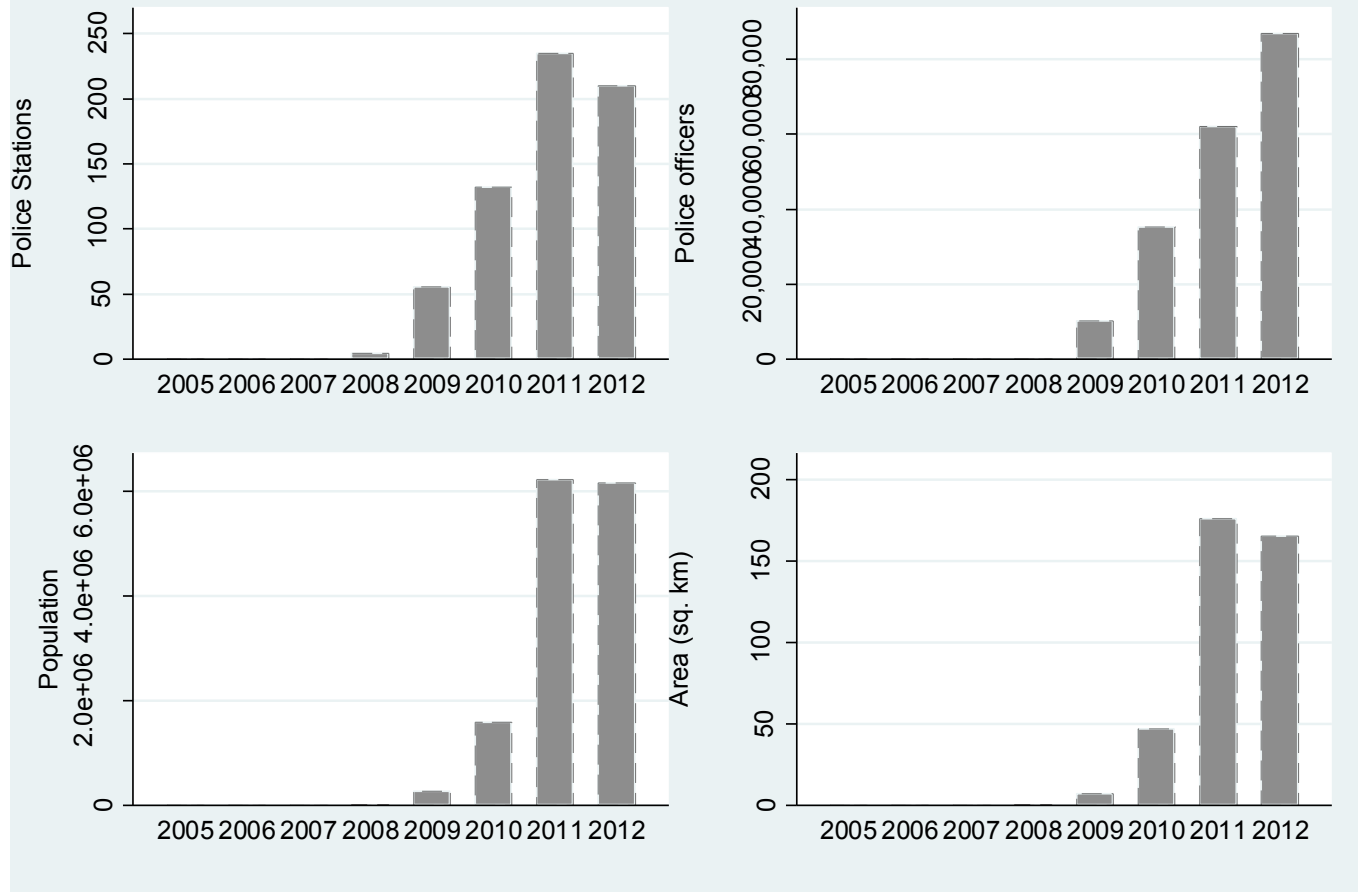


FIGURE 2: PHASE-IN OF THE PACIFICATION POLICY OVER TIME

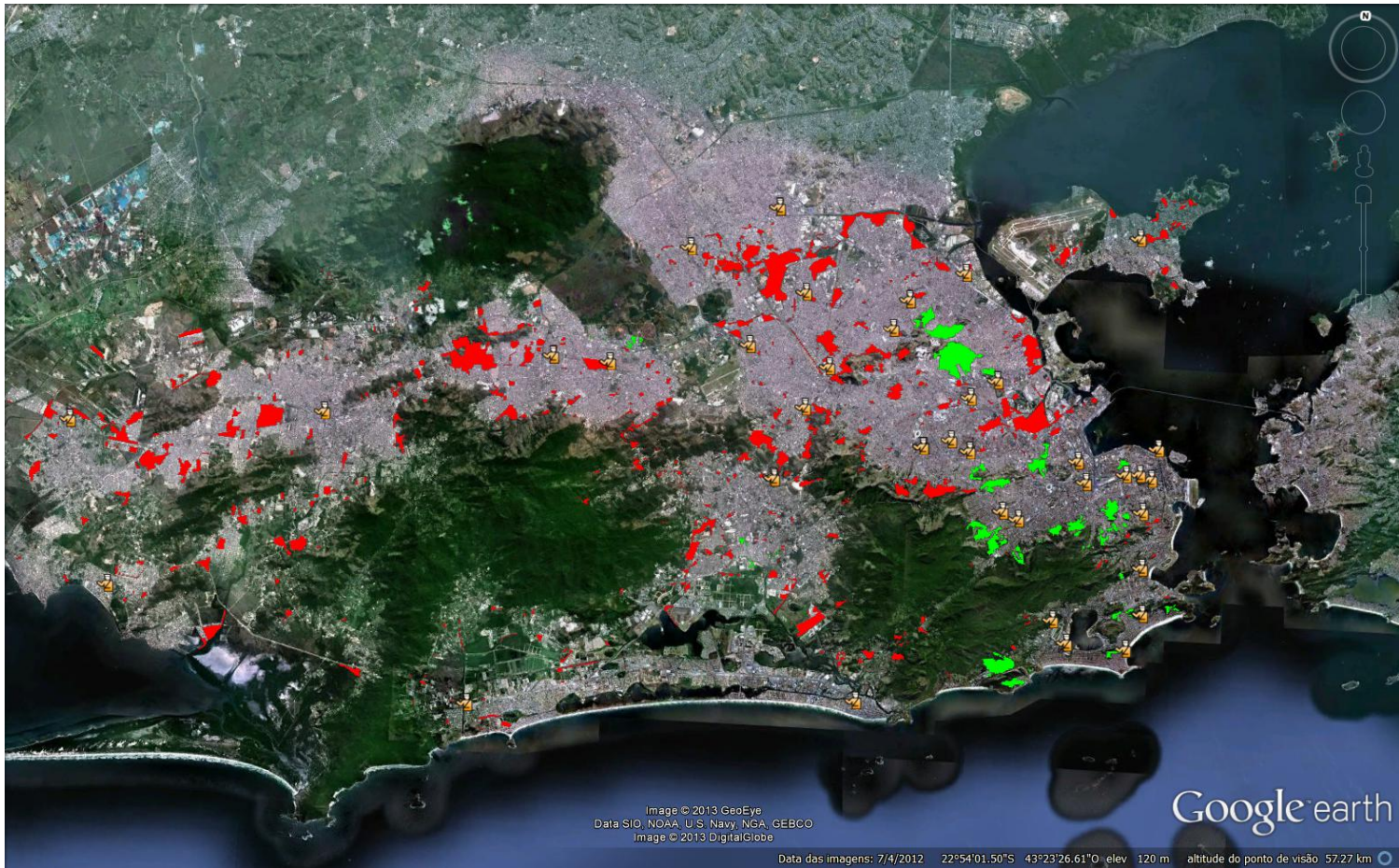


FIGURE 3: MAP OF PACIFIED COMMUNITIES. PACIFIED FAVELAS IN GREEN, NOT PACIFIED FAVELAS IN RED.

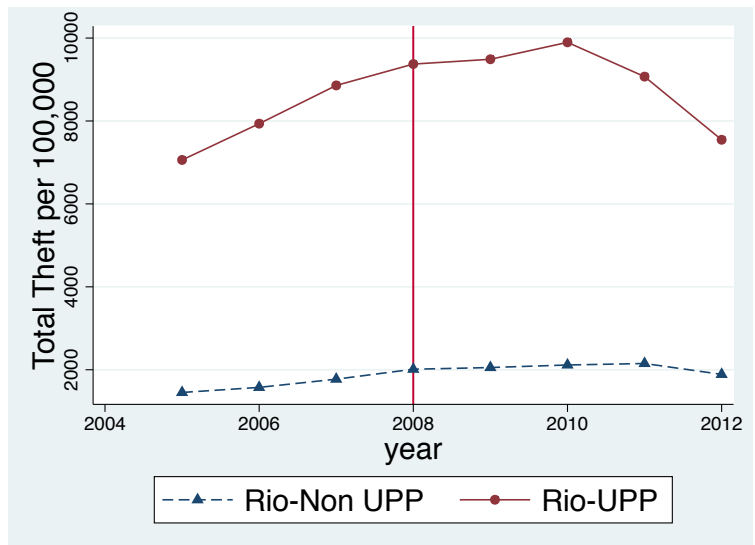
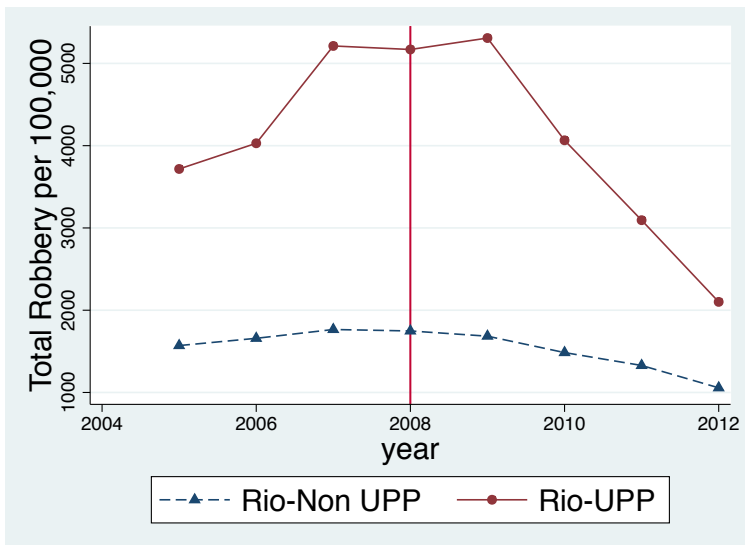
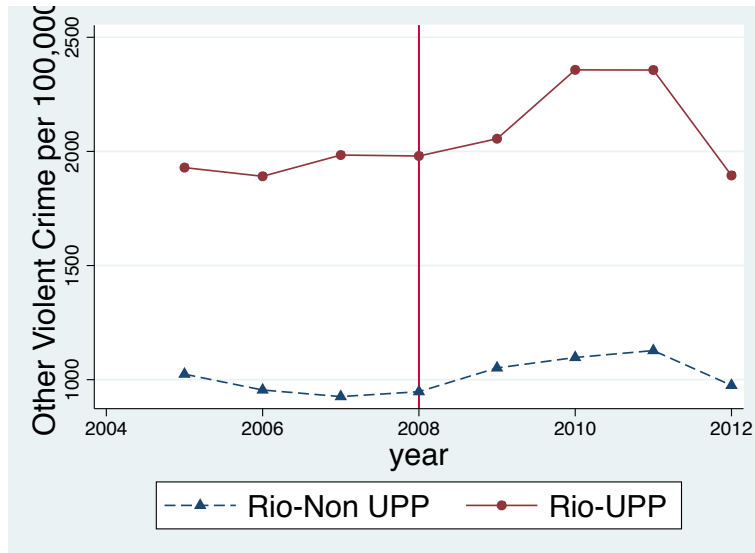
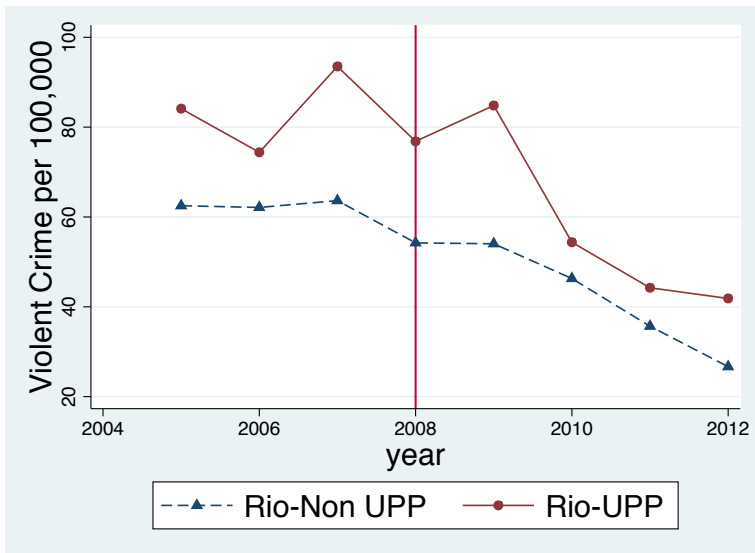


FIGURE 4: TRENDS IN CRIME IN PACIFIED AND NON-PACIFIED POLICE PRECINCTS

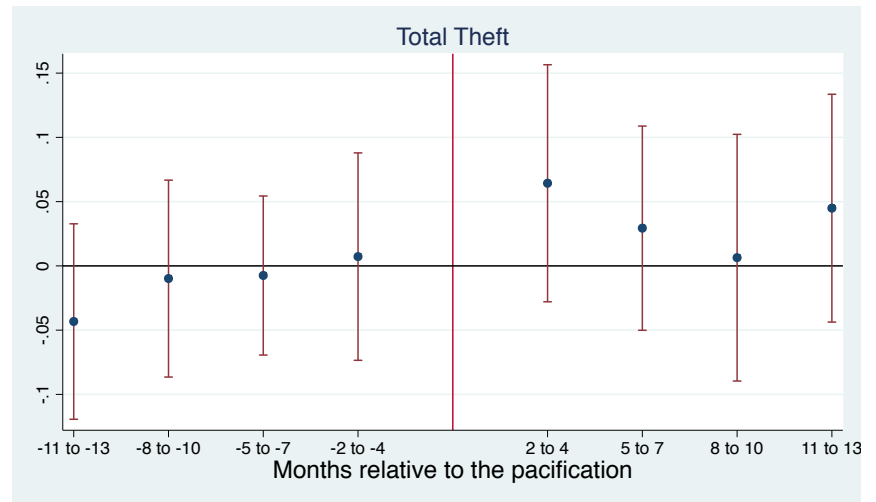
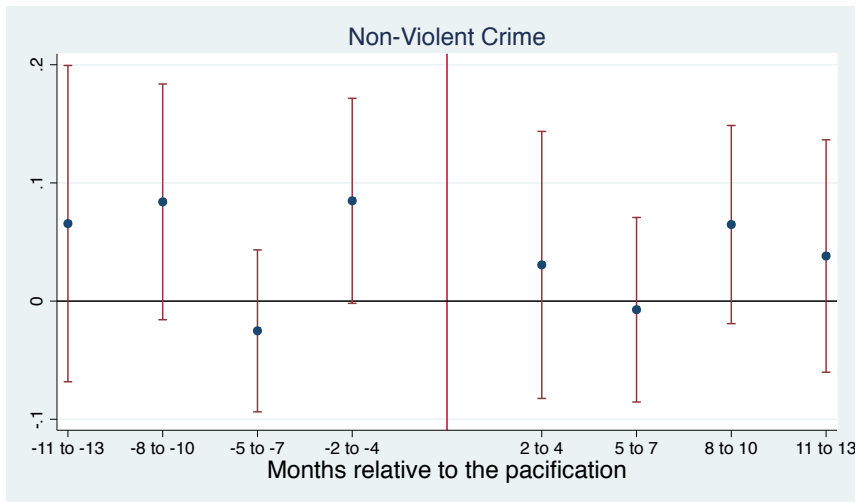
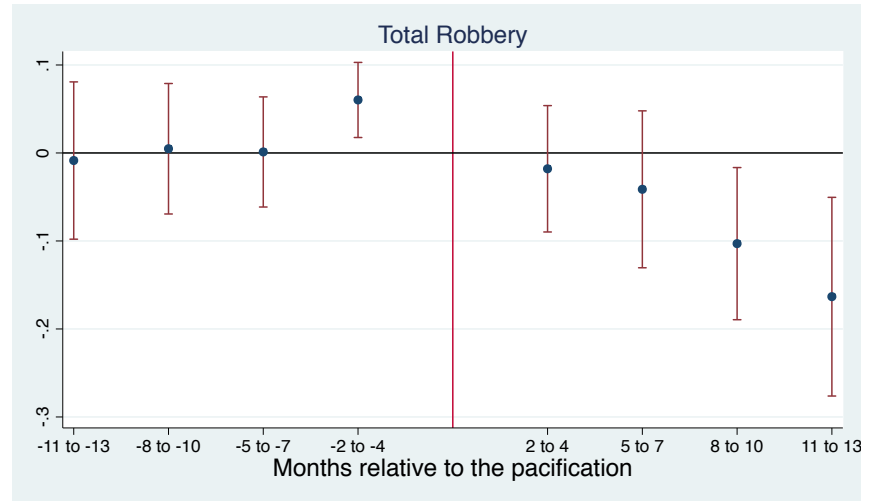
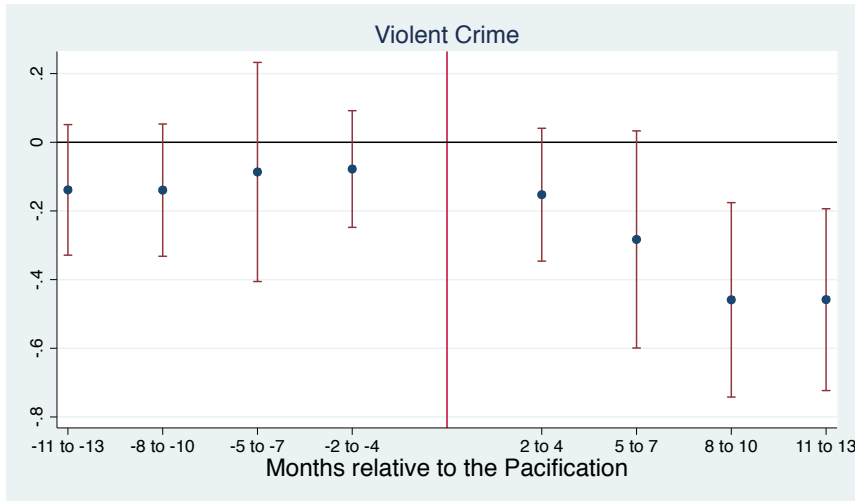


FIGURE 5: EVENT STUDY ANALYSIS AROUND THE PACIFICATION

Notes: The figures plot the coefficient of a Poisson regression interacting a pacification dummy with quarter dummies before and after the pacification. The regressions are run with data aggregated at the quarter level to reduce the month-to-month variation. All regressions include a police precinct fixed-effect and police precinct specific time trends.

TABLE 1: SUMMARY STATISTICS OF UPP VERSUS NON-UPP CHARACTERISTICS

	Favelas		Non-Favelas	
	No UPP	UPP	No UPP	UPP
% households literate	0.92 (0.00)	0.91 (0.00)	0.98 0.00	0.98 0.00
% black population	0.16 (0.00)	0.17 (0.00)	0.11 (0.00)	0.09 (0.00)
Size of household	3.31 (0.01)	3.31 (0.01)	2.98 (0.01)	2.79 (0.01)
% households street lights	0.34 (0.01)	0.19 (0.01)	0.94 (0.00)	0.97 (0.00)
% households paved roads	0.3 (0.01)	0.18 (0.01)	0.91 (0.00)	0.97 (0.00)
% households water	0.41 (0.02)	0.25 (0.01)	0.97 (0.00)	0.98 (0.00)
% households sanitation	0.34 (0.01)	0.22 (0.01)	0.88 (0.00)	0.94 (0.00)
Income per capita	449.25 (4.11)	464.29 (3.43)	1273.49 (18.02)	1858.89 (25.26)
Number of census tracts	1059	1160	4445	3531

Notes: This table reports descriptive statistics on the various characteristics of households living in Favelas versus Non-Favelas in UPP neighborhoods versus non-UPP neighborhoods. The mean reported is the mean across census tracts for each type of location.

TABLE 2: THE EFFECTS OF POLICE OCCUPATION ON POLICE ACTIONS, CRIME, AND VIOLENCE IN *FAVELAS*

	<u>Arrests</u>		<u>Drugs seizures</u>		<u>Guns seizures</u>	
	(1)	(2)	(3)	(4)	(5)	(6)
<u>Panel A. Police actions</u>						
Pacified	1.253 [0.134]***	1.096 [0.113]***	1.419 [0.163]***	1.269 [0.123]***	-0.674 [0.302]**	-0.463 [0.315]
Log pseudolikelihood	-1759	-1697	-2420	-2259	-1571	-1538
	<u>Violent crime</u>		<u>Property crime</u>		<u>Non-violent crime</u>	
<u>Panel B. Crime and violence</u>						
Pacified	-0.757 [0.242]***	-0.621 [0.225]***	0.106 [0.097]	0.1 [0.085]	0.218 [0.107]**	0.167 [0.104]
Log pseudolikelihood	-1037	-1016	-3168	-2938	-1826	-1791
Favela fixed-effects	Y	Y	Y	Y	Y	Y
Month fixed-effects	Y	Y	Y	Y	Y	Y
Favela trends	N	Y	N	Y	N	Y
Observations	1296	1296	1296	1296	1296	1296

Notes: This table reports the effects of police occupation of a *Favela* on measures of police actions, crime and violence. Panel A reports Police actions while Panel B report measures of crime and violence. Violent crime is the sum of homicides and police killings; Non-violent crime is the sum of Lacerny and Traffic crimes; Property crimes is the sum of robberies and thefts. Pacified is a dummy that equals 1 in the month the *Favela* was invaded and occupied by the police for the establishment of a Unidade de Policia Pacificadora (UPP). Each column presents the results of a count data Poisson regression where the dependent variable is listed at the top. All regressions control for population with a fixed coefficient of 1. The regressions are run for 18 *Favelas* that had a UPP established from 2008 to 2012 and the data includes 72 months, from January 2007 to December 2012. A *Favela* time-trend is a linear time trend specific for each *Favela*. Robust standard errors clustered at the *Favela* level are displayed in brackets. Significantly different than zero at 99 (***) , 95 (**), 90 (*) percent confidence.

TABLE 3: THE EFFECTS OF POLICE OCCUPATION ON DIFFERENT TYPES OF CRIME AND VIOLENCE IN *FAVELAS*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<u>Panel A. Violent and property crime</u>	<u>Homicides</u>		<u>Police killings</u>		<u>Robbery</u>		<u>Theft</u>	
Pacified	-0.488 [0.264]*	-0.402 [0.256]	-1.765 [0.297]***	-1.495 [0.454]***	-0.149 [0.116]	-0.12 [0.131]	0.337 [0.103]***	0.312 [0.076]***
<u>Panel B. Other types of crime</u>	<u>Larceny</u>		<u>Threats</u>		<u>Aggressions</u>		<u>Rape</u>	
Pacified	0.401 [0.193]**	0.351 [0.188]*	0.662 [0.097]***	0.71 [0.095]***	0.745 [0.092]***	0.721 [0.088]***	0.905 [0.190]***	0.824 [0.180]***
Favela fixed-effects	Y	Y	Y	Y	Y	Y	Y	Y
Month fixed-effects	Y	Y	Y	Y	Y	Y	Y	Y
Favela trends	N	Y	N	Y	N	Y	N	Y
Observations	1296	1296	1296	1296	1296	1296	1296	1296

Notes: This table reports the effects of police occupation of a *Favela* on different measures of crime and violence. Pacified is a dummy that equals 1 in the month the *Favela* was invaded and occupied by the police for the establishment of a Unidade de Polícia Pacificadora (UPP). Each column presents the results of a count data Poisson regression where the dependent variable is listed at the top. All regressions control for population with a fixed coefficient of 1. The regressions are run for 18 *Favelas* that had a UPP established from 2008 to 2012 and the data includes 72 months, from January 2007 to December 2012. A *Favela* time-trend is a linear time trend specific for each *Favela*. Robust standard errors clustered at the *Favela* level are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

TABLE 4: THE EFFECTS OF POLICE OCCUPATION ON POLICE ACTIONS, CRIME, AND VIOLENCE ACROSS POLICE PRECINCTS

	<u>Arrests</u>		<u>Drugs seizures</u>		<u>Guns seizures</u>	
	(1)	(2)	(3)	(4)	(5)	(6)
<u>Panel A. Police actions</u>						
Pacified	0.199 [0.139]	0.054 [0.104]	0.446 [0.163]***	0.499 [0.182]***	-0.128 [0.133]	-0.188 [0.179]
Log pseudolikelihood	-14861	-12514	-11104	-10070	-11453	-10969
	<u>Violent crime</u>		<u>Property crime</u>		<u>Non-violent crime</u>	
<u>Panel B. Crime and violence</u>						
Pacified	-0.288 [0.086]***	-0.221 [0.074]***	-0.048 [0.040]	-0.01 [0.028]	-0.015 [0.042]	-0.009 [0.031]
Log pseudolikelihood	-8654	-8525	-34579	-30467	-17310	-16625
Precinct fixed-effects	Y	Y	Y	Y	Y	Y
Month fixed-effects	Y	Y	Y	Y	Y	Y
Precinct trends	N	Y	N	Y	N	Y
Observations	3666	3666	3666	3666	3666	3666

Notes: This table reports the effects of police occupation of a *Favela* on measures of police actions, crime and violence at the Police Precinct level. Panel A reports Police actions while Panel B report measures of crime and violence. Violent crime is the sum of homicides and police killings; Non-violent crime is the sum of Larceny and Traffic crimes; Property crime is the sum of robberies and thefts. Pacified is a dummy that equals 1 in the month the *Favela* was invaded and occupied by the police for the establishment of a *Unidade de Polícia Pacificadora* (UPP). Each column presents the results of a count data Poisson regression where the dependent variable is listed at the top. All regressions control for population with a fixed coefficient of 1. The regressions are run for 39 police precincts in the city of Rio de Janeiro with monthly data from January 2005 to December 2012. Precinct trend is a linear time trend specific for each precinct. Robust standard errors clustered at the precinct level are displayed in brackets. Significantly different than zero at 99 (***) , 95 (**), 90 (*) percent confidence.

TABLE 5: THE EFFECTS OF POLICE OCCUPATION ON DIFFERENT TYPES OF CRIME AND VIOLENCE ACROSS POLICE PRECINCTS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<u>Panel A. Violent and property crime</u>	<u>Homicides</u>		<u>Police killings</u>		<u>Robbery</u>		<u>Theft</u>	
Pacified	-0.242 [0.076]***	-0.123 [0.069]*	-0.697 [0.234]***	-0.585 [0.208]***	-0.194 [0.061]***	-0.111 [0.049]**	0.007 [0.041]	0.046 [0.030]
Log pseudolikelihood	-7385	-7323	-4838	-4718	-25132	-22197	-26861	-24679
<u>Panel B. Other types of crime</u>	<u>Larceny</u>		<u>Threats</u>		<u>Aggressions</u>		<u>Rape</u>	
Pacified	-0.021 [0.080]	-0.007 [0.060]	0.138 [0.055]**	0.181 [0.067]***	0.155 [0.052]***	0.166 [0.059]***	0.176 [0.068]**	0.128 [0.064]**
Log pseudolikelihood	-13071	-12405	-15580	-14723	-16749	-15820	-5151	-5104
Favela fixed-effects	Y	Y	Y	Y	Y	Y	Y	Y
Month fixed-effects	Y	Y	Y	Y	Y	Y	Y	Y
Favela trends	N	Y	N	Y	N	Y	N	Y
Observations	3666	3666	3666	3666	3666	3666	3666	3666

Notes: This table reports the effects of police occupation of a *Favela* on measures of police actions, crime, and violence at the Police Precinct level. Panel A reports Police actions while Panel B report measures of crime and violence. Violent crime is the sum of homicides and police killings; Non-violent crime is the sum of Larceny and Traffic crimes; Property crime is the sum of robberies and thefts. Pacified is a dummy that equals 1 in the month the *Favela* was invaded and occupied by the police for the establishment of a *Unidade de Polícia Pacificadora* (UPP). Each column presents the results of a count data Poisson regression where the dependent variable is listed at the top. All regressions control for population with a fixed coefficient of 1. The regressions are run for 39 police precincts in the city of Rio de Janeiro with monthly data from January 2005 to December 2012. Precinct trend is a linear time trend specific for each precinct. Robust standard errors clustered at the precinct level are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

TABLE 6: THE EFFECTS OF POLICE OCCUPATION ON DIFFERENT TYPES OF HOMICIDES AND ROBBERY

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Homicide robbery	Homicide non-robbery	Street robbery	Car robbery	Car theft	Robbery commercial establishments	Robbery residences
- Pacified	-0.49 [0.290]*	-0.105 [0.074]	-0.075 [0.046]	-0.343 [0.112]***	0.115 [0.068]*	-0.14 [0.085]*	0.151 [0.131]
Log pseudolikelihood	-1601	-7164	-17343	-14766	-12253	-8320	-4685
Precinct fixed-effects	Y	Y	Y	Y	Y	Y	Y
Month fixed-effects	Y	Y	Y	Y	Y	Y	Y
Precinct trends	N	Y	N	Y	N	Y	N
Observations	3666	3666	3666	3666	3666	3666	3666

Notes: This table reports the effects of police occupation of a *Favela* on measures of police actions, crime, and violence at the Police Precinct level. Pacified is a dummy that equals 1 in the month the *Favela* was invaded and occupied by the police for the establishment of a *Unidade de Polícia Pacificadora* (UPP). Each column presents the results of a count data Poisson regression where the dependent variable is listed at the top. All regressions control for population with a fixed coefficient of 1. The regressions are run for 39 police precincts in the city of Rio de Janeiro with monthly data from January 2005 to December 2012. Precinct trend is a linear time trend specific for each precinct. Robust standard errors clustered at the precinct level are displayed in brackets. Significantly different than zero at 99 (***) , 95 (**), 90 (*) percent confidence.

TABLE 7: THE EFFECTS OF POLICE OCCUPATION ON DIFFERENT TYPES OF CRIME CONTINUOUS TREATMENT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<u>Panel A. Violent and property crime</u>	<u>Homicides</u>		<u>Police killings</u>		<u>Robbery</u>		<u>Theft</u>	
% Favela's population pacified	-0.445 [0.103]***	-0.242 [0.163]	-1.531 [0.256]***	-1.436 [0.377]***	-0.336 [0.088]***	-0.272 [0.077]***	-0.035 [0.051]	0.05 [0.044]
Log pseudolikelihood	-7382	-7322	-4815	-4704	-24830	-22031	-26842	-24688
<u>Panel B. Other types of crime</u>	<u>Larceny</u>		<u>Threats</u>		<u>Aggressions</u>		<u>Rape</u>	
% Favela's population pacified	-0.045 [0.108]	0.016 [0.102]	0.125 [0.079]	0.4 [0.100]***	0.165 [0.087]*	0.343 [0.095]***	0.118 [0.103]	0.222 [0.121]*
Log pseudolikelihood	-13067	-12405	-15656	-14636	-16836	-15749	-5156	-5104
SD % population pacified	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Favela fixed-effects	Y	Y	Y	Y	Y	Y	Y	Y
Month fixed-effects	Y	Y	Y	Y	Y	Y	Y	Y
Favela trends	N	Y	N	Y	N	Y	N	Y
Observations	3666	3666	3666	3666	3666	3666	3666	3666

Notes: This table reports the effects of police occupation of a *Favela* on measures of police actions, crime, and violence at the Police Precinct level. Panel A reports Police actions while Panel B report measures of crime and violence. Violent crime is the sum of homicides and police killings; Non-violent crime is the sum of Larceny and Traffic crimes; Property crime is the sum of robberies and thefts. % Favela population pacified is the total population of favela pacified in a given police precinct divided by the total population that resides in a favela in that precinct. in the month the *Favela* was invaded and occupied by the police for the establishment of a *Unidade de Policia Pacificadora* (UPP). Each column presents the results of a count data Poisson regression where the dependent variable is listed at the top. All regressions control for population with a fixed coefficient of 1. The regressions are run for 39 police precincts in the city of Rio de Janeiro with monthly data from January 2005 to December 2012. Precinct trend is a linear time trend specific for each precinct. Robust standard errors clustered at the precinct level are displayed in brackets. Significantly different than zero at 99 (***) , 95 (**), 90 (*) percent confidence.

TABLE 8: THE EFFECTS OF PACIFICATION USING DISQUE DENUNCIA (CRIME STOPPERS) DATA

	Illegal use of guns	Shootings between gangs	Drug dealing	Police corruption
	(1)	(2)	(3)	(4)
<u>Panel A. Poisson</u>				
Pacified	-0.33 [0.113]***	-0.137 [0.033]***	-0.017 [0.012]	0.017 [0.033]
Log pseudolikelihood	-5860	-2578	888	-5768
<u>Panel B. Linear probability</u>				
Pacified	-0.127 [0.041]**	-0.125 [0.035]***	-0.018 [0.000]	0.055 [0.000]
Mean dep var				
Favela fixed-effects	Y	Y	Y	Y
Month fixed-effects	Y	Y	Y	Y
Favela trends	Y	Y	Y	Y
Observations	11,676	11,676	11,676	11,676

Notes: This table reports the effects of police occupation of a *Favela* on measures of crime reported to the Toll-Free number Disque Denuncia. Pacified is a dummy that equals 1 in the month the *Favela* was invaded and occupied by the police for the establishment of a *Unidade de Polícia Pacificadora* (UPP). In Panel A Each column presents the results of a count data Poisson regression where the dependent variable is listed at the top. All regressions control for population with a fixed coefficient of 1. In Panel B the coefficients reported are from a linear probability model with neighborhood and time fixed-effects. The regressions are run in the city of Rio de Janeiro with monthly data from January 2005 to December 2012. Neighborhood trend is a linear time trend specific for each precinct. Robust standard errors clustered at the precinct level are displayed in brackets. Significantly different than zero at 99 (***) , 95 (**), 90 (*) percent confidence.

TABLE 9: THE EFFECTS OF PACIFICATION USING DISQUE DENUNCIA (CRIME STOPPERS) DATA

	Car robbery	Street robbery	Robbery residence	Aggression	Domestic violence
	(1)	(2)	(3)	(4)	(5)
<u>Panel A. Poisson</u>					
Pacified	-0.26 [0.100]***	-0.319 [0.105]***	0.404 [0.197]**	0.158 [0.077]**	0.158 [0.128]
Log pseudolikelihood	-14290	-14034	-7206	-9997	-13275
<hr/>					
Mean dep var					
Favela fixed-effects	Y	Y	Y	Y	Y
Month fixed-effects	Y	Y	Y	Y	Y
Favela trends	Y	Y	Y	Y	Y
Observations	11,676	11,676	11,676	11,676	11,676

Notes: This table reports the effects of police occupation of a *Favela* on measures of crime reported to the Toll-Free number Disque Denuncia. Pacified is a dummy that equals 1 in the month the *Favela* was invaded and occupied by the police for the establishment of a *Unidade de Policia Pacificadora* (UPP). In Panel A Each column presents the results of a count data Poisson regression where the dependent variable is listed at the top. All regressions control for population with a fixed coefficient of 1. In Panel B the coefficients reported are from a linear probability model with neighborhood and time fixed-effects. The regressions are run in the city of Rio de Janeiro with monthly data from January 2005 to December 2012. Neighborhood trend is a linear time trend specific for each precinct. Robust standard errors clustered at the precinct level are displayed in brackets. Significantly different than zero at 99 (***) , 95 (**), 90 (*) percent confidence.

TABLE 10: SPILLOVER EFFECTS OF THE PACIFICATION IN NEIGHBORING MUNICIPALITIES

	Homicides	Police killings	Robbery	Theft	Larceny	Threats	Aggressions	Rape
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pacified*2009	0.086 [0.079]	0.116 [0.207]	0.078 [0.045]*	0.118 [0.037]***	0.147 [0.080]*	0.063 [0.041]	0.100 [0.032]***	-0.103 [0.096]
Pacified*2010	0.083 [0.082]	0.322 [0.217]	0.113 [0.054]**	0.183 [0.044]***	0.112 [0.077]	0.006 [0.058]	0.090 [0.049]*	0.083 [0.112]
Pacified*2011	0.072 [0.078]	-0.131 [0.304]	0.238 [0.064]***	0.219 [0.053]***	0.128 [0.078]*	0.076 [0.057]	0.174 [0.051]***	0.024 [0.116]
Pacified*2012	-0.047 [0.086]	0.051 [0.327]	0.328 [0.064]***	0.222 [0.064]***	0.160 [0.108]	0.062 [0.063]	0.163 [0.060]***	0.159 [0.117]
Log pseudolikelihood	-12969	-3633	-26241	-35918	-19728	-32904	-32904	-11570
Favela fixed-effects	Y	Y	Y	Y	Y	Y	Y	Y
Month fixed-effects	Y	Y	Y	Y	Y	Y	Y	Y
Favela trends	N	N	N	Y	Y	Y	Y	Y
Observations	8554	8554	8554	8554	8554	8554	8554	8554

Notes: This table reports the effects of police occupation of a *Favela* on measures of police actions, crime, and violence at the Police Precinct level. Pacified is a dummy that equals 1 in the month the *Favela* was invaded and occupied by the police for the establishment of a *Unidade de Policia Pacificadora* (UPP). Each column presents the results of a count data Poisson regression where the dependent variable is listed at the top. All regressions control for population with a fixed coefficient of 1. The regressions are run for 39 police precincts in the city of Rio de Janeiro with monthly data from January 2005 to December 2012. Precinct trend is a linear time trend specific for each precinct. Robust standard errors clustered at the precinct level are displayed in brackets. Significantly different than zero at 99 (***) , 95 (**), 90 (*) percent confidence.