

Plan Colombia's Onset: Effects on
Homicides and Violent Deaths

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Plan Colombia's Onset: Effects on Homicides and Violent Deaths*

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Abstract

In this paper I explore the potential link between Plan Colombia and violence with a new perspective. I focus the analysis only on the first three running years of the program (2000-2002) in order to avoid the overlapping effect with a security policy started in 2002/2003. This paper exploits the differential in the success of the program among the different regions to identify the potential side effects on homicides and violent deaths. Results show that, although consistently negative estimates, no-significant effects are observed on homicides. On the other hand, I found evidence of increases in the number of violent deaths for women living in urban areas, and an opposite negative effect for men living in rural areas. These findings are fully consistent across different specifications of the model, the cut-off end of the program, and the classification of the regions' criteria.

Keywords: Homicides; regional analysis; Plan Colombia.

JEL-Classification: R10, H5, K1.

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I. Introduction

Historically, the relation between security policies and crime has been of great interest for a number of disciplines. Becker (1968) on the one hand, and Ehrlich (1974) on the other, both offer analyses where criminals take the decision of committing crimes based on the potential benefits and the probability of receiving punishment in terms of apprehensions and/or monetary compensations to society. It was only until recently that the increased availability of data and the new methodologies have enabled to unravel the elusive relationship between security policies – in terms of increased financial and human resources – and crime rates.¹

Most of the literature has focused on either developed countries or on the impact of security measures adopted for fighting criminal activities in urban areas (see Di Tella and Schargrodski, 2004 for Argentina, Klick and Tabarrock, 2005 for Washington D.C., Machin and Marie, 2005 for England and Wales, and Draca et al., 2009 for London).² Not many works deal with these issues in developing countries, which are usually prone to face both a wider range of criminal actors as well as higher levels of crime as such. Colombia, in particular, has been of major interest because of the coexistence of the world's oldest guerrilla group, the drug producers and dealers, and paramilitaries, as well as urban gangs. Over the past three decades these criminals and their actions have mutated to survive despite the actions of the authorities.

¹ Cameron (1988) shows how during some decades researchers were handcuffed by the intention to resolve the dilemma on the existence of a relationship between police presence and crime, as well as the direction of this causality.

² All these works also tried to deal with the causality problem between police presence and crime levels through quasi-experiment strategies taking advantage, in most of the cases, of terrorist actions.

In this paper I analyze the effects of Plan Colombia program on homicides and other types of violent deaths.³ A key feature is that the policy seems to have had disproportionate effects across the different coca producing departments. Under these conditions I consider some strategies to look at homicides and violent deaths in those departments with high-coca-destruction relative to low-destruction and non-producer ones before and after the implementation of the program.

Within the most recent studies for Colombia it is worth mentioning Angrist and Kugler (2008), Barón (2008) and Pérez (2012a,b), all of them looking at quasi-experiments to circumvent the corresponding endogeneity problems. Angrist and Kugler address the causal relationship between the increase in coca cultivation in the early nineties and violence, as well as the potential effects on the labour market in the rural areas. They classify the treatment and control groups of departments according to the 1,000 hectares threshold under cultivation, and find consistent evidence supporting the fact that more coca production ends up with more violent deaths since coca supports organized criminals in rural areas.

Barón (2008) makes use of the Plan Colombia program, to address the causal relation between this program and violence, homicides and partner abuse. To classify the treatment and control groups of departments he uses the 1,000 hectares of coca crops destroyed under the argument that this is a critical point from which coca activities might affect criminality in Colombia. The results show significant reductions on homicides in

³ The program is a Colombian initiative starting in 1999/2000 which has been partly sponsored by the American government with the purpose of bringing down the supply of illegal drugs, cocaine in particular. For that purpose the two governments agreed the specific target of reducing by half the number of hectares with coca bushes in Colombia by 2005. The total investment during the first six years of the program was approximately US\$11 billion (12.5% of Colombia's average GDP between 2000 and 2005) which were used to increase the manpower of the military and police forces, the purchase and improvement of military equipment, and the military and human rights training.

those regions where the program seems to have had stronger presence, and no significant effects were found on partner abuse.

Pérez (2012a), analyzes the Democratic Security Policy (DSP) implemented by the incoming government in 2002 and its causal effects on a wide range of crimes. There are differential results according to the types of crime committed and the type of perpetrator. Strong and significant reductions were found for those crimes commonly committed by organized crime, such as terrorism, kidnappings, auto-theft, and terrestrial piracy, but no effects from the policy on crimes usually committed by common criminals in the urban areas, such as burglaries and street robberies.

The present study contributes to the literature in several ways. Previous studies on this topic analyzed the effects of Plan Colombia on violence using data from 2000 to 2005. This strategy disregards the overlapping effect with a national policy implemented during 2002/2003 (the Democratic Security Policy, DSP), a strategy with the main purpose of reducing criminality (homicides included). This might be causing serious upward biases on the estimates, clouding the potential real effects of the program on the outcome variables. In this paper I consider a post-policy period free of the overlapping effects with the DSP, making it clearer which were the real effects of the program on homicides.

The second contribution has to do with the classification of the regions into the treatment and control groups of departments. I use a relative measure (coca crops destroyed as a percentage of the total coca cultivation) and its distribution along the departments to classify the treatment and control regions. This approach naturally categorizes the two groups by means of a relative comparable measure. I believe this

strategy is a stronger and a yet more consistent way to look at the impact of economic and police resources on homicides and violent deaths.⁴ Additionally, I classify into three groups, instead of two, the departments: high-destruction, low-destruction, and non-producers. This approach lets me carry out additional exercises in order to test robustness and assumptions of the empirical approach.⁵

The estimates show that there is no evidence supporting the fact that the implementation of Plan Colombia significantly reduced homicides, although it seems to have had positive/negative differential effects across gender and space on violent deaths in high-coca-destruction regions relative to the low-destruction and non-producing regions. I reach this conclusion after using a highly-disaggregated database for deaths, and after carrying out a series of exercises and robustness checks testing for different specifications of the baseline model and different alternatives for the groups of comparison.

My argument in this paper is that whereas it is undeniable that Plan Colombia's economic resources have played an important role in enhancing security and reducing the areas under coca cultivation, it is also true that reductions in homicides were not an effect of Plan Colombia but perhaps a result of the Democratic Security Policy. This last strategy was implemented by the incoming government in 2002 with the main purpose of cutting down the high levels of criminality in the country. It is worth mentioning that it is

⁴ As mentioned before, previous studies analyzing the effects of coca crops and violence in Colombia (Angrist and Kugler, 2008 and Barón, 2008) have used subjective ways to distinguish the two groups of departments. In particular they used 1,000 hectares increase and 1,000 hectares destruction of coca crops, respectively. These classification strategies suffer from two main drawbacks, they are absolute and subjective measures, which might be contributing even more in obscuring the real effects of the program on the outcome variables.

⁵ For example, having two potential control groups let me test for the uncounfoundedness assumption.

precisely between 1999 and 2002, four years after Plan Colombia's implementation, that crime indicators reached the highest recorded levels in the country.

The rest of the paper is organized as follows. Section II explains the nature of the classification of regions and provides some descriptive statistics of the data. Section III describes the empirical strategy and the model. In section IV the estimates of the impact of PC on homicides and violent deaths are presented, together with some robustness exercises. Section V concludes.

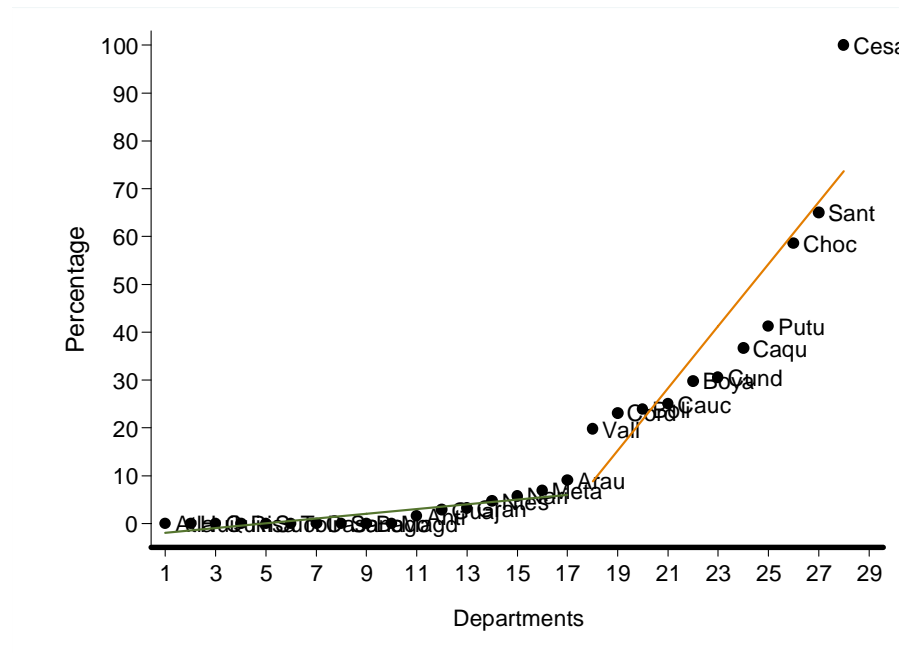
II. Classification of Regions

Regionally, Colombia is divided into 32 departments and the capital city, from which more than a half have been affected by coca cultivation over the recent decades. Apart from the particular quality of the soil attributes required to grow coca leaf, others like the distance to the populous urban areas and roads infrastructure, are factors affecting coca cultivation in the way of making it more difficult for both the detection by the authorities and the eradication programs (Rocha et al, 2010). These authors also mention the proximity to water sources as a factor determining the spatial location of coca crops.

In this paper I make use of the fact that even though Plan Colombia is a national program it has had disproportionate regional effects in the country. In particular, this identification strategy is based on the grounds of the differential results obtained from the coca eradication program along the different regions between 2000 and 2002. A total of 29 regions (covering the 33 the departments) are considered in this study from which 23 had been officially reported as having significant levels of coca cultivation. A fundamental issue for both the identification and the empirical strategy is the belief that it

was an exogenous change in the international coca crops location that ended up in the implementation of Plan Colombia. In fact, in the mid 1990s in an attempt to stop, or at least to reduce, the transit of coca leaf from the two largest producers at the time, Perú and Bolivia, to the processing laboratories in Colombia, local authorities together with the American government adopted a military strategy consisting of blocking aircrafts intending to reach Colombian territory.

Figure 1. Achievements of Plan Colombia program (Coca bushes destroyed on Producing Departments)



Note: United Nations office for Drug Control (UNODC). Based on coca cultivation and destruction carried out between 2000 and 2002.

With the purpose of identifying the treatment and control groups, I analyzed how successful was the program between 2000 and 2002 in terms of the coca bushes destruction. Previous studies have used subjective ways of deciding on the treatment and control groups. For example, Barón (2008) sets a 1,000 hectares threshold of coca bushes

destroyed under which the high/low destruction regions were specified.⁶ Alternatively, I am using a less subjective definition based on the distribution of the coca crops destruction. Figure 1 shows how there is a more clear-cut off point setting out the two groups of departments – treatment and control – in terms of their success in fighting coca leaf production. In particular, those departments in which more than 19% of existing coca crops were destroyed between 2000 and 2002 will be considered the high-destruction or treatment group (Bolívar, Boyacá, Caquetá, Cauca, Cesar, Chocó, Córdoba, Cundinamarca, Putumayo, Santander and Valle), while the remaining departments comprise the low-destruction or control group.⁷

Table 1. Coca Cultivation in Colombia

	Departments	Coca crops (ha)			Total destruction (ha)	Destruction (%)
		2000	2001	2002	(2000-2002)	(2000-2002)
		(1)	(2)	(3)	(4)	(5)
High destruction	Bolívar	5,960	4,824	2,735	3,225	23.9%
	Boyacá	322	245	118	204	29.8%
	Caquetá	26,603	14,516	8,412	18,191	36.7%
	Cauca	4,576	3,139	2,120	2,456	25.0%
	Cesar	779	0	0	779	100.0%
	Chocó	250	354	0	354	58.6%
	Córdoba	117	652	385	267	23.1%
	Cundinamarca	66	22	57	44	30.6%
	Putumayo	66,022	47,120	13,725	52,297	41.2%
	Santander	2,826	415	463	2,411	65.1%
Valle	76	184	111	73	19.8%	
Low destruction	Antioquia	2,547	3,171	3,030	141	1.6%
	La Guajira	322	385	354	31	2.9%
	Norte Santander	6,280	9,145	8,041	1,104	4.7%
	Nariño	9,343	7,494	15,131	1,849	5.8%
	Meta	11,123	11,425	9,222	2,203	6.9%
	Arauca	978	2,749	2,214	535	9.0%
	Magdalena	200	480	644	0	0.0%
	Gran Amazonía	24,899	38,486	35,309	3,177	3.2%

Note: United Nations office for Drug Control (UNODC). Gran Amazonía corresponds to the aggregation of five departments: Amazonía, Guaviare, Guainía, Vaupés and Vichada.

⁶ According to the author this definitions rests on the belief that this is a turning point setting apart the effects on violence.

⁷ The control group of departments consists of departments with low levels of coca crops destruction (Antioquia, La Guajira, Norte de Santander, Nariño, Meta, Arauca, Magdalena and Gran Amazonía), and non-producing departments (Atlántico, Huila, Quindío, Risaralda, Sucre, Tolima, Casanare, San Andrés Island, and the capital city Bogotá, D.C).

Table 1 shows, for producing departments, the number of hectares with coca bushes between 2000 and 2002 (columns 1 through 3), the number of hectares destroyed (column 4), and the percentage of destruction relative to the total cultivation between 2000 and 2002 (column 5). The table shows this information for two groups of departments; the first group (high-destruction) corresponds to those departments where Plan Colombia seems to have been successful in its purpose of destroying coca crops, whereas the second (low-destruction) is the group for which there was a modest reduction, or even an increase, between 2000 and 2002. In fact, Table 1 provides some evidence of displacement of coca cultivation across the different producing departments.

For example, it is possible to notice that in most of the high-destruction departments there was a sustained reduction in cultivation, while in the low-destruction regions there was first (between 2000 and 2001) an increase and then (between 2001 and 2002) a decrease in cultivation, significantly reducing the percentage of total destruction for this second group. This ‘displacement effect’ might be showing the first attempt of the coca producers to survive to the new conditions under the Plan Colombia’s strategies. It is important to mention that, as shown in Pérez (2012a), a second and yet more effective way to survive this Colombian/American attempt to reduce the supply of illicit drugs, was the increase in productivity, doubling the amount of cocaine produced in half of the land.

Pressure from the government, in terms of manual and aerial destruction under Plan Colombia, is how it managed to achieve the goal of reducing the total area under coca cultivation. As expected, the highest reductions achieved between 2000 and 2002

were in the major producers, Putumayo and Caquetá, passing from 66,022 ha to 13,725 ha, and from 26,603 ha to 8,412 ha, respectively. In general, through the program the government managed to reduce the national coca cultivation from 163,000 ha to 102,000 ha during this period, an important reduction showing its commitment in the war against drug production and trafficking.

Table 2. Pre and Post-Policy Homicide Rates

Departments	Total			Urban Area			Rural Area		
	Pre-Policy 1998	Post-policy		Pre-Policy 1998	Post-policy		Pre-Policy 1998	Post-policy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
High-destruction	81	107	90	85	107	91	64	87	74
Bolívar	33	45	53	37	48	57	21	27	35
Boyacá	37	52	48	35	52	47	35	48	47
Caquetá	249	343	173	238	315	155	231	343	171
Cauca	80	106	84	103	145	104	61	75	65
Cesar	57	175	137	63	163	140	46	187	116
Chocó	53	62	46	91	82	53	24	29	19
Córdoba	26	39	29	35	52	36	17	20	18
Cundinamarca	55	74	66	38	56	48	76	94	92
Putumayo	230	184	199	353	164	205	113	166	175
Santander	64	65	56	63	55	46	64	67	64
Valle	134	171	145	129	163	141	128	159	140
Low-destruction	93	111	83	90	92	67	90	125	101
Antioquia	176	195	119	179	147	84	160	176	126
La Guajira	52	117	95	83	160	138	14	52	36
Norte Santander	93	234	169	102	226	146	67	170	140
Nariño	31	63	42	42	72	41	20	51	38
Meta	115	142	145	107	97	103	90	190	175
Arauca	126	270	228	141	288	216	101	212	212
Magdalena	72	98	93	85	103	95	49	78	75
Gran Amazonia	107	82	61	118	88	64	70	59	50
Non-Producing	69	72	60	62	61	51	90	127	108
Atlántico	44	49	57	46	47	56	17	36	45
Bogotá D.C.	58	40	34	55	38	33	179	64	21
Caldas	127	188	119	118	172	101	139	216	147
Huila	70	119	96	60	96	68	73	140	128
Quindío	90	105	94	87	94	92	86	150	80
Risaralda	140	162	132	124	142	117	168	174	154
Sucre	39	54	54	31	60	54	53	39	52
Tolima	58	89	66	48	71	46	68	120	102
Casanare	171	133	142	173	146	143	122	73	117
San Andrés	12	7	20	16	9	27	0	0	0
Total Producing Departments	99	130	99	107	123	93	74	102	83
Total All Departments	88	110	85	89	97	75	77	107	88

Note: The table includes only the coca producing departments. Gran Amazonía region is the aggregation of the following five departments: Amazonas, Guaviare, Guainía, Vaupés and Vichada. High-destruction departments are those where at least 19% of the coca crops were destroyed between 2000 and 2002. Deaths and the corresponding population projections use the National Department of Statistics (DANE) as the main source.

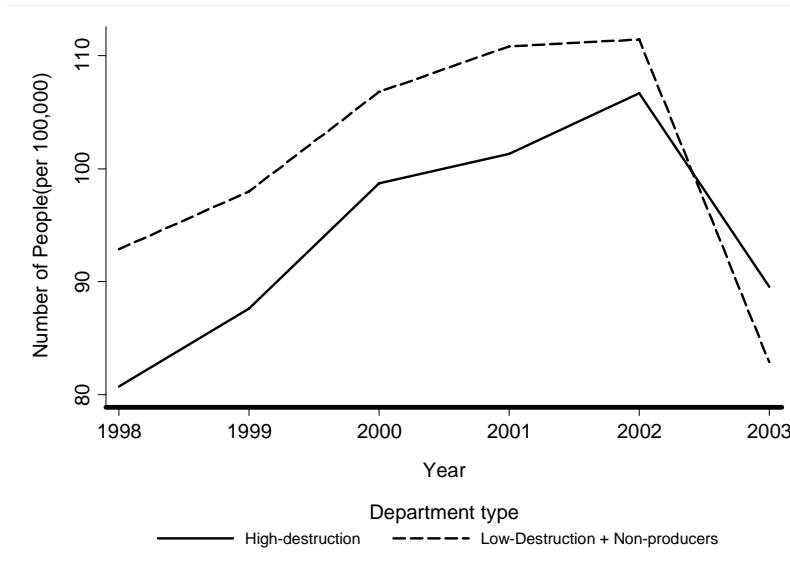
In terms of homicides, Table 2 summarizes some indicators on the pre and post-policy rates. Columns 1 through 3 show the results for the country as a whole, columns 4

through 6 for the urban areas, and columns 7 through 9 for the rural areas. In order to make the comparison between the pre and post-policy easier, and because of the significant year to year variation in the rates, I report 1998 as the pre-policy period and 2002 and 2003 as the post-policy periods.⁸

Homicides rates show some interesting characteristics. First is the fact that, with few exceptions, the number of homicides per 100,000 persons continued to increase between 1998 and 2002 even though Plan Colombia had been in operation for some time. These results were found for the three groups of departments, high-destruction, low-destruction, and non-producing, across both urban and rural areas. Only in 2003, when the DSP was already in operation, some reductions showed up. Second, in terms of the comparison between producing and non-producing departments, the table provides some indications that even though in the country as a whole (columns 1 through 3) more homicides were committed in the coca producing departments relative to non-producing ones, the disaggregation into areas of residence reveals that it is only the case for the urban areas (columns 4 through 6), whereas for the rural ones (columns 7 through 9) the non-producing departments seem to deal more with this type of crime than the producing counterpart.

⁸ 2003 is included in Table 2 as one of the post-policy years even though the main estimations reported in the analysis section defines the post-policy period from 2000 to 2002. Nevertheless, robustness checks extended this period including 2003.

**Figure 2. Homicides Rates – Men and Women Aged 15-64
(By type of department)**



Note: Deaths and the corresponding population projections use the National Department of Statistics (DANE) as the main source.

In order to give a closer look at the dynamics of the homicide rates, Figure 2 plots the comparison of the pre and post-policy trends for treatment and control groups of departments. During the pre-policy period (1998-1999) homicide rates within both groups show a noticeably similar upward trend which goes beyond the Plan Colombia’s starting point in 2000. Regarding the post-policy trends and turning points, there are two noticeable break downs which coincide with the two most recent security policies in Colombia’s recent history. The first one is in 2000 and corresponds to Plan Colombia’s starting point, and the second and more noticeable in 2002, which coincides with the commencement of the DSP. Although both changes seem to be evident in reducing homicides, there is an important difference between the two, the fact that the turning point in 2000 did not result in a positive-to-negative change of the gradient as it was in 2002. These facts seem to offer a first indication of the argument that it was the DSP, the one that made functional the economic and military resources to bring down the

staggering crime levels. Nevertheless, since the new security policy started in August 2002, it seems likely that there was space for some influence by Plan Colombia in the reduction of homicides.⁹

Table 3. Pre and Post-Policy Violent Deaths Rates (without homicides)

Departments	Total			Urban Area			Rural Area		
	Pre-Policy	Post-policy		Pre-Policy	Post-policy		Pre-Policy	Post-policy	
	1998	2002	2003	1998	2002	2003	1998	2002	2003
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
High-destruction	48	47	44	50	44	40	40	46	47
Bolívar	24	22	20	28	24	22	12	13	11
Boyacá	55	63	58	51	59	51	51	63	62
Caquetá	81	63	69	93	59	52	60	61	83
Cauca	51	52	56	70	64	61	34	42	50
Cesar	30	41	40	37	42	43	15	32	29
Chocó	28	31	27	41	42	33	17	16	9
Córdoba	33	29	29	40	36	34	26	15	18
Cundinamarca	55	59	53	50	48	44	55	72	66
Putumayo	69	76	68	82	91	79	53	60	44
Santander	51	44	47	53	36	38	45	55	58
Valle	57	52	46	54	47	41	63	63	66
Low-destruction	51	44	43	50	38	37	47	51	50
Antioquia	64	56	50	64	42	38	64	63	60
La Guajira	32	26	24	46	37	33	16	10	13
Norte Santander	45	51	54	46	47	45	40	49	55
Nariño	40	51	57	54	59	62	29	43	48
Meta	76	61	65	71	46	55	53	65	52
Arauca	78	67	55	86	53	50	60	84	58
Magdalena	34	32	27	42	32	27	19	29	22
Gran Amazonia	54	67	48	65	52	59	37	65	34
Non-Producers	47	38	38	44	34	34	54	51	53
Atlántico	30	23	23	30	21	23	25	24	16
Bogotá D.C.	43	33	31	41	31	30	235	32	42
Caldas	51	50	63	50	45	61	50	58	60
Huila	76	66	63	75	67	55	74	60	67
Quindío	54	43	48	52	38	45	47	68	55
Risaralda	48	42	40	46	38	35	51	47	45
Sucre	29	24	28	38	27	30	12	16	22
Tolima	72	59	55	69	53	50	68	65	59
Casanare	92	68	82	105	65	71	49	59	91
San Andrés	52	38	18	71	46	18	0	8	16
Total Producing Departments	51	49	46	53	44	41	42	48	47
Total All Departments	50	45	43	50	40	38	44	49	48

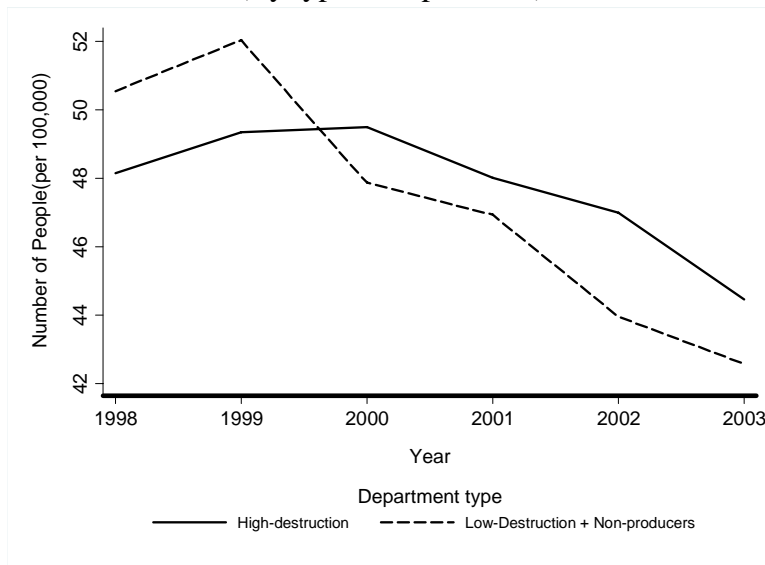
Note: The table includes only the coca producing departments. Gran Amazonía region is the aggregation of the following five departments: Amazonas, Guaviare, Guainía, Vaupés and Vichada. High-destruction departments are those where at least 19% of the coca crops were destroyed between 2000 and 2002. Deaths and the corresponding population projections use the National Department of Statistics (DANE) as the main source.

For violent deaths, Table 3 provides a summary of the rates at different levels of aggregation: individual departments and the aggregation of high-destruction, low-

⁹ In order to take this possibility into consideration, although the main analyses are based on 2002 as the post-policy end, additional robustness checks moving forward one additional period to 2003 were also examined.

destruction, and non-producing departments. Additionally, along the columns we find the pre and post-policy violent deaths rates for the national aggregation (columns 1 through 3), for urban areas (columns 4 through 6), and rural areas (7 through 9). Considering the high and low-producing aggregations the table shows a generalized slight reduction in the number of violent deaths per 100,000 persons after the implementation of Plan Colombia, with the exception of the rural areas, where the rate increased from 40 to 46 in the high-increase group, and from 47 to 51 for low-increase group, between 1998-2002. Non-producing departments on the other hand show a sustained and generalized reduction in the violent deaths rates in both urban and rural areas. As well as in the case of homicides, non-coca-producing departments show fewer violent deaths than the coca-producing counterpart, with the exception again of the rural areas, where coca-producing departments seems to face lower levels of violent deaths.

Figure 3. Violent Deaths Rates – Men and Women Aged 15-64 (By type of department)



Note: Deaths and the corresponding population projections use the National Department of Statistics (DANE) as the main source.

In terms of the comparative dynamics of violent deaths for treatment and control groups along the pre and post policy period, Figure 3 shows a first indication of the temporal coincidence between the reduction of the violent deaths' rate and the starting point of the Plan Colombia strategies. In particular, Figure 3 shows a turning point in 1999 for the control group and in 2000 for the treatment group of departments. It is also worth mentioning two characteristics supporting the identification assumption for this analysis, where the first is the similar pre-policy trends between the two groups of departments, and the second refers to how the post-policy is characterized by the swap of positions between the rates of the two groups.

III. Empirical Strategy

1. The Model

The aim of this study is to use the variation in the number of hectares with coca crops induced by the Plan Colombia as means to identify its impact on homicides and violent deaths. Since there are similar pre-policy trends for treatment and control groups of departments across both homicides and violent deaths, and given the three-level disaggregation of the data, it is possible to work with the following specification:

$$\frac{d_{adt}}{p_{adt}} = \alpha_a + \beta_d + \lambda_t + \delta(HD_d * PC_t) + \phi X_{dt} + \varepsilon_{adt} \quad , \quad (1)$$

where the two parts of the dependent variable d_{adt} and p_{adt} are the number of deaths and the population in the corresponding age group a , department d and time t . In this study variable d will refer to two different types of deaths, homicides and violent deaths. The first three terms in the right hand side are defined as follows: α_a is the age effect, β_d is

the regional (department) effect and λ_t is the time (year) effect. The fourth term is the interaction between an indicator variable for those departments with high coca-crops destruction (HD), and a dummy variable for the first three years in operation of Plan Colombia (PC).¹⁰

The fifth term X corresponds to a set of department/time varying controls, which includes local security expenditures and the GDP per-capita. These two variables are determined as convenient controls for factors that could otherwise cloud the real causal effects of Plan Colombia on the outcome variables. The first one emerges from the fact that the program was thought and put into action by the national government with national budget, case in which department's own efforts for fighting illegal activities could bias upwards the Plan Colombia's efforts. A second general consideration that might distort the results is the differential in the degree of socioeconomic development across the different regions. In this case the GDP per-capita is included in the model under the assumption that this indicator is capturing the socioeconomic progress. Finally, the last term in the right hand side, ε , corresponds to the error term. In order to control for potential omitted variables bias and serial correlation, some specifications include type-of-department (high and low-increase) time trends.

2. The Estimation Method

Given the particular characteristics of the outcome variables, homicides, and violent deaths rates, with discrete and nonnegative values only, and with excess of zeros in a

¹⁰ As mentioned before, only the first three years of Plan Colombia were considered in order to avoid overlapping with the *Democratic Security Policy*, implemented late in 2002.

proportion of about 15% of the observations for both homicides and violent deaths, it is necessary to use an estimation strategy to deal with this discreteness and nonlinearity.¹¹

According to these characteristics, one option is the count data model, which is based on the Poisson distribution for the number of occurrences of an event y over a fixed exposure period of time and can be defined as follows:

$$\Pr(y_i = j / x_i) = \frac{\exp(-\lambda(x_i, \beta)) \lambda(x_i, \beta)^j}{j!} \quad \lambda > 0; j = 0, 1, 2, \dots \quad (2)$$

This model can be easily estimated by Maximum Likelihood and is defined under at least two conditions: 1. the conditional distribution of y , given the set of regressors in X , is Poisson distributed with parameter λ ; and 2. $\lambda(x_i, \beta) = \exp(x_i' \beta)$. One additional characteristic, usually violated in practice, is the *equidispersion*, or the condition under which the expected value and the variance are the same. One easy way to deal with this potential problem is computing the standard errors robust to heteroskedasticity.¹²

Nevertheless, a more general model for properly dealing with these disadvantages is the *Negative Binomial* model. Starting from the probability function

$$f(y/x) = \int_0^{\infty} f(y|x, u) g(u|x) du \quad y \text{ and assuming a gamma distribution for } u|x,^{13} \text{ we}$$

obtain:

$$f(y|x) = \frac{\lambda^y}{y!} \int_0^{\infty} e^{-\lambda u} u^y \frac{\gamma^\theta}{\Gamma(\theta)} u^{\theta-1} e^{-\gamma u} du. \quad (3)$$

¹¹ Standard linear methods are not appropriate since the data is heteroskedastic and the conditional expectation is nonlinear and positive.

¹² The simplicity of this measure is the main characteristic over other alternatives such as the negative binomial models. An additional advantage of this approach is the interpretation of the results in terms of either semi-elasticities or marginal changes.

¹³ $g(u|x) = \frac{\gamma^\theta}{\Gamma(\theta)} u^{\theta-1} e^{-\gamma u}$.

Once $\gamma = \theta$ is assumed we get the *Negative Binomial* probability function with

$$E(y|x) = \lambda \text{ and variance } Var(y|x) = \lambda + \theta^{-1}\lambda^2 :$$

$$f(y|x) = \frac{\Gamma(y+\theta)}{\Gamma(y+1)\Gamma(\theta)} \left(\frac{\lambda}{\lambda+\theta}\right)^y \left(\frac{\theta}{\lambda+\theta}\right)^\theta. \quad (4)$$

IV. Results and Robustness Checks

1. Homicides

Following equation (1) I consider the baseline estimates of the impact of Plan Colombia on homicide rates in Table 4. For each of these two groups of the population (men and women), as moving across the columns, the specifications build up from a model including type-of-department specific time trends, and fixed effects dummies across age groups, departments (regions) and time (years), to another where additional controls are included.

Table 4. Effects of Plan Colombia on Homicides
(National Level - Men and Women Comparison)

	Dependent Variable: Homicide Rate			
	Men		Women	
	Trends	Trends +Controls	Trends	Trends +Controls
	(1)	(2)	(3)	(4)
Interaction term	0.072 (0.082)	0.083 (0.084)	-0.124 (0.192)	-0.121 (0.192)
Trends	Yes	Yes	Yes	Yes
Log GDP per-capita	No	Yes	No	Yes
Log Local security expenditures	No	Yes	No	Yes
Time dummies	Yes	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes	Yes
Number of departments	29	29	29	29
Sample Size	1250	1250	1250	1250

* p<0.10, ** p<0.05, *** p<0.01

Note: The dependent variable was computed as the number of homicides per 100,000 persons aged between 15 and 64. Robust standard errors are reported in parenthesis.

As expected, results show no significant effect in any of the two groups of the population, men or women. The estimates are prone to take zero to positive and negative values in the more complete specifications (trends + controls), columns (2) and (4), for men and women respectively. As seen in Figure 2, although the starting point of Plan Colombia in 2000 seems to have moved down homicides' increasing pattern, it does not seem to be enough for the effects to be significantly different from zero.

Table 5. Effects of Plan Colombia on Homicides
(Urban and rural areas comparisons)

	Dependent Variable: Homicide Rate			
	Men		Women	
	Trends	Trends +Controls	Trends	Trends +Controls
	(1)	(2)	(3)	(4)
A. URBAN AREAS				
Interaction term	0.230** (0.103)	0.246** (0.104)	-0.043 (0.255)	-0.039 (0.255)
Trends	Yes	Yes	Yes	Yes
Log GDP per-capita	No	Yes	No	Yes
Log Local security expenditures	No	Yes	No	Yes
Time dummies	Yes	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes	Yes
Number of departments	29	29	29	29
Sample Size	1250	1250	1250	1250
B. RURAL AREAS				
Interaction term	-0.126 (a) (0.170)	-0.122 (a) (0.170)	-0.461 (0.331)	-0.470 (0.330)
Trends	Yes	Yes	Yes	Yes
Log GDP per-capita	No	Yes	No	Yes
Log Local security expenditures	No	Yes	No	Yes
Time dummies	Yes	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes	Yes
Number of departments	29	29	29	29
Sample Size	1250	1250	1250	1250

* p<0.10, ** p<0.05, *** p<0.01

Note: The dependent variable was computed as the number of homicides per 100,000 persons aged between 15 and 64. Robust standard errors are reported in parenthesis.

(a) Because of no-convergence of the *Negative Binomial Model*, the alternative *Poisson* estimates are reported.

Across areas of residence, Table 5 shows how some differences are more noticeable both across gender and across areas of residence. Although the effects are not statistically significant, except for men in the urban areas where homicides seem to have increased in the treatment departments after PC started, all of the estimates are consistently negative. In this case, the program seems to have had a negative impact on men and women's homicides in the countryside and for women in urban areas, but more importantly, because the significance and magnitude, is the case for men living in urban areas where this type of crime increased. It is worth mentioning that these findings are consistent with the internal conflict in Colombia, where the rural-positioning-strategy of the most influential illegal armed groups ended up with security policies focusing mostly in the rural areas, neglecting general criminality in urban areas.¹⁴

I have so far not paid attention to the possibility that the turning point in 2002, and the corresponding reduction in homicides, had been the result of a four-years-lagged result of Plan Colombia instead of the Democratic Security Policy. The structural change is evident when one looks at the Figure 2, which shows a large relative decrease in homicide rates for both the high and low-destruction departments. Although this possibility is unlikely since Plan Colombia's target of reducing coca cultivation was met from the very onset of the policy (see Appendix A), additional robustness checks were carried out in order to consider this possibility.

In columns (2) and (4) of Table 6 I report the estimates that utilize the alternative of the 2000/2003 post-policy period, compared to the initial 2000/2002 (columns 1 and 3). The results from these new specifications are interesting even though the estimates

¹⁴ For more details on urban and rural crimes dynamics in the beginning/mid of 2000s see Pérez (2012a).

remain similar in most of the cases.¹⁵ On the one hand, there was a reduction with respect to the previous negative estimates when taking into account 2003 within the post-Plan Colombia period.

Table 6. Effects of Plan Colombia on Homicides
(Comparison between two different post-policy periods)

	Dependent Variable: Homicide Rate			
	Men		Women	
	Post-policy: 2000-2002	Post-policy: 2000-2003	Post-policy: 2000-2002	Post-policy: 2000-2003
	(1)	(2)	(3)	(4)
A. URBAN AREAS				
Interaction term	0.246** (0.104)	0.146* (0.084)	-0.039 (0.255)	0.031 (0.217)
Trends	Yes	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes	Yes
Number of departments	29	29	29	29
Sample Size	1250	1500	1250	1500
B. RURAL AREAS				
Interaction term	-0.122 (a) (0.170)	-0.119 (a) (0.121)	-0.470 (0.330)	-0.639** (0.279)
Trends	Yes	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes	Yes
Number of departments	29	29	29	29
Sample Size	1250	1500	1250	1500

* p<0.10, ** p<0.05, *** p<0.01

Note: The dependent variable was computed as the number of homicides per 100,000 persons aged between 15 and 64. Robust standard errors are reported in parenthesis. Given the different number of observations used to compute the estimates in columns (1) and (2) and (3) and (4), any comparison between them must be carefully carried out.

(a) Because no-convergence of the *Negative Binomial Model*, the alternative *Poisson* estimates are reported.

¹⁵ These results have to be carefully analyzed since the number of observations is different between the two post-policy periods.

On the other hand, the effect for women living in rural areas is still negative, but this time is significant, meaning a reduction in homicides for women living in treatment departments compared with women living in control departments after the policy started. What is important to mention from these results is that these reductions are consistent with the dynamics of homicides and other crimes in Colombia since 2002, but more importantly is the fact that there is still no evidence on any causal effect from Plan Colombia on reductions in homicides even after four years of the implementation of the program. This is particularly evident for men, who are more prone to be affected by the conflict.

In order to cover another possible source of ambiguity in exploring the potential effects of the program on homicides, two additional criteria for choosing high and low-coca-destruction departments were defined. Table 7 shows these two new alternatives compared with the baseline definition. The first one (criterion 1 in column 1) classifies as high and low-destruction departments (or treatment and control groups) depending on whether over 1,000 hectares of coca crops were destroyed during the post-policy period. I use it as a reference for comparison with previous studies. As a second alternative, criterion 2 in column (2) provides a measure of the net coca bushes destruction. This takes into account not only the number of hectares destroyed but also the new crops planted. Under this criterion I define as high-destruction departments those with net destruction greater than zero. Finally, for comparison purposes, criterion 3 in column (3) shows the baseline results used in this study.

Table 7. Effects of Plan Colombia on Homicides
(Comparison between three different treatment/control definitions)

Dependent Variable: Homicides			
	Criterion 1	Criterion 2	Criterion 3
	(1)	(2)	(3)
A. NATIONAL			
Interaction term	-0.005 (0.077)	-0.067 (0.079)	0.055 (0.075)
Trends	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes
Number of departments	29	29	29
Sample Size	1250	1250	1250
B. URBAN AREAS			
Interaction term	-0.037 (0.105)	0.082 (0.142)	0.204** (0.097)
Trends	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes
R-Squared	0.707	0.689	0.707
Number of departments	29	29	29
Sample Size	1250	1250	1250
C. RURAL AREAS			
Interaction term	-0.237* (0.124)	-0.211 (0.129)	-0.020 (0.125)
Trends	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes
Number of departments	29	29	29
Sample Size	1250	1250	1250

* p<0.10, ** p<0.05, *** p<0.01

Note: The dependent variable was computed as the number of homicides per 100,000 persons aged between 15 and 64. Robust standard errors are reported in parenthesis. Criteria are based on the following definitions: Criterion 1 makes use of the 1,000 hectares with coca crops destroyed to distinguish the high and low-destruction groups of departments. Criterion 2 uses the comparison between the total number of hectares destroyed and the total number of new ones, where the threshold between the high and low-destruction is decided if the difference is greater than zero. Finally Criterion 3, which is the baseline in this study, uses the own coca-destruction's density along the producing departments in order to discriminate between high and low coca crops destruction. According to this principle producing departments with coca destruction over 19% are classified as of high-destruction.

This additional robustness check in Table 7 does not intend to make the estimates comparable between each other across the three different classifications, but to look for

consistency in terms of significance and direction of the potential causal effects of Plan Colombia on homicide rates. The first noticeable characteristic is that estimates for the first two new criteria (columns (1) and (2)), show zero to negative effects not only for the national aggregation but also for urban and rural areas.

The second characteristic is that criteria 1 and 2 tend to show stronger negative effects in all the cases relative to criterion 3. This is especially noticeable in rural areas where all criteria are coincident in the negative direction of the effect with significant estimate for criterion 1. These two are coincident even in magnitude, showing a reduction of about 20 percentage points in homicides as a result of Plan Colombia. These results show some degree of sensibility of the results, not in the direction but in the strength of the effects according to different classification alternatives. Nevertheless, and as seen before, these results are highly robust to different specifications, cut-off points of the program, and different desegregations.

2. Violent Deaths

With the purpose of extending the scope of the potential effects of Plan Colombia, in this section I consider as the outcome variable the set of other deaths classified as ‘violent’, in contrast to natural deaths, deaths from diseases, or homicides. The purpose behind this idea is to establish whether or not the economic resources and the increase in the police forces, even though mainly focused on the eradication of coca crops in rural Colombia, could have had side effects in terms of the improvement in the overall levels of security and confidence in the national institutions during the early post Plan Colombia period.

The first indication of a potential causal relationship between the set up of Plan Colombia and the reduction in violent deaths is the temporal synchronization between the two (as seen in Figure 3), since it is in 1999 and 2000 when the violent deaths' increasing trend is changed for both low and high-destruction departments. In this case it is expected reductions in the number of violent deaths in those regions where Plan Colombia was more effective in terms of coca crops destruction relative to those in which there was low destruction. Table 8 shows a first exercise, a national aggregation for men and women, where this hypothesis is explored.

Table 8. Effects of Plan Colombia on Violent Deaths
(National Level - Men and Women Comparison)

	Dependent Variable: Violent Deaths			
	Men		Women	
	Trends	Trends +Controls	Trends	Trends +Controls
	(1)	(2)	(3)	(4)
Interaction term	0.066 (0.077)	0.064 (0.077)	0.240 (0.151)	0.262* (0.152)
Trends	Yes	Yes	Yes	Yes
Log GDP per-capita	No	Yes	No	Yes
Log Local security expenditures	No	Yes	No	Yes
Time dummies	Yes	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes	Yes
Number of departments	29	29	29	29
Sample Size	1250	1250	1250	1250

* p<0.10, ** p<0.05, *** p<0.01

Note: The dependent variable was computed as the number of violent deaths per 100,000 persons aged between 15 and 64. Robust standard errors are reported in parenthesis.

Results are divided into two groups of the population, men in columns (1) and (2) and women columns (3) and (4), each across two models with trends, and trends plus controls. Estimates show differential results for both men and women, with zero to positive no significant effects on male population, and with an unexpected positive and strong effect for women. According to these results after the implementation of Plan Colombia violent deaths affecting women increased in about 25 percentage points in

those regions with high-destruction of coca crops relative to those regions where low levels of destruction were reported. It is important to remember that Plan Colombia focused its attention, and most of its economic and military resources, in the countryside where coca crops are located. In this sense the next exercise includes a disaggregation of the results according to the two areas of residence, urban and rural, in order to better understand the previous results.

Table 9. Effects of Plan Colombia on Violent Deaths
(Urban and rural areas comparisons)

	Dependent Variable: Violent Deaths			
	Men		Women	
	Trends	Trends +Controls	Trends	Trends +Controls
	(1)	(2)	(3)	(4)
A. URBAN AREAS				
Interaction term	0.142 (0.099)	0.142 (0.100)	0.449** (0.203)	0.462** (0.203)
Trends	Yes	Yes	Yes	Yes
Log GDP per-capita	No	Yes	No	Yes
Log Local security expenditures	No	Yes	No	Yes
Time dummies	Yes	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes	Yes
Number of departments	29	29	29	29
Sample Size	1250	1250	1250	1250
B. RURAL AREAS				
Interaction term	-0.464**(a) (0.204)	-0.462**(a) (0.204)	0.087 (0.275)	0.084 (0.279)
Trends	Yes	Yes	Yes	Yes
Log GDP per-capita	No	Yes	No	Yes
Log Local security expenditures	No	Yes	No	Yes
Time dummies	Yes	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes	Yes
Number of departments	29	29	29	29
Sample Size	1250	1250	1250	1250

* p<0.10, ** p<0.05, *** p<0.01

Note: The dependent variable was computed as the number of violent deaths per 100,000 persons aged between 15 and 64. Robust standard errors are reported in parenthesis.

(a) Because no-convergence of the *Negative Binomial Model*, the alternative *Poisson* estimates are reported.

Following a similar strategy, a more extensive disaggregation of the population is presented in Table 9, which shows for urban (panel A) and rural population (panel B) the estimates for the effects of the program on violent death rates. Results reveal some

interesting facts. First, is that after disaggregating the population into urban and rural, urban women kept the positive and significant effect seen in the national results, with increases of violent deaths in about 45 percentage points. The second result shows a clear and significant reduction in men's violent deaths of about 46 percentage points, consistent with the two different specifications of the model, trends and trends+controls. These results seem to be consistent in terms of the reduction of men's violent deaths since rural men used to be more active agents in the conflict. The other part of the story is the presumed cross-gender and spatial displacement effect where women living in urban areas suffered increases in the number of violent deaths. In order to establish how robust these results are, and to capture any lagged effect from the program I extended the post-Plan Colombia period one additional year.

Results are reported in columns (2) and (4) of Table 10 and show that consistently significant but smaller effects were found when extending the period beyond 2002 (columns 1 and 3). Nevertheless, a skeptic might argue that the previous findings, even though based on a clear distinction between the high and low-destruction groups of departments, are the result of the criterion of choice of the comparison groups instead of the true effects of the program. Like in homicides, in order to address this possibility and to even more stringently ensure that I am comparing like with like groups of departments, I make use of the other two coca-destruction criteria. Table 11 shows in column (1) estimates based on the 1,000 hectares destroyed, and column (2) on the positive net number of hectares destroyed. Column (3) is left for comparison with the baseline criteria.

Table 10. Effects of Plan Colombia on Violent Deaths
(Comparison between two different post-policy periods)

	Dependent Variable: Violent Deaths			
	Men		Women	
	Post-policy: 2000-2002	Post-policy: 2000-2003	Post-policy: 2000-2002	Post-policy: 2000-2003
	(1)	(2)	(3)	(4)
A. URBAN AREAS				
Interaction term	0.142 (0.100)	0.131 (0.081)	0.462** (0.203)	0.380** (0.171)
Trends	Yes	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes	Yes
Number of departments	29	29	29	29
Sample Size	1250	1500	1250	1500
B. RURAL AREAS				
Interaction term	-0.462**(a) (0.204)	-0.430** (0.215)	0.084 (0.279)	-0.012 (0.238)
Trends	Yes	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes	Yes
Number of departments	29	29	29	29
Sample Size	1250	1500	1250	1500

* p<0.10, ** p<0.05, *** p<0.01

Note: The dependent variable was computed as the number of violent deaths per 100,000 persons aged between 15 and 64. Robust standard errors are reported in parenthesis. Given the different number of observations used to compute the estimates in columns (1) and (2) and (3) and (4), any comparison between them must be carefully carried out.

(a) Because no-convergence of the *Negative Binomial Model*, the alternative *Poisson* estimates are reported.

It is important to mention that Table 11 presents comparisons for gender-aggregated data across national, urban and rural areas. A first view at national level in panel A let us see consistent estimates in most of the cases in terms of direction, magnitude, and significance where even the standard errors are also very close to each other. This means that, at the national level and for aggregations across gender and areas of residence, no effects on violent deaths seem to have come from Plan Colombia in areas with high coca destruction relative to low destruction regions.

Table 11. Effects of Plan Colombia on Violent Deaths
(Comparison between three different treatment/control definitions)

Dependent Variable: Violent Deaths			
	Criterion 1	Criterion 2	Criterion 3
	(1)	(2)	(3)
A. NATIONAL			
Interaction term	0.117 (0.078)	0.100 (0.077)	0.108 (0.074)
Trends	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes
Number of departments	29	29	29
Sample Size	1250	1250	1250
B. URBAN AREAS			
Interaction term	0.030 (0.101)	0.214** (0.097)	0.222** (0.092)
Trends	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes
Number of departments	29	29	29
Sample Size	1250	1250	1250
C. RURAL AREAS			
Interaction term	0.007 (0.135)	-0.017 (0.135)	-0.020 (0.131)
Trends	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes
Number of departments	29	29	29
Sample Size	1250	1250	1250

* p<0.10, ** p<0.05, *** p<0.01

Note: The dependent variable was computed as the number of violent deaths per 100,000 persons aged between 15 and 64. Robust standard errors are reported in parenthesis. Criteria are based on the following definitions: Criterion 1 makes use of the 1,000 hectares with coca crops destroyed to distinguish the high and low-destruction groups of departments. Criterion 2 uses the comparison between the total number of hectares destroyed and the total number of new ones, where the threshold between the high and low-destruction is decided if the difference is greater than zero. Finally Criterion 3, which is the baseline in this study, uses the own coca-destruction's density along the producing departments in order to discriminate between high and low coca crops destruction. According to this principle producing departments with coca destruction over 19% are classified as of high-destruction.

Once the analysis is carried out separately for urban and rural areas (panels B and C respectively), results show the same strong consistency across the different criteria,

with positive estimates for urban areas and negative for the rural ones, with the difference that positive estimates in the urban areas are significant and all negative effects of rural regions are not. Two important conclusions can be made from the former exercises. First, the effects on violent deaths are all consistent to a varied set of specifications. And second, disaggregation of the population by gender and areas of residence is of great importance since differential effects might be found behind national and/or gender aggregations.

3. Additional Robustness Checks

The peculiarity of drug production and trafficking in Colombia as well as the particular characteristics of the program let me extend the robustness checks even further in order to provide stronger and more conclusive evidence supporting the former results of no-effects from Plan Colombia on homicides, and differential effects on violent deaths in those regions where the program had a greater impact relative to the others, but also supporting the identification assumptions.

To do so I am exploiting the fact that only 23 out of the 33 departments in the country had significant levels of coca cultivation during the period of study as well as the fact that the policy had disproportionate results across those coca-producing departments. These factors let me classify the departments into three different groups: high-coca-destruction, low-coca-destruction, and non-coca-producing departments where, under the baseline classification, the first group corresponds to the treatment group and the last two to the control groups. The first estimation is an exercise consisting of the comparison

between two additional versions of the baseline model, with the only variation in the definition of the control group.

Table 12. Effects of Plan Colombia on Homicides and Violent Deaths
(Comparison between three different control groups definitions)

	Low-destruction & Non-producers	Low-destruction	Non-producing
	(1)	(2)	(3)
A. HOMICIDES			
Interaction term	0.055 (0.075)	0.058 (0.087)	0.039 (0.094)
Trends	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes
Number of departments	29	19	21
Sample Size	1250	830	860
B. VIOLENT DEATHS			
Interaction term	0.108 (0.074)	-0.044 (0.081)	0.232** (0.095)
Trends	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes
Number of departments	29	19	21
Sample Size	1250	830	860

* p<0.10, ** p<0.05, *** p<0.01

Note: The dependent variable was computed as the corresponding number of homicides and violent deaths per 100,000 persons aged between 15 and 64. Robust standard errors are reported in parenthesis. The results correspond to the national (urban and rural areas) and gender (men and women) aggregations for the post-policy period 2000/2002. Estimates were computed based on equation (1) including trends and controls on local security expenditures and GDP per-capita. Column (1) corresponds to the estimates using the baseline definition control group (low-destruction + non-producing departments); column (2) show the estimates for the specification using only low-destruction departments as control group; and column (3) corresponds to estimates using non-producing departments as control group. All the specifications use high-destruction departments as the treatment group. Given the different number of observations used to compute the estimates along the three different specifications, direct comparisons cannot be carried out.

Table 12 shows for both homicides (panel A) and violent deaths (panel B) three different versions of the causal effects of Plan Colombia on the outcome variables. Column (1) reports the estimates corresponding to the baseline specification where the control group of departments consists of the low-destruction and non-producing departments, and Columns (2) and (3) show the estimates of a model considering low-

coca-destruction departments alone and non-producing departments alone, respectively, as the control groups.¹⁶ These results show once again, that although not the same direction of the effect, consistency in terms of no significant effects in homicides, and positive significant effects on violent deaths when non-producers alone are used as control groups. Finally Appendix B reports the results of a test that seeks to establish whether or not the unconfoundedness assumption holds.¹⁷ One way to indirectly approximate this test is using two distinct control groups choosing one of them as treatment and the other as control group. This test works in the way that given that none of them is really treated the effect should be zero in any case. As can be seen in Appendix B the estimates show no significant estimates neither for homicides (panel A) or violent deaths (panel B) across national aggregations and for urban or rural areas. Thus I found no reasons to believe that the conditional independence does not hold in this case.

V. Summary and Conclusions

In this paper I analyzed the effects of Plan Colombia on homicides and violent deaths. This policy intervention was fully implemented since 2000 under a Colombian/American cooperation which was mainly focused on the reduction of the coca cultivation in the country. Although this initiative considered additional measures such as promoting social and economic justice and the increase in security, and not just reducing the supply of cocaine, the truth is that either the program fell short in implementing measures aimed at reducing crimes, or it was never its main purpose. In fact Mejía and Restrepo (2008) and

¹⁶ It is worth mentioning that estimates across the three columns have to be carefully analyzed since three different specifications of the control group imply three different sample sizes.

¹⁷ This assumption states that the choice of the treatment and control groups are independent of the outcome variable, conditional on a set of covariates.

Gaviria and Mejía (2011) mention that once the cooperation of U.S. government started in 2000, the fundamental objectives of the program radically changed since the Americans had conditioned aids to reduce the supply of illegal drugs and not to reduce levels of insecurity in Colombia.

The quasi-experiment setting induced by the implementation of Plan Colombia let me analyze the causation between reducing coca cultivation and the violent deaths by looking at the impact of additional economic/military resources on the reduction of homicides and other violent deaths. To do so I compared the number of deaths before and after the policy implementation in the regions mainly affected (with high-destruction of coca crops) as compared to those where the impact was lower (with low-destruction of coca crops), being careful in considering only the years for which there is no overlapping with a different security program (specifically the so called Democratic Security Policy) starting late in 2002.

The estimates derived from a number of empirical strategies, show that while there is no evidence on any positive or negative effect on homicides, there are positive/negative differential effects on violent deaths when gender and areas of residence disaggregations are considered. In particular, even though the effect as a whole seems to be an increase in violent deaths, this is the case only for women living in urban areas, whereas for countrymen the results revealed reduction in the number of violent deaths. Even though there are clear and uncontroversial evidences of the achievement of the goal set by the Colombian/American cooperation – in terms of the reduction in the number of hectares with coca crops but not in terms of reducing the supply of cocaine –

no evidence was found of any significant effect of this initiative in the reduction of homicides.

The main contribution of this paper is to present new and conclusive evidence on the causal relation between Plan Colombia and violent deaths. Previous studies had shown a negative and significant relationship between them; however, this study made an effort to overcome some potential obstacles in terms of the identification strategy and, in particular, the set up of the post-policy period, from which it is clear that no causal relationship existed between Plan Colombia and the reduction of homicides during the program's onset.

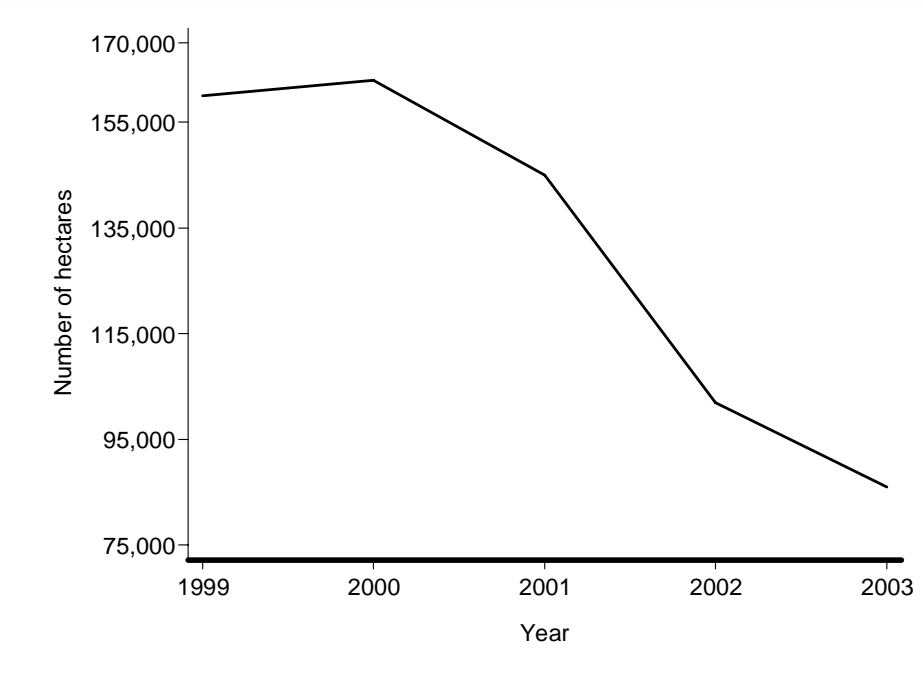
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Appendix A. Coca Cultivation in Colombia – Number of Hectares, 1999-2003



Note: United Nations office for Drug Control (UNODC) and the Government of Colombia.

Appendix B. Unconfoundedness test for the effects of Plan Colombia on Homicides and Violent Deaths
(Comparison across national, urban and rural areas)

	National (1)	Urban Areas (2)	Rural Areas (3)
A. HOMICIDES			
Interaction term	-0.001 (0.106)	-0.004 (0.143)	-0.218 (0.192)
Trends	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes
Number of departments	18	18	18
Sample Size	810	810	810
B. VIOLENT DEATHS			
Interaction term	0.286 (0.219)	0.246 (0.240)	0.252 (0.252)
Trends	Yes	Yes	Yes
Log GDP per-capita	Yes	Yes	Yes
Log Local security expenditures	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Department dummies	Yes	Yes	Yes
Age-groups dummies	Yes	Yes	Yes
Number of departments	18	18	18
Sample Size	810	810	810

* p<0.10, ** p<0.05, *** p<0.01

Note: The dependent variable was computed as the corresponding number of homicides and violent deaths per 100,000 persons aged between 15 and 64. Robust standard errors are reported in parenthesis. The results correspond to gender (men and women) aggregations for the post-policy period 2000/2002. Estimates were computed including trends and controls on local security expenditures and GDP per-capita. In this case regressions between two different control groups of departments were carried out, low-coca-destruction and non-producing.