Unintended Consequences of Alternative Development Programs: Evidence From Colombia's Illegal Crop Substitution

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UNINTENDED CONSEQUENCES OF ALTERNATIVE DEVELOPMENT PROGRAMS: EVIDENCE FROM COLOMBIA'S ILLEGAL CROP SUBSTITUTION *

Lucas Marín Llanes[▲]

Abstract

While force eradication through aerial spraying has large social costs, there is no evidence of the unexpected consequences of alternative development programs. This paper suggests an unintended effect of the largest crop substitution program in the world on political violence exploiting data on the recent Colombian program. The program's community agreements increased the rate of social leaders' killings by 546 %. My findings suggest a larger effect on municipalities where leaders oppose the expansion of illicit crops, organized crime does not hold consolidated power, different armed groups are present, and land conflicts exist. This paper contributes by providing empirical evidence in support of the hypothesis that policies aimed at reducing illicit crops have unintended consequences for local communities.

JEL Codes: D72, D74, D78

Keywords: Social leaders, Antidrug policies, Political violence, Colombia

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CONSECUENCIAS NO ESPERADAS DE PROGRAMAS DE DESARROLLO ALTERNATIVO: EVIDENCIA DE LA SUSTITUCIÓN DE CULTIVOS DE USO ILÍCITO EN COLOMBIA

Lucas Marín Llanes

Resumen

Mientras que la aspersión aérea tiene altos costos sociales, no hay evidencia sobre consecuencias no intencionadas de programas de desarrollo alternativo. Este artículo sugiere un efecto no esperado del programa de sustitución de cultivos ilícitos más grande del mundo en violencia política a través del reciente programa implementado en Colombia. Los acuerdos comunitarios del programa aumentaron la tasa de asesinatos de líderes sociales en 546%. El efecto está concentrado en municipios en los que los líderes se oponen a la expansión de los cultivos ilícitos, hay presencia de varios grupos armados y existen conflictos de tierras. Este artículo contribuye con evidencia empírica a respaldar la hipótesis sobre las consecuencias adversas en comunidades locales por políticas enfocadas en reducir los cultivos ilícitos.

Códigos JEL: D72, D74, D78

Palabras claves: Líderes sociales, Políticas antidrogas, Violencia política, Colombia

1. Introduction

Alternative development programs surged as a solution to the reduced effectiveness and negative unintended consequences of forced eradication programs, especially those focused on aerial spraying (Abadie et al. 2014; Ávila Ceron, De los Rios-Carmenado, and Martín Fernández 2018; Camacho and Mejía 2017; Dávalos, Sanchez, and Armenteras 2016; Díaz and Sánchez 2004; Van Bruggen et al. 2018; Mejía, Restrepo, and Rozo 2017). These programs attack the structural causes of illicit crops and do not suggest unintended negative effects (Higginson, Mazerolle, and Thompson 2017; Tabares and Rosales 2005; Moya 2005; Ladino, Saavedra, and Wiesner 2019; Mejía, Prem, and Vargas 2019; Lee and Clawson 1993).

This article explores a potential unintended effect on political violence of the recent crop substitution program in Colombia. As a result of the recent peace process between the Government and the Revolutionary Armed Forces of Colombia (FARC, by its Spanish acronym), the National Integrated Program for the Substitution of Illicit Crops (PNIS, by its Spanish acronym) began its implementation in 2017. To date, the PNIS constitutes the largest substitution program in the world. One of its novelties was a community agreement among government delegates, FARC members, and the community, as a prerequisite for the program's implementation in each municipality¹. This agreement represented the willingness of the community to become involved in the program and substitute illicit crops.

This concertation process required the active participation of social leaders. Therefore, community agreements could expose these actors, due to their opposition to organized crime interests, if there was no joint institutional strategy to protect their lives. Coca growers associations involved in the substitution program reported the killings of 56 of their members since the implementation of the PNIS (Gutiérrez *et al.* 2020)². Figure 1 presents the evolution of the annual rate of social leaders' killings by PNIS and non-PNIS municipalities³. The rate evolved similarly in both groups from 2005 to 2016, before the launching of the PNIS (denoted by the red vertical line). A disproportionate increase of social leaders' killings in PNIS municipalities, compared with non-PNIS, is observed after the implementation of the program. Therefore, the

¹ Municipalities in Colombia are political and administrative territorial State divisions. Each municipality has its own democratically elected and independent executive and legislative organs.

² Also, the authors reported qualitative evidence of leaders' testimonies stating the increased exposure of their lives during the implementation of the alternative development program.

³ By PNIS municipality, I mean municipalities where at least one household benefited from the program and community agreements were signed, prior to the implementation of the program.

purpose of this article is to determine if said increase was caused by the crops' substitution program.

Figure 1. Evolution of social leaders' killings rate

The empirical approach uses a unique monthly dataset of social leader's killings at the municipality level, from January 2005 to December 2019, including the exact month in which community agreements were signed in each PNIS municipality⁴. Therefore, this is a novel data set, as it enables to explode cross-sectional and time variations through the PNIS community agreements' signings.

By employing an event study strategy and comparing PNIS municipalities with potential PNIS beneficiaries that were not enrolled in the program, baseline results suggest a positive and statistically significant effect of the PNIS on social leader's killings. Concretely, the PNIS increased the monthly rate of social leaders' killings by 546 %. The program's agreement raised the monthly probability of a social leader's killing by 1.5 percentage points, representing a 167 % increase, considering that the pre-treatment controls mean was 0.9 %. Findings are robust to several specifications and the identification assumptions are likely to be fulfilled in all econometric models.

⁴ These data are reported by a Non-Governmental Organization (NGO), *Somos Defensores*; they were coded by Prem *et al.* (2018) and generously shared with the author. This information is restricted to municipalities in which PNIS has been implemented and where community agreements were signed prior the program's implementation.

I extended the analysis to heterogeneous effects for coca crops acres, armed groups presence, and land restitution processes. PNIS community agreements increased political violence in municipalities with lower and intermediate coca crops and presence of various armed groups⁵. I estimated larger effects in municipalities with land and property conflicts. Therefore, unintended effects were present in municipalities with territorial disputes among armed groups that did not hold complete power, where expectations to expand coca leaf crops existed and political violence had been historically present.

The contribution of this paper is threefold. First, it contributes to the literature on antidrug policies concerning illicit crops, as it reveals the violence costs of alternative development programs. Other antidrug policies, such as aerial spraying, proved to increase homicides, guerrilla-related attacks, and clashes among armed forces (Abadie et al. 2014; Peceny and Durnan 2002; Rozo 2018). The only paper, to the best of my knowledge, that has explored the effect of alternative development programs on violence—measured as the persistence of internal conflict—did not find statistically significant results (Vargas 2012). Therefore, this article contributes to strengthen the evidence of the lack of effectiveness and pragmatism of antidrug policies in attacking illegal crops, instead of focusing on higher levels of participation in the cocaine production chain (Zuleta 2017).

Secondly, this article contributes to the growing literature on political violence suggesting a potential effect of this antidrug policy on political actors. The killing of these actors was a systematic strategy of armed groups to gain territorial control, and their importance is fundamental in peacebuilding contexts (Arjona 2016; Steele 2017; Rodríguez Parra 2017). Moreover, there is evidence of increased violence against social leaders, while other security indicators show sustained decreases. These facts suggest the surge of new political violence dynamics (Ball, Rodríguez, and Rozo 2018; Gutiérrez *et al.* 2020). The causes of these dynamics are not entirely understood, except for the positive effect of the FARC's demobilization on social leaders' killings, due to the purge for territorial control among active armed groups (Prem *et al.* 2018).

Lastly, this paper builds evidence of the unintended consequences of peace agreements and challenges within a peacebuilding context, such as the necessity to implement integrated policies

⁵ Lower and intermediate coca crop municipalities refer to municipalities belonging to the lower and second tertile of coca acres.

in the territory. In this sense, there is no consensus in the literature, because education, labor, and social cohesion peacebuilding programs had mixed effects on violence (Findley 2018). At present, some aspects of the recent peace negotiations in Colombia suggest unintended effects on violence and deforestation (Prem et al. 2018; Prem, Saavedra, and Vargas 2020).

The remainder of this paper is organized as follows: section 2 provides a brief description of the Colombian context in regard to internal conflict and coca crops cultivation; section 3 describes the data employed; section 4 exposes the empirical strategy to estimate the effect of the alternative development program on social leaders' killings; section 5 presents an analysis of the results; section 6 explores municipalities' characteristics as potential mechanisms of the results; and lastly, section 7 discusses the conclusions.

2. The Colombian context

Illicit crops, drugs production, and trafficking have been central issues in the Colombian policy debate for the last four decades. The decline of coca leaf crops in Bolivia and Peru in the nineties resulted in an increased production of this illicit crop—main input in the manufacture of cocaine—in Colombia. This phenomenon, along with the territorial expansion of internal conflict, also resulted in a large increase in coca crops cultivation (Díaz and Sánchez 2004). The United Nations Office of Drug and Crime (UNODC 2019) has classified Colombia as the largest coca leaf producer of the world for several years.

Political violence is a present phenomenon that has lasted over six decades in Colombia. Since the nineties, Colombia has witnessed an intensification of the internal conflict, marked by permanent clashes between left- and right-wing armed organizations and military forces. Prior to the beginning of the peace negotiations between the Colombian government and the FARC guerrilla, this group was the main driver of violence in the country. Internal conflict in Colombia has been responsible for millions of victims, including the internally displaced people who account for more than 8 million victims. The purpose of the peace agreement was to put an end to this type of violence by giving political participation to FARC members and providing reparation to conflict victims. The peace process with the FARC guerrilla began in October 2012 and, as illicit drugs are a determinant of conflict persistence, the fourth point of the peace negotiations' agenda focused on contributing to the solution of the illicit drugs issue (Angrist and Kugler 2008; Mejía and Restrepo 2012).

On May 2014, the Colombian government delegates and the FARC negotiation team released a joint press conference announcing the creation of the PNIS and its implementation once the final agreement was reached. In the fourth point of the Final Agreement, on the one hand, the government committed to implement a program to create incentives for coca crops producers' households to substitute illicit crops with productive licit projects. On the other hand, FARC members committed to provide essential information to the government to facilitate the making of antidrug policies. This program consisted in delivering cash transfers to households, conditional on the voluntary substitution of crops. The program implementation began with a community agreement supporting the community's willingness to substitute the illicit use of crops and it was signed by a delegate of the National Government, a member of the FARC guerrilla, and community members. Those local collective agreements were signed in each of the municipalities that enrolled in the program⁶. After the community agreements, household-level agreements were also signed. However, those municipality beneficiaries who joined the program through these agreements are not considered in the data, as access is restricted to maintain their anonymity. Following the community agreement, the United Nations would provide verification of the crops' substitution and, if achieved, the Government would transfer 36 million Colombian pesos (COP) for each household to finance nutritional stability, capital for a productive project, and technical assistance⁷.

In late 2016, a final agreement between the oldest Latin American guerrilla and the Government was signed. Consequently, at present, the substitution program has been implemented in 55 municipalities⁸. In terms of the effects on coca cultivations, the program has not been effective due to increasing expectations for transfers and because baseline information on coca crops was not taken, which increased incentives to grow the coca leaf (Chouvy 2013; Unlu and Kapti 2012). There is compelling evidence of the anticipatory short-term effects of the PNIS announcement and implementation on coca crops (Ladino, Saavedra, and Wiesner 2019; Mejía, Prem, and Vargas 2019).

⁶ There is an exception in those community agreements pertaining to the municipalities of Putumayo, which signed a regional agreement, instead of several municipality-level agreements.

⁷ This amount is equivalent to approximately 37 times the national minimum wage.

⁸ A relevant precision to make is that the PNIS was also implemented in municipalities where community agreements were not signed. In these municipalities, household level agreements were signed, yet it is not possible to access this information because it is kept confidential in order to protect PNIS beneficiaries. Therefore, the study is limited to municipalities with community agreements and effective PNIS implementation.

Given that the peace agreement had enhanced several policies, the government and the FARC prioritized 170 municipalities to ensure a quick implementation of the reforms. To that end, in these municipalities, the government created a set of Development Programs with Territorial Approach (PDET, by its Spanish acronym), as a planning and management tool to implement programs in accordance with the Final Agreement. The selection of these municipalities was based on four criteria: affected by the armed conflict, presence of illicit economies, high rates of poverty, and weak institutional presence. The selection of PDET municipalities is relevant to the allocation of the PNIS, because being a PDET municipality was one of the criteria that made it possible to benefit from the crops' substitution program.

In parallel with the development of internal conflict and drug trafficking, the killing of social leaders—a phenomenon which is not recent, but subsequent to the peace agreement with the FARC—increased. In this context, social leaders are actors involved in human rights protection in the communities affected by political violence in Colombia. Some municipality characteristics are related to social leaders' killings, such as the existence of illicit crops, former FARC presence, and land restitutions processes (Merizalde Martínez and Ucrós Didier 2018). Additionally, as these leaders had gained power after the FARC's demobilization, they became more exposed to active armed groups as they opposed their interests and expansion (Ball, Rodríguez, and Rozo 2018; Gutiérrez *et al.* 2020; Prem *et al.* 2018). Therefore, this paper contributes in this direction by exploring if there is evidence of a higher risk to social leaderships due to a peace negotiation program within a peacebuilding context.

3. Data

To develop the empirical strategy, I employ data from several sources. Firstly, the reports by *Somos Defensores* are the source of information on social leader's killings⁹. This is a Non-Governmental Organization (NGO) seeking to prevent and protect human rights defenders at risk because of their work protecting communities affected by the internal conflict in Colombia. This NGO created a program to systematize the information on violence against social leaders so as to have evidence of this phenomenon and make the need for their protection visible. The sources of this information system are over 500 human rights organizations present in the

⁹ There are several available sources of information on social leaders' killings in Colombia. However, Gutiérrez *et al.* (2020) handled the data homogeneity among sources, despite their different definitions of social leaderships, by means of a metanalysis. I used the *Somos Defensores*' data because it is the largest panel dataset covering the 2005-2019 period.

territory. Additionally, *Somos Defensores* carries out fieldwork in order to verify that the victims are indeed social leaders. These monthly reports are available from January 2005 to December 2019 and are coded by Prem *et al.* (2018)¹⁰.

This information makes it possible to compute the monthly social leaders' killings rate per 100,000 habitants in each municipality. Moreover, an extensive margin analysis is carried out by employing a dummy variable equals one, if a killing of a social leader occurred in the municipality at least once a month. This probabilistic approach is relevant because it mitigates potential measurement error concerns and controls for municipalities with a high concentration of social leaders' killings.

In terms of the variable of interest, I managed to obtain, through a formal petition to the Territorial Renovation Agency (ART, by its Spanish acronym), monthly municipality information on community agreement signings¹¹. The intuition behind the use of community agreements is that these processes required the active involvement of social leaders to congregate households and to convince them to join the program¹². This active participation exposes social leaders because organized crime considers their actions a threat to their interests in illicit drug trafficking. Therefore, it is possible to exploit monthly data from the *Somos Defensores*' information and build a unique monthly panel data set from January 2005 to December 2019.

Since the PNIS was not randomly assigned, it is fundamental to control, in the econometric estimation for coca crops, other peace agreement programs and institutional capacity, because those were the criteria for the allocation of the program. Coca crops information was taken from the Integrated System for Illegal Crop Monitoring (SIMCI, by its Spanish acronym), a UNODC program. To measure institutional capacity, I employ own municipality fiscal revenue, available from 1983 on an annual basis. The source of the information is the Treasury Consolidator and Public Information (CHIP, by its Spanish acronym) – Unique Territorial Form (FUT by its Spanish

¹⁰ The data was generously shared with the author.

¹¹ Periodically, ART and UNODC publish reports monitoring the PNIS implementation and results, in terms of substitution. There is a difference between the information on those reports, because, in this article, I only consider PNIS municipalities as those in which the program has been implemented and where community agreements were signed. In this paper, those municipalities where community agreements were signed, but PNIS was not implemented, for example, Timbio (Cauca), or where community agreements were not signed, are not included.

¹² Following the community agreements, the ART made individual agreements with each of the beneficiary households in the program. The information from individual agreements is confidential due to its sensitiveness and exploring its effects is beyond the scope of this paper.

acronym). Therefore, it is possible to control for determinants of PNIS allocation, correlated with violent dynamics.

As for information about armed groups' presence, the traditional measure is municipality attacks by different groups. However there are academic disagreements around this variable because, in those municipalities where armed groups have absolute territorial control, attacks or clashes might not occur (Arjona 2016). Therefore, I employ an alternative measure, based on information about municipalities in electoral risk due to armed group presence. This variable is taken from the Electoral Observation Mission (MOE, by its Spanish acronym) which reports this information every electoral year¹³. In consequence, information is available for 2007, 2010, 2011, 2014, 2015, 2016, and 2018. These data have a limitation for time-varying estimations; nevertheless, this information is mainly employed to define subsamples from pre-treatment periods and included in econometric models at a baseline period.

Land conflict is a determinant of internal conflict in Colombia and an intensifying factor of political violence (Albertus and Kaplan 2013; Flores 2014; Lopez-Urbe and Sanchez-Torres 2015). A measure for land property conflicts is land restitution, as it accounts for the legal processes aiming to determine property rights over a field. This information was obtained through the Land Restitution Unit (URT, by its Spanish acronym), which is the governmental institution in charge of dealing with such processes. I acquired the cumulative number for process by municipality until 2019. This information enables the exploration of heterogeneous effects on land restitutions processes, given that PNIS may have larger effects on social leaders' killings in municipalities with a history of political violence.

To develop robustness checks with complementary information, I employ the coca suitability index, a variable reflecting the probability of coca crop presence, conditioned on natural characteristics such as altitude, soil erosion, among others (Mejía and Restrepo 2012)¹⁴. Lastly, I also employ municipalities' characteristics, such as population and municipality area, to normalize the aforementioned information. The Center of Studies on Economic Development (CEDE, by its Spanish acronym), at Universidad de Los Andes, collects this data.

¹³ The MOE employs information from several sources to build its database. Those organizations are Peace and Reconciliation Foundation (PARES, by its Spanish acronym), *Corporación Nuevo Arcoiris* and Conflict Analysis Resource Centre (CERAC, by its Spanish acronym).

¹⁴ This information was also generously shared by one of the authors.

4. Empirical strategy to determine the effect of the crop substitution program on political violence

The empirical strategy employs the timing variation of the PNIS community agreements across beneficiary municipalities. This set allows a difference-in-differences approach, where PNIS municipalities compose the treatment group. Technically, this approach is an event study, because municipalities receive the program in different periods. The baseline econometric specification is defined as follows:

$$y_{m,s} = \mu_m + \mu_s + \delta d_m^s + \beta X_{m,s} + \varepsilon_{m,s} \quad (1)$$

where $y_{m,s}$ is a vector including the social leaders killing's rate per 100,000 inhabitants or a dummy equals 1, if a social leader killing occurred in municipality m during period s ; μ_m and μ_s are municipality and period fixed effects, respectively; d_m^s is a dummy variable that takes the value of 1 from period s in which the community agreement signature took place in municipality m ; $X_{m,s}$ is a covariates matrix including variables such as a dummy variable equals 1, if the municipality is a PDET municipality¹⁵, and baseline characteristics such as the logarithm of coca crops acres, presence of armed groups, and the logarithm of real own fiscal revenues¹⁶ prior to the announcement of PNIS, interacted with year fixed effects; lastly, $\varepsilon_{m,s}$ is the stochastic error term¹⁷.

From these specifications, δ is the difference-in-differences estimator representing the effect of PNIS community agreements on social leaders' killings. To interpret the parameter of interest as causal, a lags and leads model is specified as follows:

$$y_{m,s} = \mu_m + \mu_s + \sum_{s=-K}^{-2} \gamma_s d_m^s + \sum_{s=0}^L \delta_s d_m^s + \omega_{m,s} \quad (2)$$

where K is the number of periods prior to the treatment and L is the number of periods following the treatment, relative to the treatment period. Under this specification, every estimate contained

¹⁵ Through Decree 983 of 2017 the government created PDET municipalities. Therefore, the dummy variable included in the covariates' matrix equals 1 from June 2017 onwards.

¹⁶ Real own fiscal revenues are normalized to 2018 prices.

¹⁷ Every econometric specification clusters errors at the municipality level.

in γ_s must be statistically insignificant to have evidence of the potential fulfillment of the parallel trend assumption, and δ_s represent the dynamic effects of the treatment.

The central aspect of the methodology is to determine the control group, more precisely the municipalities with which it is theoretically and technically reasonable to compare the treatment group. Intuitively, it is not reasonable to compare it with the rest of the country's municipalities, as PNIS municipalities are systematically different due to the presence of illicit crops. Even if difference-in-differences allows pre-existing systematic differences among control and treatment groups, defining the control group as the rest of municipalities could lead to an overestimated effect. In PNIS municipalities, political violence could increase over time due to structural characteristics such as illicit crop presence. Therefore, the slope of the social leaders' killings rate should be larger in the treatment group, thus defining the counterfactual, since the rest of municipalities could lead to a positively bias estimate. In consequence, I define the control group as municipalities with coca crops presence, but which are not beneficiaries of the program through community agreements, as this characteristic is a structural difference among Colombian territories.

Recalling, on May 2014, the Government delegates and FARC members announced in a joint press release the creation of the PNIS once a final agreement was reached, and there is evidence of an anticipatory effect leading to an increase on coca crop cultivation as a result of this PNIS announcement (Mejía, Prem, and Vargas 2019). Hence, to determine the municipalities included in the counterfactual, I chose municipalities with coca leaf crops prior to the PNIS announcement in order to maintain the independence from the anticipatory effect. All municipalities included in the sample were potential PNIS beneficiaries, given that they were municipalities with illicit crops. Then, the treatment group is a subset of potential PNIS beneficiaries. Formally, the municipalities included in the sample accomplish the following restriction:

$$coca\ crops_{m,2013} > 0 \text{ or } PNIS = 1$$

This decision criterion is fundamental for the empirical strategy for two reasons. Firstly, it proves that PNIS anticipatory effect was transversal to the country, as beneficiary municipalities were not announced before 2013, period in which I define control group's municipalities. Secondly, the identification assumption is likely to be fulfilled, as the municipalities in the sample were potential beneficiaries of the program with similar structural characteristics; implying that the

rate of social leaders' killings could evolve similarly before the implementation of the policy, in both groups.

As mentioned in previous sections, a main criterion to benefit from the alternative development program was to inhabit in a PDET municipality. In addition to this, Decree 896 of 2017 prioritized municipalities with a high density of illicit crops, located within a Natural Park, or being in the transitional penal system. These formal criteria gave margin to policy makers to select municipalities with these characteristics. However, not every PDET, nor every coca producing municipality, benefited from the substitution program. In the selection process, other factors were considered, such as the former presence of FARC—as it reduced the difficulties to uphold conversations with local communities—timing and budgetary restrictions, and political negotiations between government and FARC delegates¹⁸. Therefore, conditional to coca crops presence, the selection of 55 PNIS municipalities from a set of 195 potential beneficiaries responded to political, budgetary, and timing restrictions that are exogenous to local political violence dynamics. In order to control for potential confounders on the selection of PNIS municipalities, the model includes the density of coca crops, the presence of armed groups, the municipality institutional capacity, the implementation of PDET, and municipality and time-fixed effects, to control for unobservable municipality characteristics and to enable flexible political violence time trends, respectively.

A potential threat to the identification strategy is the endogeneity of the community agreements signature. It is possible that the PNIS was implemented in municipalities in which the dynamics of social leadership were different from those of non-PNIS municipalities. An ideal empirical test to prove this hypothesis would be to determine the spatial distribution of social leaders. Unfortunately, there is no information about a social leaders' census in Colombia, as classifying individuals in this category is a challenging task and there is no consensus among institutions. However, besides the community agreements, the selection of PNIS municipalities was also based on political, economic, and timing restrictions that are exogenous to the dynamics of social leaders' killings. Moreover, political violence against social leaders is concentrated in municipalities affected by internal conflict and with illicit economies (ACNUDH 2020). This evidence does not suggest a homogenous distribution of social leaderships in the municipalities

¹⁸ In a recent public audience with the Colombian Government, the lead Government functionary for the PNIS assured that among the limitations for the expansion of the program were the financial restrictions (Political Control Debate – Second Constitutional Commission, 2:51:00).

included in the sample, however, it implies that violence against these actors is concentrated in municipalities both on the control and treatment groups. Nevertheless, as it is not empirically possible to test this, results must be interpreted with caution due to this potential threat to the empirical strategy¹⁹.

Table 1 presents municipality characteristics for the baseline sample, including non-PNIS municipalities with coca crops presence in 2013, and PNIS beneficiary municipalities. These results suggest both higher probability and rate of social leaders' killings in PNIS municipalities. Furthermore, these municipalities have larger areas of coca crops and higher own fiscal revenues.

Table 1. Municipality characteristics in 2013

	Non-PNIS municipalities		PNIS municipalities		Mean difference (p-value)
Variables	Observations	Mean (St. deviation)	Observations	Mean (St. deviation)	
Monthly data					
Social leaders' killings rate (per 100,000 inhabitants)	1,680	0.022 (0.315)	660	0.079 (0.627)	-0.057*** (0.004)
Social leaders' killings (=1 if at least one annual killing)	1,680	0.009 (0.094)	660	0.024 (0.154)	-0.015*** (0.004)
Annual data					
Coca crops acres (normalized by total municipality area)	140	96.589 (196.212)	55	244.87 (395.851)	-148.281*** (0.001)
Armed groups presence	140	0.421 (0.496)	55	0.382 (0.490)	0.040 (0.615)
Neo-paramilitary presence	140	0.171 (0.378)	55	0.164 (0.373)	0.008 (0.897)
Left-wing group presence	140	0.314 (0.466)	55	0.255 (0.440)	0.060 (0.414)
Own fiscal resources (logarithm, constant millions COP)	140	5.903 (2.102)	55	6.811 (1.293)	-0.908*** (0.003)

*** p<0.01, ** p<0.05, * p<0.1

In figure 2, I present the evolution of the monthly rate of social leaders' killings. In terms of the

¹⁹ The ideal robustness test to strengthen the results would be to estimate the effect of community agreements within PNIS municipalities and explode the timing variation of the agreements by municipality. This empirical approach was not possible due to the fact that there is not enough statistical power because the sample is strongly reduced and there is not sufficient time variation among community agreements.

empirical strategy, this figure is suggestive because, prior to the red vertical line representing the first community agreement, the social leaders' killings rate evolved parallelly in PNIS and non-PNIS municipalities. However, after the red line, a divergency in the social leaders' assassinations rate is straightforward. Therefore, this figure is compelling in that it determines an increase in political violence in PNIS municipalities after the signature of community agreements, in comparison with non-beneficiary municipalities.

Figure 2. Monthly evolution of social leaders' killings rate

5. Results

5.1. Main results

Table 2 presents results of equation (1) including, as dependent variables, the rate or the probability of a social leader's killing. These results suggest a positive and statistically significant effect of PNIS on social leaders' killings rate and probability. In the case of the continuous model, PNIS community agreements seem to raise in average the monthly rate in 0.142 killings per 100,000 inhabitants. This estimate implies an approximate 546 % increase in the social leaders' killings rate, compared with the pre-treatment mean. For the probabilistic model, results are also disturbing inasmuch as PNIS implementation incremented the annual probability of social leader

killings by 1.5 percentage points. This effect points out a 167 % increase in the probability of a social leader killing. These results are consistent with previous evidence suggesting the increased risk of leaders, as armed groups opposed the expansion of the program and aimed to kill social leaders in those territories (Gutiérrez *et al.* 2020).

Table 2. Monthly impact of community agreements on social leaders' killings

VARIABLES	Monthly data	
	Social leaders' killings rate	Dummy variable of social leaders' killings
PNIS community agreement	0.142*** (0.049)	0.015** (0.007)
Pre-PNIS coca crops and own fiscal revenue	✓	✓
Pre-PNIS armed groups presence	✓	✓
PDET	✓	✓
Municipality fixed effects	✓	✓
Month fixed effects	✓	✓
Pre-treatment controls mean	0.026	0.009
Observations	35,100	35,100
R-squared	0.022	0.040

Standard errors, clustered by municipality, are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

This monthly dataset requires more restrictive assumptions due to the large number of periods prior to the signature of the agreements. The larger the number of periods prior to the treatment, the more likely it is to find a period during which the treatment was statistically significant. Panel 1 suggests that, without community agreements, the evolution of social leaders' killings would evolve in a similar trend before the signing of the agreement, since there are no statistically significant parameters prior to the treatment period. Hence, the results presented in table 2 could be interpreted as causal effects, if treatment allocation is effectively exogenous to social leaders' dynamics.

Additionally, these figures suggest that the positive effect of community agreements is driven by the first periods after the signature. These dynamics suggest a short-term positive effect of the crop substitution program on political violence, insomuch as some periods following the

agreement's signing show that the magnitude of the effect is similar to the pre-treatment effects.

Panel 1. Parallel trend assumption in monthly models

1.A. Continuous model

1.B. Probabilistic model

5.2. Robustness

A question may arise regarding the impact of the sampling criterion on the estimated effects. Therefore, I defined the sample in different ways, in order to show that the results are robust and independent from the sampling criterion. Firstly, I present robustness checks by moving the period backwards through to 2005 in which coca crops municipalities were selected. I also added, not only the municipalities with coca crops in 2013, but those municipalities with illicit crops in at least one period between 2005 and 2013. Therefore, these additional sampling criteria determine that the results are independent from the year in which control municipalities were chosen. Results of these models are presented in Appendix A. For the models employing different years to define the sample, the effect varies between 496 %-569 % and 156 %-178 % for rate and probability, respectively.

Moreover, econometric models were estimated by aggregating the information at the quarterly level. This test suggests that the main results are not sensible to the level of temporal aggregation of the data. These results are presented in Appendix B.

Thirdly, the baseline models were run with exogenous characteristics taken from the coca suitability index. I include in the sample municipalities above the 3rd quartile of probability of

having coca crops. Table 3 presents results for the sample including these municipalities²⁰. Therefore, in this specification, the comparison is made between PNIS municipalities and potential coca grower municipalities, based on natural characteristics such as the altitude and soil erosion, among other natural characteristics. This robustness test enables to determine the consistency of the results with a control group composed of municipalities with a large exogenous probability of coca crops presence and not based on actual presence that may be less exogenous. These results suggest a positive and statistically significant effect of PNIS community agreements on social leaders' killings. By employing this sample, community agreements increased the social leaders' killings rate by 919 %.

Lastly, I only include in the sample those PDET municipalities with coca crops prior to the announcement of the substitution program. Thus, this sample includes municipalities which have similar characteristics, such as illicit crop presence, high poverty rates, weaker institutional capacity, and have been historically affected by the civil conflict, in which the difference between treatment and control groups is the allocation of PNIS. The second and third column of table 3 present results for this sample. Consequently, these findings suggest a result consistent with those of the baseline models, given that positive and significant effects were found.

Table 3. Robustness checks results of community agreements on social leaders' killings

VARIABLES	Suitability above the 3rd quartile	PDET	
	Rate	Rate	Probability
PNIS	0.147* (0.086)	0.119** (0.052)	0.015* (0.008)
Pre-PNIS coca crops and own fiscal revenue	✓	✓	✓
Pre-PNIS armed groups presence	✓	✓	✓
PDET	✓		
Municipality fixed effects	✓	✓	✓
Month fixed effects	✓	✓	✓
Pre-treatment controls mean	0.016	0.036	0.014
Observations	58,188	21,780	21,780
R-squared	0.019	0.029	0.045

²⁰ Estimation of the baseline model for the probability of a social leader's killing with the suitability sample was not possible because there is not enough variation in the outcome and the econometric model does not have enough statistical power to estimate the parameters.

Standard errors, clustered by municipality, are in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

In this case, it is also fundamental to approximate the accomplishment of the identification assumption. Appendix C evidences the potential fulfillment of the parallel trend assumption for the three models presented in the previous table and there is no statistically significant estimate prior to the signature of any community agreement.

Since it was possible to determine the positive effect of this alternative development program on political violence against social leaders, I explored some mechanisms to explain these results in more depth.

6. Mechanisms

To deepen the understanding of current political violence in Colombia, I test three potential mechanisms in order to explain the economic and statistically positive effect of the program's community agreements on social leaders' killings: i) coca crops cultivation; ii) armed groups presence; and iii) land restitution processes. In the case of coca crops' heterogenous effects, the underlying intuition consists in expecting larger effects of the alternative development program on municipalities with larger coca crops, considering that there are more resources at stake. In terms of armed groups presence, it is likely that the competition dynamics among these groups would lead to higher violence against those social leaders who are promoting the implementation of the program. Lastly, since agrarian conflicts are at the roots of the Colombian civil conflict, I test whether this program has larger effects on municipalities historically affected by political violence (Albertus and Kaplan 2013; Flores 2014; Lopez-Urbe and Sanchez-Torres 2015).

For the two first mechanisms, I ran equation (1) for different subsamples. To determine the samples to estimate equation (1), I computed the total area of coca crops from 2005 to 2013 and built coca crops terciles. Therefore, the econometric model was estimated with municipalities with reduced areas of coca crops (1st tercile), intermediate areas (2nd tercile) and large areas (3rd tercile). To control for municipality's area heterogeneity, I normalized the coca crops area with the municipality surface.

In table 4, I illustrate the heterogenous effects driven by the coca crops area. The average effect on the continuous model is driven by municipalities on the lower terciles. These findings point out a 0.12 increase in social leaders' killings rate and an increase in 2.3 percentage points in the

municipalities of the second tercile. The magnitude of these effects is large, taking into account the mean prior to PNIS implementation of 0.026 and 0.1 % for the rate and the probability of a killing, respectively. In the lowest tercile municipalities, the PNIS seems to increase the social leaders' killings rate by 3433 %.

Table 4. Heterogenous effects by coca crops area

VARIABLES	Social leaders' killings rate			Social leaders' killing probability		
	1 st coca crops tertile	2 nd coca crops tertile	3 rd coca crops tertile	1 st coca crops tertile	2 nd coca crops tertile	3 rd coca crops tertile
PNIS community agreement	0.206*	0.116*	0.063	0.012	0.023*	0.017
	(0.118)	(0.061)	(0.062)	(0.011)	(0.012)	(0.011)
Pre-PNIS coca crops and own fiscal revenue	✓	✓	✓	✓	✓	✓
Pre-PNIS armed groups presence	✓	✓	✓	✓	✓	✓
Municipality fixed effects	✓	✓	✓	✓	✓	✓
Month fixed effects	✓	✓	✓	✓	✓	✓
Pre-treatment controls mean	0.006	0.026	0.057	0.004	0.010	0.017
Observations	12,420	12,420	12,420	12,420	12,420	12,420
R-squared	0.027	0.027	0.036	0.033	0.047	0.050

Standard errors, clustered by municipality, are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

According to Mejía and Restrepo (2012), there is a positive effect of coca crops value on violence. Therefore, at first glance, this mechanism may lead to expect larger effects in municipalities with larger coca cultivations, given that more resources are at stake. Therefore, these results could be counterintuitive because the largest effect was expected on the third tercile. However, this evidence is compelling, as it forwards the argument that social leaders' killings are not mainly driven by coca crops presence. Additionally, figure 3 presents the evolution of coca crops by tertiles. It is evident that the increase in total coca crop cultivation has been driven by the increase in the top tercile municipalities. Organized crime has not met opposition nor barriers in those regions to expand illicit use crops. This could be due to their large power and territorial control in municipalities in the upper tercile. In contrast, in the second and first tertiles, coca crops do not seem to have large variations in time, except for the period 2014 through 2017,

year in which the PNIS started its implementation nationwide. Groups interested in coca crops expansion may see these municipalities as an opportunity to increase cultivations, considering that, in the 3rd tertile municipalities, coca crops cannot be expanded because illicit crops occupy a large share of the municipality's area as a whole. Furthermore, the power of organized crime over 1st and 2nd tertile municipalities may not be as strong as in 3rd tertile municipalities and social leaders may compete with these groups in these regions.

Figure 3. Coca crops evolution by tertiles

This interpretation is consistent with previous studies that refer to political competition as a driver to increase violence, given that armed groups operate in some regions as political actors (Chacón, Robinson, and Torvik 2011). Also, since 3rd tertile municipalities may have lower quality institutions, it is likely that civilians would pose less opposition to armed groups, while in municipalities with better quality institutions, less civilians would be willing to cooperate with armed groups (Arjona 2016). This intuition could partially explain that, in municipalities with low and intermediate coca crops, which have better quality institutions than those with a high number of illicit crops, there is a stronger opposition to armed groups' interests from social leaders.

In the case of armed group presence, I ran equation (1) for three subsamples. The first one consists of a sample including municipalities in which neo-paramilitary groups were present in 2011, which is the year prior to the peace process announcement. Secondly, the subsample included municipalities where a left-wing guerrilla was present in 2011. With these estimations it is possible to explore heterogenous effects conditioned on the presence of armed groups and depending on their political orientation. Lastly, I estimated equation (1) for a subsample of municipalities, where both left- and right-wing armed groups were present. This subsample could reflect the heterogenous effect in those municipalities where armed groups contend for territorial control (Prem *et al.* 2018)²¹.

Table 5 presents findings for municipalities with presence of left- and right-wing armed groups, and municipalities with presence of both groups. There are not heterogenous effects by group presence on the rate of social leaders' killings. Upon exploring the right side of the table, the differential effect on social leaders' killing probability becomes evident. These results suggest a positive and significant effect of the PNIS community agreements on social leaders' killing probability in municipalities with presence of both groups. The PNIS community agreements increased the probability of a social leader being killed by 424 % in municipalities with presence of both armed groups²². Likewise, a positive effect is found in municipalities with presence of neo-paramilitary groups. However, the magnitude and statistical confidence are small, in comparison with estimations in municipalities with competing armed groups.

Table 5. Heterogeneous effects by armed groups presence

VARIABLES	Social leaders' killings rate			Social leaders' killing probability		
	Neo-paramilitary	Left wing group	Both groups	Neo-paramilitary	Left wing group	Both groups
PNIS community agreement	0.171 (0.115)	0.089 (0.087)	0.441 (0.337)	0.058* (0.030)	0.034 (0.021)	0.212*** (0.018)
Pre-PNIS coca crops and	✓	✓	✓	✓	✓	✓

²¹ These models do not include all variables included in the covariance matrix of equation (1), since there is a reduced number of municipalities under these specifications. The only control variable included is the dummy variable associated with PDET municipalities.

²² In quarterly aggregation models, presented in Appendix B, there is a positive and statistically significant effect of left-wing and right-wing groups on social leaders' killings. However, the magnitude of the effects computed in municipalities with presence of both groups is more than 3 times larger than that of municipalities with presence of a single armed group. Therefore, the effects of the substitution program on political violence are more intense in municipalities with presence of armed groups' competition.

own fiscal revenue						
Municipality fixed effects	✓	✓	✓	✓	✓	✓
Month fixed effects	✓	✓	✓	✓	✓	✓
Pre-treatment controls mean	0.057	0.057	0.124	0.032	0.019	0.050
Observations	6,300	10,620	2,160	6,300	10,620	2,160
R-squared	0.053	0.033	0.091	0.064	0.052	0.147

Standard errors, clustered by municipality, are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Social leaders are at higher risk in regions where armed groups contend for territorial control. These results are aligned with previous studies suggesting that armed groups do not necessarily attack civilians when they have territorial control; instead, they opt to rule and establish new social orders (Arjona 2009). Therefore, in municipalities where an armed group has gained territorial control, it is likely that social leaders would not have the possibility to oppose their actions. Additionally, domination and coercion are frequent in contexts where there is competition among armed groups (Metelits 2009; Arjona 2010). So, in municipalities with presence of both groups, where no one actor holds enough power, social leaders have higher participation and, hence, strong battles for territorial control take place among groups. These findings are consistent with recent literature on social leaders' killings, such as Prem *et al.* (2018), who point out the struggle for territorial control in territories with former FARC presence as a mechanism to increase social leaders' killings.

Agrarian conflicts over the land have been a fundamental determinant of internal conflict in Colombia (Albertus and Kaplan 2013; Flores 2014; Lopez-Urbe and Sanchez-Torres 2015). Moreover, agrarian conflicts are also related to a poor definition of property rights and weak state capacity. In those municipalities, political violence is more recurrent and social leaders are more exposed due to the low capacity of formal institutions. Consequently, the expected effect of the PNIS on social leaders' killings is stronger in municipalities with these characteristics. Therefore, I include an interaction term in equation (3), specified as follows:

$$y_{m,s} = \mu_m + \mu_s + \delta d_m^s + \theta d_m^s * R_m + \beta X_{m,s} + \varepsilon_{m,s} \quad (3)$$

where R_m is a dummy variable that takes the value of 1, if municipality m experienced at least one land restitution process by the end of 2019. Therefore, θ is interpreted as the marginal effect

of community agreements on social leader's killings in municipalities with agrarian conflict problems, measured through land restitution processes.

In table 6, results suggest a marginal positive effect of municipalities with land restitution processes in the probability of a social leader's killing. Like previous results, the magnitudes of the effects are non-negligible, bearing in mind that the pre-treatment mean of probability is 1.1 %. Results indicate a marginal 2.7 percentage points increase in the likelihood of a social leader killing in municipalities with land restitution processes due to PNIS community agreements.

Table 6. Heterogenous effects by municipalities with land restitution processes

VARIABLES	Monthly data	
	Social leaders' killings rate	Social leaders' killing probability
PNIS community agreement	0.130** (0.053)	0.006 (0.006)
PNIS community agreement * Land restitution processes	0.037 (0.081)	0.027* (0.015)
Pre-PNIS coca crops and own fiscal revenue	✓	✓
Pre-PNIS armed groups presence	✓	✓
Municipality fixed effects	✓	✓
Month fixed effects	✓	✓
Pre-treatment controls mean	0.044	0.011
Observations	35,100	35,100
R-squared	0.022	0.041

Standard errors, clustered by municipality, are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

7. Conclusions

This article explores the potential effect of an alternative development program on political violence in Colombia, employing an event study methodology, in which the treatment group consists of the PNIS beneficiary municipalities and the control group includes non-PNIS coca growers' municipalities. Due to the peace agreement between the Government and the oldest

Latin American guerrilla, in 2014, the negotiation parties released the announcement of the implementation of an illicit crop substitution program. A central aspect of this policy is the concertation through a community agreement representing the community's willingness to substitute illicit crops and to participate in the design and implementation of the program.

I employ data on social leaders' killings to measure this type of violence, considering that these persons are defenders of human rights in communities affected by political violence in Colombia. Results from the baseline model suggest a 546 % increase on the monthly rate of social leaders' killings and a 167 % increase in the probability of a killing due to the community's agreement to implement the program. These results are consistent with several specifications, sampling decisions criteria, and to quarterly aggregations.

Heterogeneous effects were found for coca crops areas, armed groups presence, and land restitution processes. For coca crop cultivations, the average effect on the treated is driven by municipalities with low and intermediate coca crops. Competition for local power between social leaders and organized crime causes an increase in political violence against social actors (Arjona 2016; Chacón, Robinson, and Torvik 2011). Then, for the case of armed groups presence, the effect concentrates in municipalities with presence of both left- and right-wing armed groups. These findings are consistent with previous evidence, as the competition among armed groups may lead to local leaders' coercion and dominance (Metelits 2009; Prem *et al.* 2018; Arjona 2010). Lastly, I found evidence of a larger effect of PNIS on social leaders' killings in municipalities with land restitution processes. These findings relate to the central role of land and agrarian conflicts as the origin of Colombian political violence (Albertus and Kaplan 2013; Flores 2014; Lopez-Uribe and Sanchez-Torres 2015).

Overall, these results must be analyzed in depth as the country goes through a peacebuilding period after more than five decades of internal conflict caused by political violence. These results demand deep attention from policy makers, because they suggest a surge of violence dynamics against political actors. Likewise, concrete actions to protect social leaders in violent regions are required to end this trend, given that it represents a threat to political participants and it menaces the fundamental role of social leadership in a peacebuilding context (Arjona 2016; Ball, Rodríguez, and Roza 2018).

Participative policies must be implemented in order to understand heterogeneous contexts within a country and to better fit this heterogeneity, especially regarding illicit crops issues. The PNIS

and further crop substitution programs should include an integrated approach, including the active protection of leaders and their communities. The integrated approach and regionally oriented policy designs could mitigate the alteration of violence dynamics and reduce the exposure of social leaders. These policies require the active presence and coordination of governmental institutions in the territory in order to protect social leadership (Rodríguez Parra 2017; Gutiérrez *et al.* 2020). If the community and leaders' integrity is not ensured through integrated institutional presence, policy's results will not be achieved, social leaderships will be deterred, and peacebuilding will be put at risk.

The results contribute to build robust evidence of the effect of crop substitution programs on violent dynamics. However, this methodology does not allow to establish a counterfactual for estimating results, if the PNIS has been implemented without community agreements. Therefore, further research should focus on testing these hypotheses with different alternative development programs, such as *Formalizar para sustituir*, also currently taking place in Colombia. With those estimations, it would be possible to determine if some particularities of the PNIS design guide the effects on political violence, or if the effects are transversals to alternative development programs. Moreover, a differential community focus could be relevant in further studies, considering that coca crop expansion took place in special indigenous and Afro-Colombian regions (Erasso and Vélez 2020). Therefore, it is necessary to test whether minority ethnic communities are at a higher risk with the implementation of these policies. An additional aspect of further research should focus on the government's role in the implementation of these policies. As presented in previous sections, it seems that the effect of the PNIS community agreements on political violence is present in the short-term. There are many possible explanations for these results that could range from characteristics of the program that expose social leadership only in proximate periods to disincentivized social leadership following the increases in violence. Efforts to determine mechanisms to explain this short-run effects should be the aim of subsequent articles.

Furthermore, to the best of my knowledge, this is the first paper to explore the relationship of a crop substitution program with political violence dynamics and that provides important insights about this association. Hence, it points towards fundamental unintended consequences that this type of policies must consider when facing similar decisions regarding the substitution of illicit crops. In terms of antidrug policies, this article builds concrete evidence on the social costs of

these policies and demands a rethinking of alternative development programs, given that this evidence suggests that these programs expose political actors, if no institutional efforts are made to protect them and their fundamental rights.

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9. Appendix

9.1. Appendix A: Robustness checks with different sampling criteria

Table A.1. Econometric results with municipalities with coca crops in at least one period

VARIABLES	Month	
	Social leaders' killing's rate	Social leaders' killing probability
PNIS community agreement	0.142*** (0.048)	0.015** (0.007)
Pre-PNIS coca crops and own fiscal revenue	✓	✓
Pre-PNIS armed groups presence	✓	✓
PDET	✓	✓
Municipality fixed effects	✓	✓
Month fixed effects	✓	✓
Observations	48,060	48,060
R-squared	0.017	0.037

Standard errors, clustered by municipality, are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.2. Econometric results changing the year to define the sample's municipalities

Variables	2005		2006		2007		2008		2009		2010		2011		2012	
	Rate	Prob.	Rate	Prob.	Rate	Prob.	Rate	Prob.	Rate	Prob.	Rate	Prob.	Rate	Prob.	Rate	Prob.
PNIS	0.129** (0.050)	0.014* (0.007)	0.130** * (0.049)	0.016** (0.007)	0.134** * (0.048)	0.015** (0.007)	0.130** * (0.048)	0.015** (0.007)	0.148** * (0.049)	0.014** (0.007)	0.132** * (0.048)	0.014** (0.007)	0.137** * (0.048)	0.014** (0.007)	0.136** * (0.048)	0.014** (0.007)
Pre-PNIS coca crops and own fiscal revenue	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pre-PNIS armed groups presence	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDET	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Municipalit y fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Month fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observatio ns	32,760	32,760	34,560	34,560	33,660	33,660	35,460	35,460	37,260	37,260	35,460	35,460	36,000	36,000	36,360	36,360
R-squared	0.027	0.043	0.027	0.043	0.025	0.042	0.025	0.042	0.019	0.041	0.024	0.041	0.022	0.042	0.023	0.040

Standard errors, clustered by municipality, are in parentheses
*** p<0.01, ** p<0.05, * p<0.1

9.2. Appendix B: Robustness checks employing quarterly data

Figure B.1. Quarterly evolution of social leaders' killings rate

Table B.1. Quarterly impact of community agreements on social leaders' killings

VARIABLES	Monthly data	
	Social leaders' killings rate	Dummy variable of social leaders' killing
PNIS community agreement	0.411*** (0.142)	0.035* (0.018)
Pre-PNIS coca crops and own fiscal revenue	✓	✓
Pre-PNIS armed groups presence	✓	✓
PDET	✓	✓
Municipality fixed effects	✓	✓
Quarter fixed effects	✓	✓
Pre-treatment controls mean	0.078	0.025
Observations	11,700	11,700
R-squared	0.056	0.101

Standard errors, clustered by municipality, are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Panel B.1. Parallel trends assumption in quarterly models

A.1. Continuous model

A.2. Probabilistic model

Table B.2. Heterogenous effects by coca crops area

VARIABLES	Social leaders' killings rate			Social leaders' killing probability		
	1st coca crops tertile	2nd coca crops tertile	3rd coca crops tertile	1st coca crops tertile	2nd coca crops tertile	3rd coca crops tertile
PNIS community agreement	0.595*	0.338*	0.182	0.035	0.064*	0.036
	(0.345)	(0.176)	(0.178)	(0.030)	(0.033)	(0.026)
Pre-PNIS coca crops and own fiscal revenue	✓	✓	✓	✓	✓	✓
Pre-PNIS armed groups presence	✓	✓	✓	✓	✓	✓
PDET	✓	✓	✓	✓	✓	✓
Municipality fixed effects	✓	✓	✓	✓	✓	✓
Quarter fixed effects	✓	✓	✓	✓	✓	✓
Pre-treatment controls mean	0.017	0.079	0.171	0.012	0.030	0.038
Observations	4,140	4,140	4,140	4,140	4,140	4,140
R-squared	0.055	0.052	0.073	0.071	0.096	0.112

Standard errors, clustered by municipality, are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B.3. Heterogeneous effects by armed groups presence

	Social leaders' killings rate	Social leaders' killing probability
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VARIABLES	Neo-paramilitary	Left wing group	Both groups	Neo-paramilitary	Left wing group	Both groups
PNIS community agreement	0.492 (0.330)	0.251 (0.240)	1.238 (0.947)	0.131* (0.066)	0.080* (0.047)	0.448*** (0.037)
Pre-PNIS coca crops and own fiscal revenue	✓	✓	✓	✓	✓	✓
PDET	✓	✓	✓	✓	✓	✓
Municipality fixed effects	✓	✓	✓	✓	✓	✓
Quarter fixed effects	✓	✓	✓	✓	✓	✓
Pre-treatment controls mean	0.172	0.170	0.372	0.077	0.044	0.100
Observations	2,100	3,540	720	2,100	3,540	720
R-squared	0.080	0.070	0.123	0.134	0.115	0.259

Standard errors, clustered by municipality, are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B.4. Heterogenous effects by municipalities with land restitution processes

VARIABLES	Quarterly data	
	Social leaders' killings rate	Social leaders' killing probability
PNIS community agreement	0.375** (0.158)	0.013 (0.019)
PNIS community agreement * Land restitution processes	0.109 (0.234)	0.065* (0.037)
Pre-PNIS coca crops and own fiscal revenue	✓	✓
Pre-PNIS armed groups presence	✓	✓
PDET	✓	✓
Municipality fixed effects	✓	✓
Quarter fixed effects	✓	✓
Pre-treatment controls mean	0.241	0.054
Observations	11,700	11,700
R-squared	0.056	0.103

Standard errors, clustered by municipality, are in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

9.3. Appendix C: Parallel trends assumption in robustness checks models

Figure C.1. Lags and leads specification for suitability index model

Panel C.1. Lags and leads specification for PDET models

A.1. Continuous model

A.2. Probabilistic model