Do Police Displace Crime? The Effect of the Favela Pacification Program in Rio de Janeiro

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Abstract

An important however understudied challenge in the crime literature is to isolate the causal effect of police presence on crime displacement. Following the announcements of Brazil as the host of the 2014 FIFA World Cup and of the city of Rio de Janeiro as the host of the 2016 Summer Olympic Games, the Government of Rio de Janeiro launched the Favela Pacification Program. The program consists in the expulsion of criminals from some favelas (pacified favelas), territories usually controlled by gangs. Using data on homicide rates across Rio de Janeiro before and after the starting date of the Favela Pacification Program, I find that it displaces crime from pacified to non-pacified favelas.

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Previous literature finds a causal negative effect of police presence on crime there where police presence exogenously increases.[1] A crucial point to assess the effect of police presence on crime is to which extent crime displacement may take place. Little attention has been paid in the economics literature to this topic with only a few works assessing the issue. Mirko Draca, Stephen Machin and Robert Witt (2010) do not find evidence of crime displacement using the allocation of police forces after the terrorist attacks in London in July 2005 and Rafael Di Tella and Ernesto Schargrodsky (2004) do not find evidence of crime displacement either, using the allocation of police forces after a terrorist attack in Buenos Aires in July 1994.[2] This literature exploits the distance from the place where police presence exogenously increases as the relevant dimension to define treatment and control groups in order to assess the effect of police deployment on crime displacement.

In this work I exploit the organized crime structure of crime in Rio de Janeiro to define the treatment and the control group. Crime in Rio de Janeiro is dominated by a few gangs spread all over the city that use favelas -slums located over the hills within the city- as headquarters from where they can control criminal activity. When a favela is pacified and criminals are expelled, gang members have an incentive to relocate somewhere else. As they belong to a gang, they will not take away rents from criminal activity in territories dominated by their own criminal organization. However, they may try to recover lost rents in territories dominated by rival gangs. Thus, in order to evaluate crime displacement after a favela pacification, territories dominated by the same gang that used to control the pacified favela compose the control group whereas territories dominated by rival gangs compose the treatment group. Pacified territories, as they do not belong to any gang, are not part of either the control or the treatment group.

The Favela Pacification Program was launched by the Government of Rio de Janeiro after the announcement of Brazil as the country to host the 2014 FIFA World Cup and Rio de Janeiro as the city to host the 2016 Summer Olympic Games. Rio de Janeiro was announced as a host city of the FIFA World Cup on 17 August 2007 and elected by the International Olympic Committee on 2 October 2009. The program consists in the expulsion of criminals from some favelas and is intended to recover for the State territories under gang control. To pacify a territory the State conducts a pacification operation, which is the deployment of police forces and the expulsion of criminals from the territory. Afterwards,

[1] Mirko Draca, Stephen Machin and Robert Witt (2011), Machin and Olivier Marie (2009), Jonathan Klick and Alexander Tabarol (2005), Rafael Di Tella and Ernesto Schargrodsky (2004) and Steven Levitt (1997), among others. Justin McCrary (2002) points out some concerns with the Levitt (1997) paper (see also Levitt's 2002 reply). Earlier works find mixed results but do not address the endogeneity problem, i.e. that police forces are allocated to areas with higher crime rates. An extensive discussion on this topic can be found in Di Tella and Schargrodsky (2004).

[2] Brian Jacob, Lars Legfren and Enrico Moretti (2007) do find an *intertemporal* crime displacement effect using weather shocks as exogenous sources of variation. Cody Telep, David Weisburd, Charlotte Gill, Zoe Vitter and Doron Teichman (2014) provide a review of crime displacement evaluations in the criminology literature.

a Pacifying Police Unit with jurisdiction over the pacified territory is installed to prevent criminals from returning to the territory. Up to now the Favela Pacification Program has pacified thirty-eight territories.

In Rio de Janeiro 1,764 persons were murdered in 2010, a homicide rate of 27.9 per 100,000 inhabitants. In the same year the homicide rate in Mexico, in the middle of a bloody war against drug traffickers, was 18.1 per 100,000 inhabitants. Dispute among gangs to gain control over territories from where they can organize criminal activity and hide from police are the main reason why such a high homicide rate is prevalent in Rio de Janeiro. Two kinds of criminal organizations are found in the city: three gangs composed by regular criminals and many militias composed mostly by police officers and military personnel, active or retired. The three gangs composed by regular criminals are Comando Vermelho (CV), Portuguese for Red Command, Amigos dos Amigos (AA), Portuguese for Friends of Friends and Terceiro Comando Puro (TCP), Portuguese for Pure Third Command. CV was formed in a prison in 1979, TCP was formed during the 80's and is the result of a split from CV as AA, formed in 1998, is as well. These criminal organizations use favelas as their headquarters. Two features of favelas make them particularly attractive for criminals. First, the lack of state presence makes favelas a good place to hide. Second, their location, nearby wealthier neighborhoods, makes them an ideal location from where criminals can organize and execute criminal activities, specially drug trafficking and crimes against property.

Militias were supposed to be a response to protect favela residents from gangs formed by regular criminals. The first militia in Rio de Janeiro, in Favela Rio das Pedras, began its activities in the early 80's. Each militia is composed mainly by police officers and military personnel, active or retired, living in the favela. In June 2008 the Lesgislative Assembly of Rio de Janeiro asked Rio de Janeiro's deputy Marcelo Freixo to elaborate a report detailing militia activities. Freixo presented a 282-pages report on 14 November 2008 indicating that different militias controlled at least 170 territories in the city, and that approximately 10-percent of Rio de Janeiro police officers belong to a militia. In the report is clear that militias represent as much a threat for the population as CV, AA or TCP represent and that militias engage in the same kind of criminal activities: drug trafficking and crimes against property.

Figure 1 depicts the thirty-eight Pacifying Police Units jurisdictions and the criminal organization which used to control the territory before the pacification is indicated.

Insert Figure 1

Table 1 contains information on the thirty-eight territories pacified by the Favela Pacification Program. Most of the territories, thirty-two out of thirty-eight, were controlled by CV until the pacification date.

Table 1

As Table 1 shows, five territories were under AA control and one was controlled by a militia. No territory under TCP control has been pacified. Batan, the territory controlled by a militia, was the first to be pacified and the second to be pacified was Cidade de Deus, which pacification started on 11 November 2008 with violent clashes between the police and CV. After Cidade de Deus the territories pacified were, in chronologigal order, Santa Marta, Babilonia, Pavao, Tabajaras, Providencia, Borel, Formiga, Andarai, Salgueiro and Turano, which was pacified on 10 August 2010. Each one of these territories were under CV control. On 14 October 2014 the first territory that was under AA control, Macacos, is pacified. Other twenty-one CV and four AA territories were pacified until the last pacification operation, conducted in March 2014.

The treatment evaluated in this work is the incentive that CV has, due to the Favela Pacification Program, to displace criminal activities to AA territories during the period that runs from the Cidade de Deus pacification, the first pacification conducted in a CV territory, to the Macacos pacification, the first pacification conducted in an AA territory. The control group is composed by territories dominated by CV and the treatment group is composed by territories dominated by AA. Pacified territories do not belong to any gang and therefore do not compose either the control or the treatment group. The ending date of the treatment takes into account that once an AA territory is pacified, CV territories cannot be considered a control group anymore because are receiving a treatment as well. Two points related to the militia territory, Batan, are worth mentioning. First, to avoid heterogeneity in unobservables the militia territory is not considered part of the treatment group because crime reporting rates in a militia territory, given that militias are composed to a large extent by police officers, may substantially differ from crime reporting rates in territories dominated by regular criminals. In any case, the results presented in this work are robust to the inclussion of the militia territory in the control group. Second, the Batan pacification, the first one conducted, biases the effect of the Favela Pacification Program on crime displacement found in this work as long as militia members are more prone to displace criminal activities to either CV or AA territories. After controlling for fixed effects at the territory level, there is no reason to believe this is the case. Militias and gangs composed by regular criminals do not cooperate with each other.[3]

In this work the aim is to evaluate the effect of the Favela Pacification Program on crime displacement to AA territories. A methodological issue that the empirical method must address is that the allocation of gangs across the city is potentially endogenous in a crime regression. The difficulty to enter the territory or the economic condition of its surrounding areas may be affecting its crime rates and also which gang is controlling the territory. CV and AA certainly take into account these kind of territories characteristics when looking for new headquarters because they are directly related to the economic extraction that gangs can gain from the territory. To control for this potential endogeneity

[3]During the 90's AA and TCP cooperated in order to fight against CV. This is the only well-known cooperation between gangs that has occurred in Rio de Janeiro.

of the allocation of gangs across the city I employ a difference-in-differences strategy that allows to control for fixed effects at the territory level. The kind of variable that generates the possible endogeneity of the allocation of gangs in a crime regression, as the relative economic condition of the territory and its surroundings or the territory's surface conditions, are constant across time and thus the endogeneity of the allocation of gangs can be broken down controlling for fixed effects at the territory level.

Another methodological concern is that the difference-in-differences estimate may be capturing not the effect of the Favela Pacification Program, but other simultaneous security measures. In particular, if police forces put more emphasis on (non-pacified) CV territories than in AA territories crime displacement may be due to not only the Favela Pacification Program. If this were the case police should be more active in territories controlled by CV than in territories controlled by AA. This possibility is evaluated using data on police activity at the territory level, and no differences in police activity across territories is found.

The data best suited to assess crime displacement in Rio de Janeiro is the homicide rate. To set up a new headquarter in a territory dominated by AA, CV must necessarily fight for the control over the territory. As both CV and AA are heavily-armed organizations, clashes among these gangs produce a relevant number of homicides. This is the reason why the homicide rate is the best measure to assess crime displacement. It is worth noting that a displacement of criminals from pacified favelas to AA territories is not necessarily captured by property crime data. CV criminals can trigger a battle with AA, set up a new CV headquarter in the territory and the property crime could be unaffected by these events. If CV and AA have the same behavior regarding property crime, the replacement of criminals would not affect the property crime rate. However, crime displacement still takes place. I use data on property crime to evaluate if the displacement of CV criminals to AA territories lead to a change in property crime rates in AA territories. As a falsification test, I also use data on sexual assaults. The nature of this crime indicates that the Favela Pacification Program should not have an effect on it.

The results found in this work indicate that the Favela Pacification Program had a positive, significant and non-negligible in magnitude effect on homicide rates in AA territories. This is taken as evidence that CV gang members expelled from pacified territories tried to relocate their criminal activities in AA territories. The results also show that at least one type of property crime -fraud- increased in AA territories as a consequence of the Favela Pacification Program. No effect on sexual assaults is found. Additionally, no significant differences in police activity across AA and CV territories is found which suggests that the effect on homicides and property crime is due to the Favela Pacification Program and not the result of a spurious correlation. Finally, many placebo tests are performed.

The average treatment effect estimates reported in this work represents a minimum of the effect of the Favela Pacification Program on crime displacement. The reason of the downward bias is that CV, the control group, may be affected by the treatment, a viola-

tion of the Stable Unit Treatment Value Assumption. There are two main reasons why CV territories may be affected by the Favela Pacification Program. On the one hand, CV members that had their territories pacified may displace criminal activities to CV territories instead of fighting for a new one with a rival gang. This would result in an increase of crime in the control group during the treatment period, which produces a difference-in-differences estimate biased downwards. On the other hand, if CV members look for new territories, a possible consequence is that AA retaliates. This would also generate an increase in crime in the control group during the treatment period, which would bias the effect of the Favela Pacification Program downwards.

The work is structured as follows. Section I provides some background about favelas and the Favela Pacification Program. Section II explains the Quasi-experiment that the Favela Pacification Program provides. Section III presents the data employed in the estimates and Section IV the empirical strategy used. Secction V presents the results and section VI concludes.

I. Background

A. Favelas in Rio de Janeiro

Favela da Providencia was the first favela in Rio de Janeiro. At the end of a civil war in the eastern State of Bahia, some soldiers were promised land in Rio de Janeiro in return for their services provided to the army. The promise was not honored and the veterans decided, in 1897, to occupy a hill located nearby Rio de Janeiro city center which gave rise to the slums known as Favela da Providencia. During the 20th century the favela phenomenon found its basis on reasons very similar to those that originated the first favela: inmigrants arriving without means to afford regular housing occupied the hills within the city and a vast number of favelas emerged. Currently in Rio de Janeiro there are 965 favelas, where 1,443,773 inhabitants - 22.8-percent of the city population - lives.[4] One of the most salient characteristics of Rio de Janeiro's urban landscape is the proximity from any point to a favela: they are spread all over the city and can be found either near to a wealthy or a working class neighborhood.

To the Brazilian Institute of Geography and Statistics a favela is a place that present the following three characteristics. First, there is a lack of basic public services. The access to wastewater treatment and water services is limited as it is the access to garbage collection. According to the Brazilian Census 2010, in the favelas of Rio de Janeiro 12-percent of the population has an inadequate access to wastewater treatment, 2.7-percent has an inadequate access to water services and 2.5-percent do not have garbage collection, whereas these percentages in the rest of the city are are 3.2-percent, 0.3-percent and

[4]The Population data is provided by the Brazilian Institute of Geography and Statistics and the data on the number of favelas is provided by the Pereira Passos Institute.

0.2-percent, respectively. Second, urban planning is precarious: streets and sidewalks are in poor condition or even nonexistent. Third, land is illegally occupied by inhabitants. In the largest favela in Rio de Janeiro, Rocinha, only 23-percent of residences hold land title (Sergio Guimaraes and Maina Celidonio, 2012).

But probably the most well-known characteristic of favelas, that exemplifies to which extent favelas have been communities with limited state penetration, is that they have been places where criminals were allowed to impose their rule with no police confrontation. The only official goal of the Favela Pacification Program says a lot about the previous situation in favelas: to recover to the State territories dominated by heavily-armed criminals. During decades the State renounced to provide security within favelas, which made them the ideal place for criminals to hide from police and organize criminal activities.

B. The Favela Pacification Program

On 1 January 2007 Sergio Cabral sworn into office as Governor of Rio de Janeiro State. During his campaign he made emphasis on public security issues and announced that if elected changes in the public security policy of Rio de Janeiro would be implemented. Traditionally, when a dispute between gangs in a favela was too bloody, police's response was a transitory incursion in the favela to contain the battle. These kind of incursions were not aimed to expel the gang that was controlling the favela; the aim was simply to stop the clash between gangs. Implicitly, transitory incursions were a form to maintain the status quo in the favela.

Changes in Rio de Janeiros's public security policy were unchained by an unexpected event. On 14 May 2008 three journalists from O Dia journal were kidnapped in Batan, a neighborhood on the west side of the city, by members of the militia that used to control the territory. The journalists were working on a report dennouncing the abuses commited by the militia when they were captured by the criminals. The journalists were released the same day of their capture but the kidnap was not publicly announced until the 31st of May to avoid interferences on the investigations conducted by the police. The news of the journalists being kidnaped, and tortured, by the militia alarmed the press and drew public attention. On 1 June 2008 police forces occupied Batan without any kind of opposition from the militia. Occupations in a specific place of the city was not something new in Rio de Janeiro, but for the first time the police decided to remain in the territory. Batan is the first territory pacified by the program.

The Favela Pacification Program consists in the pacification of some favelas and is intended to recover for the State territories under gang control. The pacification of a territory consists of two stages. First, the deployment of police forces and the expulsion of criminals, where clashes between police forces and criminals usually, but not necessarily, take place. On a symbolic event, the day when police forces are deployed in the favela, the police raise the Brazilian flag to signal that the territory is under State control and does not belong to a gang anymore. The second stage is the set up of a Pacifying Police Unit

with jurisdiction over the pacified territory, which aims to prevent criminal's return.

The Favela Pacification Program did not have a legal framework when it was put into practice. The Rio de Janeiro state decree-law N 42.787 of the 6th of January 2011, more than two years after the Batan pacification and when twenty-one territories were already pacified, is the only legal instrument ruling the Favela Pacification Program. The decree-law describes the characteristics a territory must present to be considered to be pacified and the steps a pacification operation must follow. In practice, what the decree-law does is a description of what was already being put into practice by the police.

According to the decree-law N 42.787 a territory is "potentially able to be contemplated" for a pacification operation if it is a poor territory where ostensively and heavily-armed criminals represent a threat for the democratic state under the rule of law. Regarding the pacification process, the decree-law establishes that the first step of a pacification is the deployment of police forces in the territory to recover for the State territories controlled by ostensively-armed criminals. Then, after a stabilization period where additional police forces may be called in, a Pacifying Police Unit with jurisdiction over the pacified territory is installed.

II. The Quasi-experiment

A. Treatment and Comparison Period

On 11 November 2008 the first CV territory, Cidade de Deus, was pacified. Thus the treatment period starts on 11 November 2008. After the pacification of Cidade de Deus and until the 10th of August 2010, other ten CV territories were pacified: Santa Marta, Babilonia, Pavao, Tabajaras, Providencia, Borel, Formiga, Andarai, Salgueiro and Turano. On 14 October 2010 the first territory controlled by AA, Macacos, is pacified. This event gives AA criminals an incentive to gain rival gangs territories. For the same reason that when CV territories are pacified AA receive a treatment, when AA territories are pacified CV territories receive a treatment. As a result, as of 14 October 2010, CV cannot be considered anymore a control group. Both CV and AA are under treatment after 14 October 2010. Only until this date there is a clear control group, and for this reason I set 14 October 2010 as the ending date of the treatment period. Figure 2 shows the timeline of events.

Insert Figure 2

The comparison period chosen runs from 17 August 2007 to the moment immediately before the treatment period starts. The starting date of the comparison period takes into account that the first major sport event Rio de Janeiro was announced to host was the 2014 FIFA World Cup, on 17 August 2007. The comparison period is ideally a span of time with no important differences with respect to the treatment period other than the treatment itself. The announcement potentially triggers a positive economic shock in certain areas

of the city which make them more attractive to criminal activity, particularly those close to where matches of the FIFA World Cup were played, the Maracana Stadium. Thus, to avoid time-series heterogeneity in unobservables in the territories I set the starting date of the comparsion period on 17 August 2007.

B. Comando Vermelho Territories, Pacified Territories and the Control Group

CV territories compose the control group in this work. There are thirty-two CV territories pacified by the Favela Pacification Program, and each one is included in the control group. But the period during which these territories belong to the control group differ. The reason is that when a territory is pacified it does not belong to CV anymore, and so cannot be considered part of the control group. After the pacification the territory is recovered by the State.[5] Figure 3 shows for each territory that used to be controlled by CV the period when is considered part of the control group, i.e. before the pacification, and the period when is not part of the control group, i.e. during the pacification.

Insert Figure 3

III. Data Description

The data used to estimate the effect of the Favela Pacification Program on crime displacement is provided by the Public Security Institute (PSI), a Rio de Janeiro Government office in charge of collecting and publishing data related to crime and police activity. To elaborate this database, the PSI locates the place where the offense occurred or the police activity took place, and if it happened within a territory the PSI assigns the offense or the police activity to it. As according to PSI this is a time consuming process, there is data only for the first thirty-six pacified territories. There is no data for two CV territories yet: Lins and Vila Kennedy. Of the remaining thirty-six territories one is the militia territory, and therefore thirty-five territories form the sample used to compute the estimates.

The database contains monthly data on offenses and police activity for each territory from January 2007 onwards. The crime data is discriminated on data referred to homicides, sexual assaults and four kinds of property crime: robbery and homicide, robbery, theft and fraud.[6] Data on homicides is used to assess gang clashes which is taken as ev-

[5] In pacified territories crime-reporting rates are expected to change drastically. Changes in crime-reporting rates would lead to unobserved heterogeneity across time for the same territories that would bias the average treatment effect. Pacified territories are dropped from the sample and not used to compute the estimates.

[6] When the victim of a robbery is murdered the offense is recorded as a robbery and homicide case and not as an homicide case. A robbery and homicide case is naturally not only a property crime, but it does have a property crime component that disguinshes it from homicides. Moreover, robbery and homicide is not an appropriate crime to assess gang clashes.

idence of crime displacement, property crime is used to evaluate if crime displacement leads to changes in property crime rates in the treatment territories and data on sexual assaults is used as a falsification test. The police activity data is discriminated according to the following categories: drug arrest, gun arrest, car recovery, warrants of arrest and offenses caught in the act. The PSI database also includes data on civilians killed by the police due to resistance cases, which PSI does not categorize neither as crime nor police activity data. Data on police activity and civilians killed is used to test if police behavior in CV and AA territories was the same during the Favela Pacification Program.

As the PSI data has a monthly periodicity, we need to redefine the starting and ending dates of the comparison and the treatment period that has been defined as days. The treatment period that, had daily data been available would be from the 11th of November 2008 to the 14th of October 2010, with monthly data is redefined as November 2008 to September 2010. I do not consider October 2010 as a treatment period to avoid the information of the second half of the month when CV territories are under treatment. The comparison period would ideally be from the 17th of August 2007 to the 11th of November 2008. With monthly data the comparison period is September 2007 to October 2008. I do not include August 2007 in the comparison period to discard the information from the 1st to the 16th of August, before the announcement of Rio de Janeiro as a host city of the 2014 FIFA World Cup, the event that sets the starting date of the comparison period. Figure 4 shows the comparison and treatment period with monthly data.

Insert Figure 4

The monthly periodicity of the data forces us to redefine also until when a CV territory that is pacified is part of the control group, i.e. before the pacification, and when it is not part of the control group, i.e. after the pacification. The optimal (daily) timeline would be that depicted in Figure 3. The monthly timeline is constructed with a simple general rule. As of the month when the pacification begins, regardless of if the pacification begins on the first or on the last day of the month, the territory is not included in the control group. Figure 5 shows when territories that at some point where controlled by CV are considered part of the control group. Naturally, those CV territories that were pacified after the first pacification of an AA territory, on 14 October 2010, compose the control group during the whole comparison and treatment period.

Insert Figure 5

Some descriptive statistics are presented in Table 2. Panel A shows crime rates per 100,000 inhabitants and Panel B shows police activity and civilians killed rates.

Insert Table 2

In Figure 6 we can see an introductory graphical analysis of the effect of the Favela Pacification Program on the homicide rate and in Figure 7 we see the evolution of the police activity rate. The vertical lines indicate the starting date of the treatment period. Regarding Figure 6 it is worth noting two points. First, before the treatment, CV and AA homicide rate lines show parallel trends. Second, during the treatment period this pattern changes drastically, and we can see how the difference in homicide rates among CV and AA territories is not evident anymore.

Insert Figure 6 and Figure 7

IV. Empirical design

The aim of this work is to evaluate the causal effect of the Favela Pacification Program on crime displacement from pacified territories to AA territories. The basic econometric specification is the following:

$$Y_{it} = \alpha + \beta * Treatment + I_i + M_t + \varepsilon_{it} \tag{1}$$

where Y_{it} is homicide rate per 100,000 inhabitants per month t at the territory i level. I_i stands for fixed effects at the territory level, M_t stands for monthly effects and ε_{it} is the error term. Treatment stands for the interaction of the treatment period, November 2008 to September 2010, and the treatment group, AA territories. The comparison period runs from September 2007 to October 2007 and the control group is composed by CV territories. Pacified territories are not included in the estimates.

A natural concern with the empirical design is that the allocation of gangs may be endogenous in a crime regression. In this regard, we must note that our sample present a high degree of homogeneity among territories. Every territory in the sample is a poor place where their inhabitants live in slums and criminals have traditionally imposed their rule. Moreover, these are not any poor territory. The program was launched after the announcement of Rio de Janeiro as a host city of the 2014 FIFA World Cup and of the 2016 Summer Olympic Games, which suggests that the Favela Pacification Program has been focused on territories that are to some extent involved in the security of these events. This makes the territories included in the sample an even more homogeneous group. Unobservable characteristics affecting crime rates should not vary largely among territories included in the sample. If crime rates are affected by unobservable characteristics, as territories' location and surface conditions, these are constant in time. To control for this potential source of heterogeneity a difference-in-differences estimate controlling for fixed effects at the territory level is used.

V. Results

A. The effect of the Favela Pacification Program

Table 3 reports the results of the estimates of equation (1). Five specifications are reported in both Panel A, where the estimates with homicide rate as dependent variable are presented, and Panel B, where the estimates with property crime rate as dependent variable are presented.

Insert Table 3

The treatment variable for Column A models is a standard treatment variable: a dummy that takes the value 1 for AA territories from November 2008 to September 2010 and 0 otherwise. The treatment variable for Column B models is the standard treatment variable times the height in 100 meters of the territory highest point. The reasoning behind the use of elevation to weight the treatment variable in Column B models is security for the gang controlling the favela. Gang bosses usually live in the highest points of the hill, from where they can control criminal activities and find time to scape in case a rival gang or the police arrive. The higher the highest point the more desirable the favela should be. The treatment variable for Column C models is the standard treatment variable times the following distance measure:

$$\frac{\sum_{p(t)} D_{ap(t)}}{\sum_a \sum_{p(t)} D_{ap(t)}} \text{ for each } t,$$

where $D_{ap(t)}$ is the distance from an AA territory a to a territory $p(t)$ pacified at month t or before. For each one of the five treatment territories the numerator value is the sum of the distances from the territory to every territory already pacified at time t. Each treatment territory has a different numerator value at every t. The denominator value at each t is the same for each one of the treatment territories: is the sum of the numerator values of the five treatment territories.

The treatment in Column A models is the same for each treatment territory and is time-invariant, whereas the treatment in Column B models is time-invariant as well but varies for each treatment territory and the treatment for Column C models varies across time and treatment territories. A fourth specification, Column D models, is included to assess the possible effect of the announcement, on 2 October 2009, of Rio de Janeiro as the host city of the 2016 Summer Olympic Games. In this specification the standard treatment variable is split in two: one for the period before the announcement-the first eleven months of the treatment- and other for the period after the announcement. From columns A to D every model includes fixed effects at the territory level and month effects. In a fifth specification, Column E models, linear trends at the territory level are also included.

The results shown in Panel A indicate that the Favela Pacification Program had a positive and significant effect on the homicide rate. This is taken as evidence that the program

caused gang clashes in AA territories. The treatment coefficient found in column A indicates that the Favela Pacification Program causes a 1.371 average increase in the homicide rate per 100,000 inhabitants in AA territories. If we take into account that the average population in AA territories is 26,356 inhabitants and that the treatment period lasts twenty-three months, a 1.371 treatment coefficient implies that 41.5 homicides occurred in AA territories due to the Favela Pacification Program from November 2008 to September 2010. We can see how the treatment is significant in every specification. Is worth noting that when the treatment is split into two periods only the first eleven months present a significant coefficient. The average treatment effect of the Favela Pacification Program found in this work is certainly biased downwards due to the possibility that AA retaliates CV attacks and that CV members may move to some of their own territories instead of to some AA territories. In both cases the downward bias of the average treatment effect would increase as time goes by, which may explain why in column D the treatment coefficient for the period from the month twelve of the treatment onwards in not significant.

In Panel B we evaluate if the gang fight for AA territories leads to an increase in property crime. The treatment is significant in the models A to D, but not in the column E specificiation, when linear trends at the territory level are added. Table 4 presents results of equation (1) for four types of property crime, which allows a better understanding of the effects the Favela Pacification Program had on property crime in AA territories. The types of property crime vary according to the violence needed to commit the offense: robbery and homicide, robbery, theft and fraud.

Insert Table 4

In Panel A of Table 4 we can appreciate how no effect is found on robbery and homicide. We can see in Table 2 how during the comparison and treatment period robbery and homicide presents a remarkable low rate in comparison with other forms of crime. Six robbery and homicide cases were registered in the thirty-five territories of the sample used in the estimates from September 2007 to September 2010, and with such a small variation in the variable is expected to find no effect of the Favela Paification Program on the most violent form of robbery. In Panel B we see that the effect on robbery is signifficant in the first three specifications. In column D the effect is significant on the period after the announcement of Rio de Janeiro as a host city of the 2016 Summer Olympic Games, and there is no significant effect when territory linear trends are added. The results shown in Panel C does not allow us to confirm an effect of the Favela Pacification Program on the theft rate. In column A and C the treatment coefficient is significant at the 10-percent level, but there is no significant effect in the specifications reported in column B and E. In column D model we see that the treatment coefficient is significant at the 10-percent level for the period before the announcement of Rio de Janeiro as the 2016 Summer Olympic Games organizer. In Panel D we do appreciate a significant and robust effect of the Favela Pacification Program on fraud. The effect is significant in each specification. In the spec-

ification reported in column D we see that the effect is significant at the 1-percent level during the first eleven months of the treatment.

The results presented in Table 4 suggest that tha Favela Pacification Program caused an increase in fraud rates on AA territories. If we consider column A of Panel D, a 1.533 coeffcient of the treatment variable implies that 46.6 cases of fraud ocurred in AA territories during the treatment period caused by the program. Regarding robbery and theft rates, the evidence is not conclusive. No effect of the Favela Pacification Program on robbery and homicide is found.

B. Internal validity of the results

To help assess the internal validity of the results I present three types of tests. First, a falsification test using data on sexual assaults, a form of crime that the Favela Pacification Program should not affect. Second, many results are presented to evaluate if the police of Rio de Janeiro was putting more emphasis on crime prevention in territories under CV control. In such a case, the average treatment effect of the Favela Pacification Program on crime displacement found in this work would be capturing not only the program's effect, but also other security measures. Finally, I present many placebo tests.

Table 5 contains the results of a falsification test where is tested if the Favela Pacification Program had any effect on sexual assaults. No significant effect is found.

Insert Table 5

If in paralell to the Favela Pacification Program other security measures with the same effect were conducted, the average treatment effect found in this work would be capturing a spurious correlation. In this regard a possible problem is that the government of Rio de Janeiro could be not only implementing the Favela Pacification Program, but also putting more emphasis to prevent crime in CV than in AA territories. If this were the case police should be more active in territories controlled by CV than in territories controlled by AA. Thus crime displacement could be, at least partially, from territories under CV control and not exclusively from pacified territories. To assess this possibility I present many tests to evaluate if police behavior changed during the Favela Pacification Program in non-pacified favelas. From tables 6 to 11 is tested if the program had any effect on variables that reflect police activity in the territory. In Table 6 the dependent variable is drug arrest and in Table 7 is gun arrest.

Insert Table 6 and Table 7

Drug arrest would imply to take away from gangs an important source of revenue. Gun arrest would imply not only to take away economic resources but also to restrict the most important input to commit violent offenses. Thus, if the police of Rio de Janeiro was putting more emphasis to prevent crime in CV territories, drug and gun arrest rates

would certainly be among the main police targets. No significant effect is found either in Table 6 or Table 7.

Another way of assessing if a different emphasis was put on territories depending on which gang was controlling it is testing if the Favela Pacification Program had an effect on the warrants of arrest. Table 8 presents the results of equation (1) when the dependent variable is the warrants of arrest rate. Again, no significant effect is found.

Insert Table 8

Tables 9 and 10 present estimates of equation (1) for models where the dependent variables is car recovery rate and offenses caught in the act rate, respectively. No significant effect is found.

Insert Table 9 and Table 10

The last results to assess police behavior are presented in Table 11, where the estimates of equation (1) are computed using the resistance cases rate as the dependent variable. The data on the resistance cases can be ambiguous. The reason is that a civilian killed by security forces is labelled as a resistance case or not based on what security forces report, and thus there is the possibility that in some cases the term resistance case would not be appropriate. Even taking into account this possible problem, the resistance cases model also indicates if a different emphasis was put on crime prevention in CV territories.

Insert Table 11

Finally, Table 12 contains the results for many placebo tests used to evaluate if AA territories suffered any relative increase in the homicide rate before the Favela Pacification Program. If the homicide rate was increasing in AA territories, in comparison with CV territories, even before the program launch, then it is not possible to claim that the Favela Pacification Program displaced crime to AA territories. The period used to compute the placebo tests is the comparison period that runs from September 2007 to October 2008 and the placebo treatment for each test begins in the month indicated in the column header. The dependent variable used is the homicide rate per 100,000 inhabitants per territory.

Insert Table 12

The models where the placebo treatment starts in October 2007 and November 2007 have a negative and significant effect. If homicide rates were increasing in AA territories before the Favela Pacification Program launch, the effect should be positive. The rest of the models do not present a significant effect.

To conclude, there is no significant effect in the sexual assaults model reported in Table 5, which provides a robustness test for the empirical strategy used in this work because

is a type of crime we should not expect to be affected by the Favela Pacification Program. There is no significant effects in the models reported in tables 6 to 11, which suggests that the average treatment effect of the Favela Pacification Program is not capturing changes on the emphasis on crime prevention in non-pacified territories controlled by either CV or AA. Finally, no positive and significant effects are found in the models reported in Table 12, which suggests that the average treatment effect of the Favela Pacification Program is not capturing a previous increase in the homicide rate in AA territories.

C. Discussion

The results found in this work have relevant policy implications. It is important to highlight two points. First, the estimates show that there are important negative externalities in terms of crime displacement to non-pacified areas of Rio de Janeiro. If we consider the results presented in Panel A of Table 3, the coefficient of the standard treatment variable (column A) is 1.371, which implies that the program caused 41.5 homicides in AA territories. I take this as evidence that CV was displacing criminal activities to AA territories, which led to battles over the territories. The second policy relevant point is that the displacement of criminals caused an increase in one form of property crime, fraud, in AA territories. Is worth noting that the fraud rate increase in AA territories implies an increase in crime towards non-gang members, an important difference with homicides, a crime that is mostly related to gang activity.

It is worth remembering that the average treatment effect on crime displacement found in this work is probably biased downwards due to retaliation and possible displacement of crime from pacified to CV territories. Additionally, from October 2010 to March 2014 twenty-five territories more were pacified, which probably caused more pressure over non-pacified territories. Given the negative externalities of the Favela Pacification Program is no surprise that since March 2014 no territories have been pacified and its future seems uncertain. We do not have data to compute a complete cost-benefit analysis, but we can highlight that the effect of police deployment on crime displacement found in this work casts doubt on the convenience of police deployment as a security measure in the presence of organized crime.

A natural question to ask is which is the external validity of the results found in this work. It is worth noting that the significant average treatment effect of the Favela Pacification Program is found in an organized crime context. Crime displacement is probably encouraged by the logistic support given to gang members by their own criminal organization. Thus, the results found in this work do not mean that the deployment of police forces lead to crime displacement of criminals which are not gang members.

VI. Conclusions

Previous works find a causal and negative effect of police presence on crime there where police presence increases. However, crime displacement remains an understudied topic. Up to now, no work in the economic literature has found evidence of geographical crime displacement. Previous literature exploits the distance from the place where police presence exogenously increases as the relevant dimension to define treatment and control groups in order to assess the effect of police deployment on crime displacement. In this work I exploit the organized crime structure of crime in Rio de Janeiro to define the treatment and the control group.

The Favela Pacification Program was launched by the Government of Rio de Janeiro after the announcement of Rio de Janeiro as a host city of two major sport events: the 2014 FIFA World Cup and the 2016 Summer Olympic Games. The program consists in the expulsion of criminals from some favelas (pacified favelas), territories usually controlled by gangs.

The Favela Pacification Program and the prevalence of organized crime in Rio de Janeiro provide a unique framework to evaluate the causal effect of police deployment on crime displacement. When criminals are expelled from a territory, gang members may try to relocate their criminals activities elsewhere. As these criminals belong to a gang they will not take away rents from criminal activities in territories dominated by their own organization. But they do have an incentive to recover lost rents in territories dominated by other gangs. Thus, in order to evaluate crime displacement, territories dominated by the same gang that used to control the pacified territory form the control group whereas territories dominated by other gangs form the treatment group.

At the onset of the program, from November 2008 to September 2010, eleven territories dominated by CV were pacified which gave this criminal organization an incentive to displace criminal activities to territories dominated by other gang, AA. The results found in this work indicate that the Favela Pacification program has a positive, significant and non-negligible in magnitude effect on homicide rates in AA territories. The results are robust to several alternative specifications and do not seem to be capturing any change in crime dynamics previous to the program or the effect of any other security measure. This is taken as evidence that CV gang members expelled from pacified territories tried to relocate their criminal activities in AA territories. Moreover, the Favela Pacification Program caused an increase in one type of property crime, fraud, in AA territories.

In brief, my results suggest that police deployment in a territory, when organized crime is present, displaces criminal activity to other territories.

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Figure 1. Pacified Territories in Rio de Janeiro

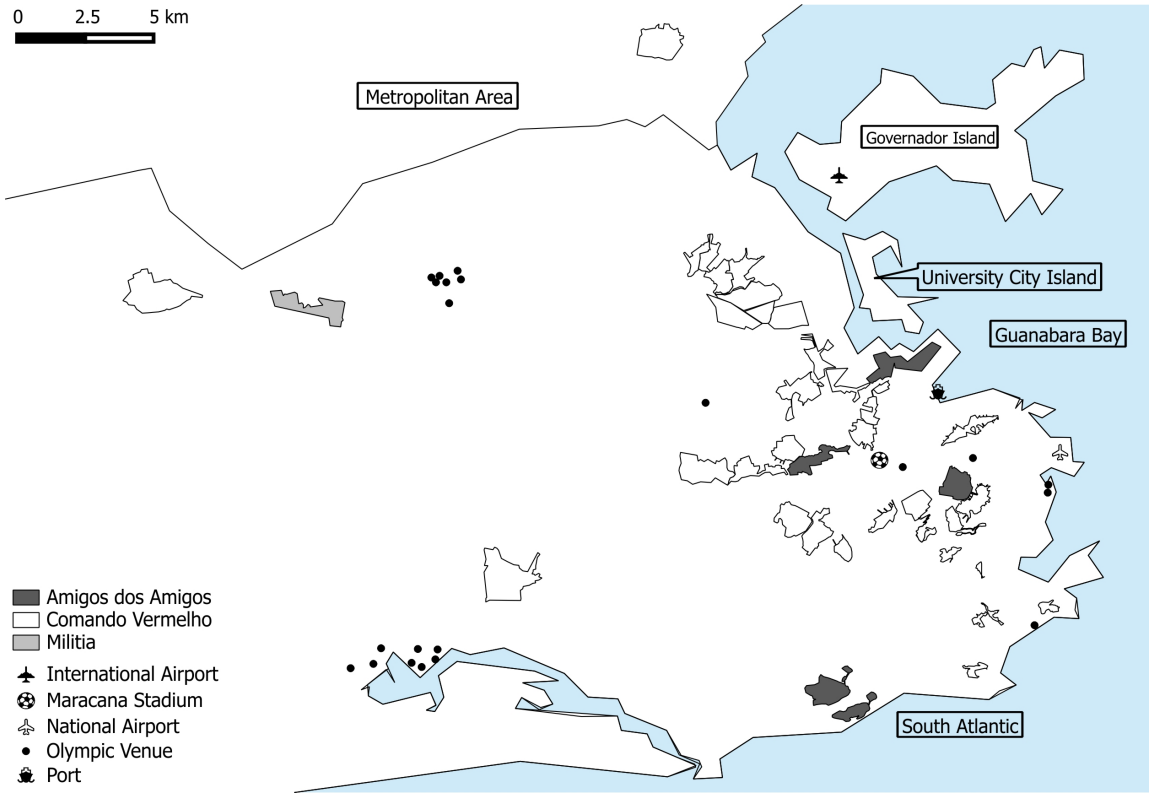


Figure 2. Timeline of Events

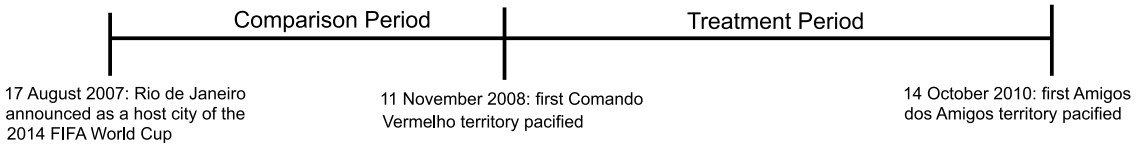
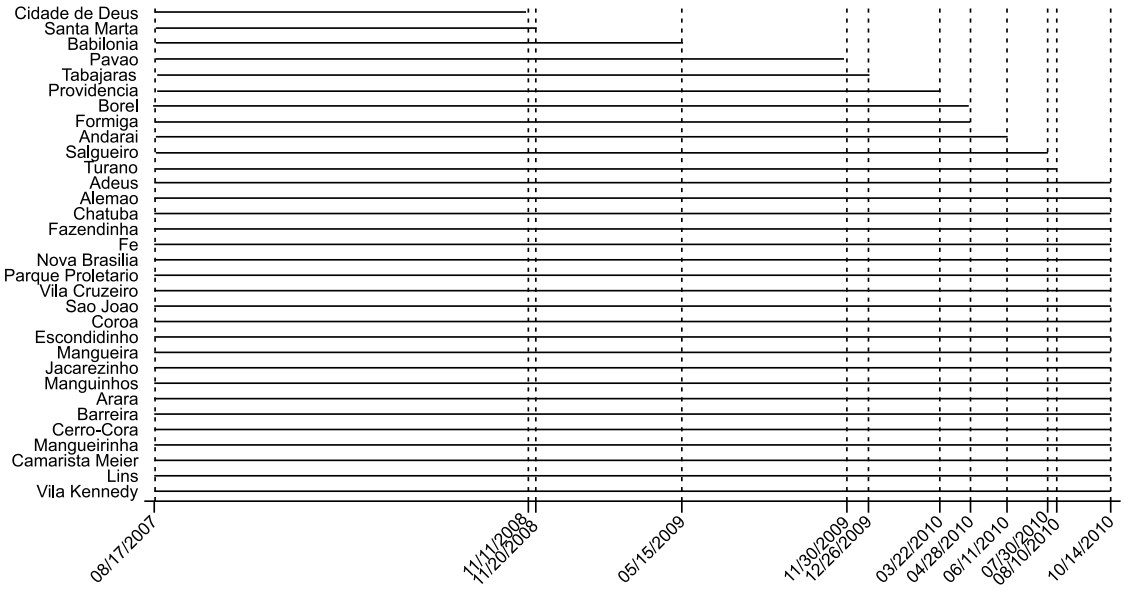


Figure 3. Control Group and Pacified Territories

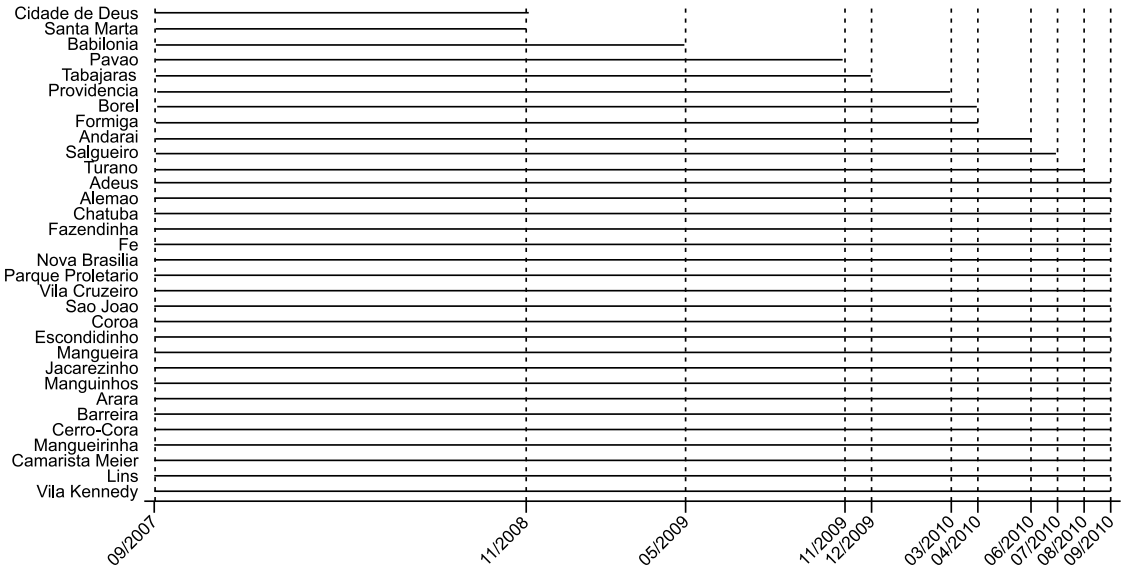


Notes: Territories belong to the control group during the time a line is depicted. Blank spaces mean that the territory was already pacified and therefore do not belong to the control group.

Figure 4. Monthly Timeline of Events

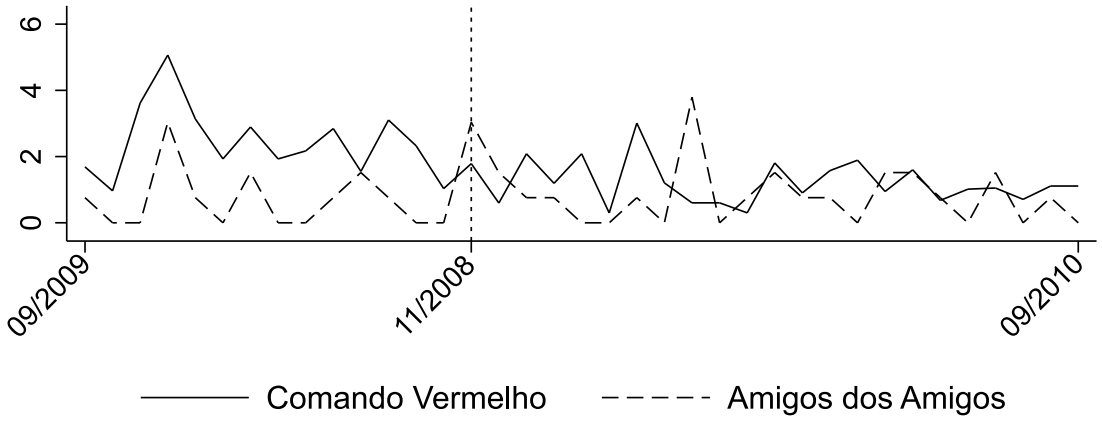


Figure 5. Control Group and Pacified Territories



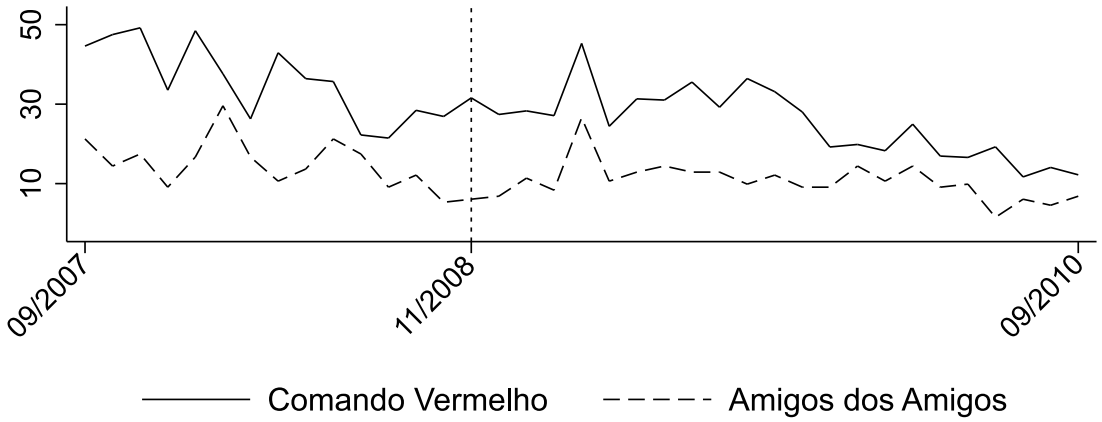
Notes: Territories belong to the control group during the time a line is depicted. Blank spaces mean that the territory was already pacified and therefore do not belong to the control group.

Figure 6. Homicide rate



Notes: Homicide rates per 100,000 inhabitants per territory.

Figure 7. Police activity rate



Notes: Police activity rates per 100,000 inhabitants per territory. Police activity is the sum of drug arrest, gun arrest, car recovery, offenses caught in the act and warrants of arrest.

Table 1. The Favela Pacification Program

Territory	Gang until the Pacification Date	Pacification Date
Batan	Militia	1 June 2008
Cidade de Deus	Comando Vermelho	11 November 2008
Santa Marta	Comando Vermelho	20 November 2008
Babilonia	Comando Vermelho	15 May 2009
Pavao	Comando Vermelho	30 November 2009
Tabajaras	Comando Vermelho	26 December 2009
Providencia	Comando Vermelho	22 March 2010
Borel	Comando Vermelho	28 April 2010
Formiga	Comando Vermelho	28 April 2010
Andarai	Comando Vermelho	11 June 2010
Salgueiro	Comando Vermelho	30 July 2010
Turano	Comando Vermelho	10 August 2010
Macacos	Amigos dos Amigos	14 October 2010
Adeus	Comando Vermelho	28 November 2010
Alemao	Comando Vermelho	28 November 2010
Chatuba	Comando Vermelho	28 November 2010
Fazendinha	Comando Vermelho	28 November 2010
Fe e Sereno	Comando Vermelho	28 November 2010
Nova Braslia	Comando Vermelho	28 November 2010
Parque Proletario	Comando Vermelho	28 November 2010
Vila Cruzeiro	Comando Vermelho	28 November 2010
Sao Joao	Comando Vermelho	1 June 2011
Coroa	Comando Vermelho	2 June 2011
Escondidinho	Comando Vermelho	2 June 2011
Sao Carlos	Amigos dos Amigos	2 June 2011
Mangueira	Comando Vermelho	19 June 2011
Rocinha	Amigos dos Amigos	12 November 2011
Vidigal	Amigos dos Amigos	12 November 2011
Jacarezinho	Comando Vermelho	13 October 2012
Manguinhos	Comando Vermelho	13 October 2012
Arara	Comando Vermelho	17 January 2013
Barreira	Comando Vermelho	3 March 2013
Caju	Amigos dos Amigos	3 March 2013
Cerro-Cora	Comando Vermelho	29 April 2013
Mangueirinha	Comando Vermelho	2 August 2013
Camarista Meier	Comando Vermelho	6 October 2013
Lins	Comando Vermelho	6 October 2013
Vila Kennedy	Comando Vermelho	13 March 2014

Notes: Pacification operations are vastly reported by the Brazilian media; dates and gangs controlling the territory are obtained from numerous media reports.

Table 2. Descriptive Statistics

		Amigos dos Amigos		Comando Vermelho	
		Treatment period	Comparison period	Treatment period	Comparison period
Panel A. Crime					
Homicide		1.624	0.978	1.989	2.902
		(0.358)	(0.318)	(0.258)	(0.351)
Property crime		31.725	30.201	63.486	77.909
		(2.590)	(4.358)	(4.766)	(6.146)
	Robbery and homicide	0.057	0	0.031	0.023
		(0.057)	(0)	(0.022)	(0.019)
	Robbery	12.909	14.823	30.430	41.158
		(1.648)	(3.088)	(2.906)	(3.752)
	Theft	16.657	13.714	29.646	32.118
		(1.164)	(1.685)	(2.069)	(2.505)
	Fraud	2.101	1.663	3.377	4.608
		(0.360)	(0.383)	(0.314)	(0.500)
Sexual Assaults		1.038	1.140	1.228	1.063
		(0.341)	(0.348)	(0.212)	(0.219)
Panel B. Police Behavior					
Police activity		16.043	21.037	37.332	48.745
		(1.781)	(2.626)	(2.468)	(3.432)
	Drug arrest	4.928	4.854	9.851	13.186
		(0.773)	(0.953)	(0.945)	(1.367)
	Gun arrest	4.854	7.472	8.712	13.349
		(0.797)	(1.437)	(1.050)	(1.763)
	Car recovery	3.311	5.710	10.848	13.031
		(0.503)	(0.748)	(0.829)	(1.589)
	Caught in the act	2.564	2.627	5.883	7.597
		(0.409)	(0.688)	(0.534)	(0.793)
	Warrants of Arrest	0.384	0.371	1.958	1.580
		(0.151)	(0.173)	(0.340)	(0.374)
Resistance cases		2.113	3.983	0.877	2.453
		(0.595)	(0.530)	(0.274)	(0.389)
Observations		70	420	115	579

Notes: Rates per 100,000 inhabitants. Standard errors in parentheses.

Table 3. The Effect of the Favela Pacification Program

Panel A. Homicide					
	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	1.371				2.775
	(0.577)**				(1.249)**
Amigos dos Amigos*Elevation		0.482			
		(0.246)*			
Amigos dos Amigos*Distance Measure			6.105		
			(2.842)**		
Amigos dos Amigos(1-11 months)				1.890	
				(0.637)***	
Amigos dos Amigos(12-23 months)				0.876	
				(0.793)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.1313	0.1307	0.1310	0.1318	0.1646

Panel B. Property crime					
	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	12.804				9.200
	(5.088)**				(8.036)
Amigos dos Amigos*Elevation		5.157			
		(1.970)**			
Amigos dos Amigos*Distance Measure			63.302		
			(23.864)**		
Amigos dos Amigos(1-11 months)				9.733	
				(4.609)**	
Amigos dos Amigos(12-23 months)				15.737	
				(7.835)*	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.8652	0.8651	0.8652	0.8652	0.8779

Notes: Dependent variable in Panel A is monthly homicide rate per 100,000 inhabitants per territory. Dependent variable in Panel B is monthly property crime rate per 100,000 inhabitants per territory. Property crime is the sum of robbery and homicide, robbery, theft and fraud. Elevation is measured in 100 meters. The distance measure is $\frac{\sum_{p(t)} D_{ap(t)}}{\sum_a \sum_{p(t)} D_{ap(t)}}$ for each t, where $D_{ap(t)}$ is the distance from an Amigos dos Amigos territory a to a territory $p(t)$ pacified at time t or before. Standard errors clustered at the territory level in parentheses.

*** Significant at the 1-percent level.

** Significant at the 5-percent level.

* Significant at the 10-percent level.

Table 4. The Effect of the Favela Pacification Program on Property Crime

	Panel A. Robbery and homicide				
	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	0.042				0.250
	(0.063)				(0.196)
Amigos dos Amigos*Elevation		0.006			
		(0.0196)			
Amigos dos Amigos*Distance Measure			0.238		
			(0.350)		
Amigos dos Amigos(1-11 months)				0.112	
				(0.117)	
Amigos dos Amigos(12-23 months)				-0.024	
				(0.047)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.0561	0.0559	0.0562	0.0577	0.0883
	Panel B. Robbery				
	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	7.720				1.248
	(3.773)**				(6.851)
Amigos dos Amigos*Elevation		2.919			
		(1.381)**			
Amigos dos Amigos*Distance Measure			38.907		
			(17.808)**		
Amigos dos Amigos(1-11 months)				4.147	
				(3.993)	
Amigos dos Amigos(12-23 months)				11.134	
				(5.614)*	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.7685	0.7683	0.7685	0.7687	0.7912

(Continue)

Table 4. The Effect of the Favela Pacification Program on Property Crime
(Continued)

	Panel C. Theft				
	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	3.507				4.499
	(2.074)*				(2.755)
Amigos dos Amigos*Elevation		1.585			
		(0.967)			
Amigos dos Amigos*Distance Measure			25.045		
			(13.686)*		
Amigos dos Amigos(1-11 months)				3.382	
				(1.795)*	
Amigos dos Amigos(12-23 months)				3.626	
				(2.767)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.7942	0.7942	0.7987	0.7942	0.7987
	Panel D. Fraud				
	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	1.533				3.201
	(0.720)**				(1.184)**
Amigos dos Amigos*Elevation		0.646			
		(0.269)**			
Amigos dos Amigos*Distance Measure			6.660		
			(3.810)*		
Amigos dos Amigos(1-11 months)				2.090	
				(0.703)***	
Amigos dos Amigos(12-23 months)				1.001	
				(0.947)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.2390	0.2389	0.2388	0.2394	0.2614

Notes: Dependent variable in Panel A is monthly robbery and homicide rate per 100,000 inhabitants per territory. Dependent variable in Panel B is monthly robbery rate per 100,000 inhabitants per territory. Dependent variable in Panel C is monthly theft rate per 100,000 inhabitants per territory. Dependent variable in Panel D is monthly fraud rate per 100,000 inhabitants per territory. Elevation is measured in 100 meters. The distance measure is $\frac{\sum_{p(t)} D_{ap(t)}}{\sum_a \sum_{p(t)} D_{ap(t)}}$ for each t, where $D_{ap(t)}$ is the distance from an Amigos dos Amigos territory a to a territory $p(t)$ pacified at time t or before. Standard errors clustered at the territory level in parentheses.

*** Significant at the 1-percent level.

** Significant at the 5-percent level.

* Significant at the 10-percent level.

Table 5. The Effect of the Favela Pacification Program on Sexual Assaults

	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	-0.254				-1.450
	(0.651)				(1.051)
Amigos dos Amigos*Elevation		-0.003			
		(0.307)			
Amigos dos Amigos*Distance Measure			-1.303		
			(3.087)		
Amigos dos Amigos(1-11 months)				-0.650	
				(0.750)	
Amigos dos Amigos(12-23 months)				0.124	
				(0.655)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.0731	0.0730	0.0731	0.0736	0.0859

Notes: Dependent variable is monthly sexual assaults rate per 100,000 inhabitants per territory. Elevation is measured in 100 meters. The distance measure is $\frac{\sum_{p(t)} D_{ap(t)}}{\sum_a \sum_{p(t)} D_{ap(t)}}$ for each t, where $D_{ap(t)}$ is the distance from an Amigos dos Amigos territory a to a territory $p(t)$ pacified at time t or before. Standard errors clustered at the territory level in parentheses.

Table 6. The Effect of the Favela Pacification Program on Drug Arrest

	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	1.034				-1.503
	(2.752)				(2.885)
Amigos dos Amigos*Elevation		1.034			
		(1.011)			
Amigos dos Amigos*Distance Measure			3.811		
			(13.886)		
Amigos dos Amigos(1-11 months)				0.499	
				(3.434)	
Amigos dos Amigos(12-23 months)				1.546	
				(2.280)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.4868	0.4870	0.4868	0.4869	0.5451

Notes: Dependent variable is monthly drug arrest rate per 100,000 inhabitants per territory. Elevation is measured in 100 meters. The distance measure is $\frac{\sum_{p(t)} D_{ap(t)}}{\sum_a \sum_{p(t)} D_{ap(t)}}$ for each t, where $D_{ap(t)}$ is the distance from an Amigos dos Amigos territory a to a territory $p(t)$ pacified at time t or before. Standard errors clustered at the territory level in parentheses.

Table 7. The Effect of the Favela Pacification Program on Gun Arrest

	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	-0.400				-2.826
	(1.907)				(3.584)
Amigos dos Amigos*Elevation		0.136			
		(0.752)			
Amigos dos Amigos*Distance Measure			-3.341		
			(9.421)		
Amigos dos Amigos(1-11 months)				-1.479	
				(2.291)	
Amigos dos Amigos(12-23 months)				0.629	
				(1.887)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.1910	0.1910	0.1910	0.1911	0.2487

Notes: Dependent variable is monthly gun arrest rate per 100,000 inhabitants per territory. Elevation is measured in 100 meters. The distance measure is $\frac{\sum_{p(t)} D_{ap(t)}}{\sum_a \sum_{p(t)} D_{ap(t)}}$ for each t, where $D_{ap(t)}$ is the distance from an Amigos dos Amigos territory a to a territory $p(t)$ pacified at time t or before. Standard errors clustered at the territory level in parentheses.

Table 8. The Effect of the Favela Pacification Program on Warrants of Arrest

	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	-0.593				-0.926
	(0.479)				(1.003)
Amigos dos Amigos*Elevation		-0.139			
		(0.179)			
Amigos dos Amigos*Distance Measure			-2.809		
			(2.366)		
Amigos dos Amigos(1-11 months)				-0.960	
				(0.593)	
Amigos dos Amigos(12-23 months)				-0.242	
				(0.696)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.2461	0.0990	0.0992	0.0994	0.1253

Notes: Dependent variable is monthly warrants of arrest rate per 100,000 inhabitants per territory. Elevation is measured in 100 meters. The distance measure is $\frac{\sum_{p(t)} D_{ap(t)}}{\sum_a \sum_{p(t)} D_{ap(t)}}$ for each t, where $D_{ap(t)}$ is the distance from an Amigos dos Amigos territory a to a territory $p(t)$ pacified at time t or before. Standard errors clustered at the territory level in parentheses.

Table 9. The Effect of the Favela Pacification Program on Car Recovery

	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	0.573				-3.560
	(3.254)				(3.016)
Amigos dos Amigos*Elevation		0.293			
		(1.261)			
Amigos dos Amigos*Distance Measure			1.069		
			(15.574)		
Amigos dos Amigos(1-11 months)				-0.539	
				(2.268)	
Amigos dos Amigos(12-23 months)				1.637	
				(4.331)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.3798	0.3798	0.3798	0.3800	0.5238

Notes: Dependent variable is monthly car recovery rate per 100,000 inhabitants per territory. Elevation is measured in 100 meters. The distance measure is $\frac{\sum_{p(t)} D_{ap(t)}}{\sum_a \sum_{p(t)} D_{ap(t)}}$ for each t, where $D_{ap(t)}$ is the distance from an Amigos dos Amigos territory a to a territory $p(t)$ pacified at time t or before. Standard errors clustered at the territory level in parentheses.

Table 10. The Effect of the Favela Pacification Program on Offenses Caught in the Act

	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	0.331				-2.019
	(1.452)				(2.069)
Amigos dos Amigos*Elevation		0.407			
		(0.458)			
Amigos dos Amigos*Distance Measure			0.406		
			(7.464)		
Amigos dos Amigos(1-11 months)				0.054	
				(1.910)	
Amigos dos Amigos(12-23 months)				0.595	
				(1.240)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.3181	0.3182	0.3180	0.3181	0.3599

Notes: Dependent variable is monthly offenses caught in the act rate per 100,000 inhabitants per territory. Elevation is measured in 100 meters. The distance measure is $\frac{\sum_{p(t)} D_{ap(t)}}{\sum_a \sum_{p(t)} D_{ap(t)}}$ for each t, where $D_{ap(t)}$ is the distance from an Amigos dos Amigos territory a to a territory $p(t)$ pacified at time t or before. Standard errors clustered at the territory level in parentheses.

Table 11. The Effect of the Favela Pacification Program on Resistance Cases

	(A)	(B)	(C)	(D)	(E)
Amigos dos Amigos	-0.118				-0.339
	(0.993)				(1.375)
Amigos dos Amigos*Elevation		0.278			
		(0.334)			
Amigos dos Amigos*Distance Measure			-1.211		
			(4.983)		
Amigos dos Amigos(1-11 months)				-0.120	
				(1.046)	
Amigos dos Amigos(12-23 months)				-0.115	
				(1.121)	
Terrifory fixed effects	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes
Territory trends	No	No	No	No	Yes
Observations	1,184	1,184	1,184	1,184	1,184
R^2	0.1587	0.1588	0.1587	0.1587	0.1951

Notes: Dependent variable is monthly resistance cases rate per 100,000 inhabitants per territory. Elevation is measured in 100 meters. The distance measure is $\frac{\sum_{p(t)} D_{ap(t)}}{\sum_a \sum_{p(t)} D_{ap(t)}}$ for each t, where $D_{ap(t)}$ is the distance from an Amigos dos Amigos territory a to a territory $p(t)$ pacified at time t or before. Standard errors clustered at the territory level in parentheses.

Table 12. Placebo Tests

	October 2007	November 2007	December 2007	January 2008
Amigos dos Amigos	-3.116	-2.069	0.301	0.995
	(1.487)**	(0.902)**	(0.765)	(0.764)
Terrifory fixed effects	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes
Observations	490	490	490	490
R^2	0.2479	0.2475	0.2455	0.2461
	February 2008	March 2008	April 2008	May 2008
Amigos dos Amigos	0.731	1.033	0.349	0.526
	(0.694)	(0.657)	(0.629)	(0.583)
Terrifory fixed effects	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes
Observations	490	490	490	490
R^2	0.2456	0.2457	0.2459	0.2463
	June 2008	July 2008	August 2008	September 2008
Amigos dos Amigos	0.635	0.527	-0.451	0.014
	(0.510)	(0.694)	(0.768)	(0.855)
Terrifory fixed effects	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes
Observations	490	490	490	490
R^2	0.2458	0.2456	0.2456	0.2455

Notes: Dependent variable is monthly homicide rate per 100,000 inhabitants per territory. The treatment variable takes the value 1 for Amigos dos Amigos territories during the period that runs from the month indicated in the column header to October 2008 and 0 otherwise. Standard errors clustered at the territory level in parentheses.
** Significant at the 5-percent level.