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Is the war on drugs working? Examining the Colombian case using micro data

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Is the war on drugs working?
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Is the war on drugs working?

Examining the Colombian case using micro data

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Abstract

The intense debate on the effectiveness of the war on drugs contrasts with the lack of empirical evidence on its impacts. To evaluate the effectiveness of control-supply policies, we use micro data from an original survey with farmers living in a coca growing area in Colombia. We find that while eradication and alternative development decrease coca supply, the elasticity of supply of these policies is rather low. The efficiency of anti-drug policies could be increased by investing more in alternative development and less in eradication. Our analysis suggests that changing people's attitudes toward coca can be a promising alternative in the fight against drugs.

Keywords: Coca; Colombia; War on Drugs, Morality.

JEL classification: D81, G11, K42, Z12, Z13

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1. Introduction

More than 40 years passed since the war on drugs was launched by President Nixon. Yet, it is not clear whether the supply-control policies (interdiction, domestic enforcement and country-source control) have been successful. Critics argue that the collateral cost have outweighed the benefits. For instance, the enforcement of anti-drug policies has been associated with increased HIV and HCV infections, social exclusion of the minorities and poorer groups, higher crime rates and emergence of terrorist groups (NIDA, 2000; Diaz and Sanchez, 2004; Caulkins and Kleiman, 2011). Furthermore, the figures on the benefits of enforcement present mixed results. While prevalence of drug use is falling, the total consumption has been stable due to higher proportion of heavier users. Besides, the prices of illicit drugs have not increased as intended by source country supply policies (Caulkins et al. 2005).

Evaluating the effectiveness of the war on drugs by its effect on prices can however be misleading. Changes in consumption trends, competitiveness in the retail and trafficking markets, and the technologies used to smuggle and produce illicit substances, can neutralize the effect of supply control strategies on prices leading to the underestimation of the effects of the policy (Caulkins and Reuter, 1998). In this paper, we use an alternative measure of the effectiveness of anti-drug policies. Particularly, we focus on the effect of source country policies on drug supply and consider the case of Colombia, the largest producer and provider of cocaine to the US market.

The objective of this paper is to provide a quantitative measure on the effectiveness of policies aiming at decrease the areas with coca, the raw material used in the production of cocaine. Two main strategies are used in Colombia to combat drug production: alternative development which consists of giving carrots or individual

monetary payments to farmers in exchange for the promise of not cultivating coca and stick policies which consist on the eradication of illicit crops using aerial spraying of herbicides or manual destruction of the plants. About 1 billion dollars (1.2% of Colombia's GDP in 2005) are spent annually on the anti-drug policy in Colombia (ONDCP, 2006; Alvarado and LaHuerta, 2005.) Yet, little is known on the effectiveness of this policy. In this paper we estimate the elasticity of supply of coca to carrot (alternative development) and stick (eradication) policies considering separately the extensive and intensive margins. Moreover, we compare the cost-effectiveness of these two strategies.

The main limitation to measure the effectiveness of anti-drug policy is the lack of information on drug availability. Due to the illicit nature of the activity, little is known on how raw material producers, traffickers and dealers react to anti-drug policies. Most of the statistics are based on macro data that considers figures at the regional level. For instance, based on satellite images the UNODC provides annual census on total areas with coca in Andean Countries. The papers that use this information to investigate the determinants of the supply of drugs in Colombia conclude that carrots are effective in reducing the area of land cultivated with coca, while sticks either increased coca supply or had no significant effect (Carvajal, 2002; Díaz and Sánchez, 2004; Moreno et al., 2003; Moya, 2005; Tabares and Rosales, 2005; Reyes, 2011; Dion and Russler, 2008). However, the use of information aggregated at the regional level poses the question on how to find a valid instrument to control for the endogeneity of policy interventions.

In this paper we circumvent the problem of the endogeneity of policy interventions using a unique micro data set. In 2006 we conducted a survey with farmers living in Putumayo, Colombia, one of the regions with larger coca cultivation tradition in the

world. As coca cultivation is a common activity in the region and the main source of cash income for many farmers, participants in the survey were willing to answer an anonymous survey on coca cultivation. In the survey we ask farmers for cultivation decisions in two different years (2003 and 2005), so we obtained a unique self-reported panel data set on drug production. For small scale farmers, as the ones included in our survey, policy can be considered exogenous as the decision from one single farmer is marginal and does not affect the likelihood to be targeted by anti-drug programs. Using exogenous information on areas sprayed three years previous to the reference years; we are able to estimate the effectiveness of eradication policies using panel data analysis. Besides, with support from the farmers, we estimate the relative profitability for what farmers considered the best alternative to coca and use this estimative at the community level to evaluate the effectiveness of alternative development. We find that coca cultivation is more elastic with respect to carrots than to sticks. One percent increase in the number of hectares eradicated over the number of hectares cultivated decreases coca cultivation in 0.29 percent, while one percent increases in the return of the alternative decrease coca cultivation in 1.67 percent. Our analysis suggests that in order to decrease coca cultivation in 1% it is required to invest about 2 million dollars in anti-drug policies.

Interestingly, we find that coca and non-coca farmers differ in socioeconomic characteristics. Besides being older, less educated and more risk averse, non-coca farmers are more likely to self-report as being Protestants than coca farmers. This indicates that religiosity can affect participation in illicit activities. Yet, more investigation is required on the exact channels by which religiosity plays a role.

To the best of our knowledge this is the first empirical study estimating the elasticity of supply of coca cultivation using revealed preference data. Two studies use experimental data to estimate the elasticity of supply of coca. Ibanez and Carlsson (2010) use a hypothetical choice experiment and Ibanez and Martinsson (2013) use a framed field experiment. This paper is complementary to the previous work as here we use information on actual cultivation decisions. Garcia-Yi and Grote (2010) investigate the motivations of indigenous groups to cultivate coca in Peru. However, as coca cultivation is not illicit in this country, it is not possible to derive policy implications from this analysis.

Some studies have compared the cost-effectiveness of supply and demand control policies. For instance Rydell, Caulkings and Everingham (1996) conclude that it is more cost-effective to implement treatment than enforcement. Yet, the price-elasticity of supply control policies used in the analysis is assumed rather than estimated. Crane et. al., (1997) estimate the effect of source country interdiction activities on cocaine street prices. They find that prices increases can be associated with mayor supply control operations. One limitation of their analysis is that it cannot disentangle the effectiveness of different drug control strategies. Grossman and Mejia (2008) and Mejia and Restrepo (2011) use micro simulation models to estimate the cost effectiveness of different anti-drug strategies in Colombia and the U.S. These studies conclude that it is more effective to control trafficking than production. One limitation of micro simulations as this is that the estimations are highly sensitive to the assumptions of the model and do not correspond to actual measures of elasticity of supply.

In our analysis we consider the partial equilibrium effects of anti-drug policies[1]. Moreover, in the cost-effectiveness analysis we use the monetary cost of the anti-drug policies and do not consider its social costs which in the case of eradication could be significant and further reduce its cost-effectiveness.

The paper is organized as follows. Section two presents the empirical strategy that guides our analysis. Section three presents the data while section four discusses the results. Policy implication and conclusions are presented in sections five and six, respectively.

2. Empirical strategy and econometric model

We want to investigate the effect of anti-drug policies on the decision to cultivate coca and the number of hectares that are cultivated. This decision can be understood as a two step process. In the first step, farmers decide whether to cultivate coca or not, while in the second step farmers decide on the number of hectares that they want to cultivate.

This model can be represented by a Cragg model (1971) that consists of two equations. The first equation is a decision equation where a farmer, *i*, chooses to cultivate coca in period *t*, ($Crop_{it} = 1$) if the utility of cultivating coca is larger than the utility of not cultivating it, ($V_{it}^{*} > 0$). The utility of cultivating coca is a function of a vector $X_{it.}$ that includes policy variables x_i, and other economic and non-economic factors,

$$Crop_{i_{it}} = \begin{cases} 1 & V_{it}^{*} = X_{it}'\beta_i + u_i + v_{it} \geq 0 \\ 0 & Otherwise \end{cases} \qquad (1)$$

The second equation is a truncated regression model that considers the amount of hectares cultivated (*Ha*) as a function of a vector of parameters $X_{2it,}$ such that*:*

[1] We cannot estimate the total effect of the policies and account for side effects as displacement of coca crops to other areas.

$$E[Ha \mid Ha_i > 0] = X_{2it}'\beta_i + \sigma\lambda_{it} \qquad (2)$$

Where, $\lambda_i = \phi(X_{it}\beta_i)/[1-\Phi((X_{it}\beta_i)]$, and ϕ and Φ are the standard normal density and the cumulative standard normal distribution, respectively.

The total elasticity of supply with respect to policy variables x_i can be represented as:

$$\frac{\partial E[Ha_i]}{\partial x_i} = \frac{\partial P[Crop_i = 1]}{\partial x_i} E[Ha_i \mid Ha_i > 0] + \frac{\partial E[Ha_i \mid Ha_i > 0]}{\partial x_i} P[Crop_i = 1],$$

where x_i is a covariate (eradication or alternative development).

We use a random effects probit model to estimate equation (1) and a random generalized least squares to estimate equation (2).

3. Data

Putumayo in the South East of Colombia was selected as the locality for data collection because of its well-established tradition in coca production. Coca production was established in the region in the 1980's and by 2000 about one third of Colombia's coca-growing areas were located in Putumayo (DNE, 2005). In addition, this was the first region where eradication campaigns (destruction of coca plants through aerial spraying or manual pulling-up of plants) were implemented on a large scale. Since 1989 Putumayo has benefited from alternative development projects aimed at making non-coca activities more profitable (DNE, 2005). In 2000 the government implemented Voluntary Agreements of Substitution (VAS) in which farmers agreed to destroy coca plants in exchange for funding (in kind) for a food security project. Later, this program was replaced by the Forest Guarding Families Program (FGP) in which farmers agreed to destroy coca plants in exchange for a three year monetary subsidy, paid bimonthly. Under the FGP, farmers could also benefit from a subsidized credit for the

establishment of a legal product (e.g. palm hearts, flowers, vanilla and cattle-raising). If farmers opted in to the productive project, they could also receive technological advice and support in commercialization.

We included four municipalities in our study: Mocoa and Orito, where the number of hectares (ha) of coca per square kilometer of the total municipal area are low (0.08ha coca/Km^2 and 0.17ha coca/Km^2, respectively) and Puerto Asis and Valle del Guamuez where that ratio is higher (0.54ha coca/Km^2 and 1.82ha coca/Km^2, respectively.

The recruitment of participants was done with the support of the local leaders.[2] We asked the local leaders to invite the community for a one day meeting with university researchers. In order to avoid self-selection, participants did not know that they would participate in a survey on coca cultivation during the meeting. To reduce the problem of validity of self-reported data due to the illegality of coca cultivation, participants in the survey were informed that it was an academic study and therefore no names or addresses were asked. We made clear to participants that we were not representing any governmental organization and that the data would confidential.

During the morning session, a group of enumerators conducted individual interviews. In the afternoon, after a lunch break we conducted a framed field experiment. The results of this experiment are presented in Ibanez and Martinson (2013). In total 293 households were interviewed for about one hour using a pre-tested questionnaire, but due to late arrivals a shorter version of the interview was conducted in 38 cases. No significant differences were found between the samples with the short and long questionnaires with respect to hectares with coca, education level, age or gender (Mann-Whitney test).

[2] Due to the lack of population registers, it was not possible to select participants in the survey randomly.

The questionnaire included questions about productive activities on the individual's farm in 2003 and 2005, coca production in the municipality in 2003 and 2005, attitudinal questions on coca production and anti-drug policies, and standard questions on socioeconomic characteristics[3]. In addition, participants were asked detailed questions that enable the estimation of the net return from coca and the best alternative. This exercise asked each of the participants to provide detailed figures on the productive costs. As the estimated profitability of coca and the alternative might differ for coca and non-coca farmers, in the analysis we use mean values at the locality level. In order to compare the level of moral development between coca and non-coca farmers we used the Moral Judgment Test (Lind et. al., 1985). Besides, the survey included a hypothetical risk experiment that followed Binswanger (1980) design. Lastly, the survey included a hypothetical choice experiment on coca production at different levels and of eradication and alternative development. The results are presented in Ibanez and Carlsson (2010).

4. Results

Descriptive statistics

Table 1 analyses the representativeness of our sample comparing the survey and census data. We find that there are no significant differences in age, household size and education level between the farmers who participated in the survey and the average population in the area. Even though, the proportion of large farm-holders is underrepresented in our sample, compared with Census data, the average number of hectares with coca in 2005 is not significantly different from the "Coca cultivation Census" data (UNODC, 2009).

[3] Details on the survey used can be found in Ibanez and Carlsson, 2010.

>>>TABLE 1<<<

Table 2 presents the summary statistics of the variables related with coca cultivation in 2003 and 2005. We find that the self-reported proportion of coca farmers and the amount of land cultivated with coca decreased between 2003 and 2005. The reduction in areas cultivated with coca can be explained by the decrease in the economic incentives to cultivate coca observed during this period: i) The relative profit of coca compared with that of alternatives dropped; ii) the number of hectares sprayed out of the total number of hectares cultivated with coca in the municipality increased; iii) about one third of the subjects participated in the Voluntary Agreements of Substitution. The perceived proportion of farmers cultivating coca in the municipality is remarkable close to the self reported proportion of coca farmers. This can be an indicative of the accuracy of self-reported information. Our descriptive data supports the hypothesis that it pays off to cultivate coca as coca is three to five times more profitable than the alternative crop.

>>>TABLE 2<<<

Table 3 presents the descriptive statistics of socioeconomic characteristics for farmers included in the analysis. The second and third columns refer to non-coca and coca farmers respectively. The last column presents the results of the Wilcoxon rank-sum test on equity on the distribution between coca and non-coca farmers for continuous variables and the Pearson's chi-squared for independence in distribution across groups. We find that coca farmers are significantly younger, more educated and hold smaller land farms than non-coca farmers. No significant differences were observed between coca and non-coca farmers with respect to wealth or remoteness (measured as transport cost to the market). Using a hypothetical risk experiment following Binswanger's

(1980) design, we find that more than half of the sample had severe and extreme levels of risk aversion. Yet we find no significant differences between coca and non-coca farmers with respect to the level of risk aversion.

The moral Judgment test (Lind et. al., 1985) makes possible to measure moral development. According to theory of social development (Kohlberg, 1969), the actions of individuals at the lowest level of moral development, pre-conventionalists, are motivated by individualistic and opportunistic behavior (e.g. avoidance of personal harm or obtaining personal satisfaction). At an intermediate level, the actions of conventionalists are motivated by social concerns (e.g. what others would think or the desire to preserve social order). At the highest level of moral development, post-conventionalists justify their moral actions by higher objectives such as human rights and principles of conscience. We find that coca and non-coca farmers are not significantly different in the level of moral development. This result opposes Aguirre's (2003) finding of lower moral development of criminal juveniles in Colombia versus a comparative control group.

Though most of the farmers declared to be Catholic, the percentage of people that declared to be Protestant was significantly higher for non-coca farmers than for coca farmers. A significantly larger proportion of coca farmers declared not to belong to any religion (being Atheist) than was the case with non-coca farmers.

>>>TABLE 3 <<<

Following the theory of procedural justice (Tyler, 1990), we measured the guilt associated with disobeying the authorities or legitimacy of the authorities by the degree of acceptance to a series of statements about the authorities and the rule imposed by them. We captured three aspects: 1) participation in defining policies to control coca

cultivation; 2) effectiveness of the policies against coca cultivation and 3) fairness in the implementation of the policies against coca cultivation. The level of obligation to comply is significantly higher for non-coca farmers than for coca farmers.

Elasticity of supply to anti-drug policies

Table 4 presents the results for the random effects probit model and the random effects generalized least squares. In the first equation we use a dummy variable taking the value of one if the farmer cultivates coca and zero otherwise. In the second equation we use the conditional number of hectares as a dependent variable. We present the results for two alternative models. The first model considers only economic incentives while the second model controls for socioeconomic characteristics of participants. We find that in all models there is a significant correlation between coca cultivation decisions over time (rho>0) which supports the use of panel data analysis. Besides, the econometric model supports the use of a two step procedure to correct for sample selection (lambda>0).

Consistently with Becker's (1968) economic model of crime, economic incentives affect coca cultivation decisions. Higher risk of eradication, measured as the number of hectares eradicated over the number of hectares with coca in the municipality two years previous to the reference period, reduce the likelihood to cultivate coca and the number of hectares cultivated. Also, higher net profit of the alternative decreases coca cultivation. Yet, carrot and stick policies have differential effects on the extensive and intensive margins. While increased risk of eradication affects to a larger extent the likelihood to cultivate coca than the amount of coca cultivated, alternative development

has the opposite effect and affects more the number of hectares cultivated than the likelihood to cultivate.

Contrary to expectations, we find a backward-bending coca supply curve. This finding is consistent with the idea that people cultivate coca in order to obtain a target level of income so higher price of coca allows switching to alternative activities. There are positive neighborhood effects on coca cultivation. Living in a municipality where more coca has been cultivated in the past increases the likelihood to cultivate coca and the number of hectares that are cultivated. This could indicate positive social interaction effects as the ones proposed by Glaeser et al. (1996), Levitt (1998), Calvo and Zenou (2004) and Garoupa (1997 and 2003). Alternatively, this positive correlation can be due to particular economic conditions in the area that favor the illicit activity.

Once that we control for socioeconomic characteristics of participants we find that the effects of carrots and sticks are robust. Evaluating the elasticities at the average policy levels between 2003 and 2005, we find that the supply of coca is inelastic to the level of risk. The total elasticity of supply with respect to eradication is -0.29 versus an elasticity of supply with respect to alternative development of -1.69.

We find a negative correlation between age and education on the likelihood to cultivate coca. The positive sign of education could be related with the higher education level of the younger generations of coca farmers. The positive correlation between risk aversion and coca cultivation could be due to the perception that coca is more secure than alternative products as it has a stable market. Interestingly, we find that normative factors seem to affect coca cultivation decisions. Living in an area with a higher percentage of Protestants, scoring higher in the Moral Judgment Test and living in a community where authorities have higher legitimacy, is significantly associated

with lower number of hectares with coca. This result provides supporting evidence to Sen (1977), Etzioni (1990) and Vanberg (1998). Moreover, controlling for the level of law enforcement, we find that farmers who live in more remote areas cultivate more hectares with coca. Although one would expect that more remote areas also have lower level of law enforcement, in the case of coca cultivation this does not seem to be the case. About 81% percent of the farmers in the survey declared to have been affected by aerial spraying at least once during five years previous to the survey. We also find that there is no significant correlation between our measure of remoteness and number of times that farmers were sprayed or how often they witness police control. Yet, we also run a series or robust checks to address potential endogeneity of law enforcement. In particular we run the model including three alternative measures of perceived risk at the communal level. The measures used are subjective level of risk aversion, witness of police control and number of times that they experience eradication. In all three regressions the result holds and remoteness is associated with more coca.

>>>TABLE 4 <<<

5. Policy implications

The results of our analysis suggest that both strategies used by authorities in Colombia to control coca cultivation, i.e. eradication and alternative development programs, are effective in discouraging coca cultivation. From a policy perspective it is important to compare the marginal cost of these two anti-drug policies.

Given that there are no precise figures on the cost of the anti-drug policies in our analysis we made many simplifications. Hence the following analysis is meant to be indicative. To estimate the marginal cost of eradication, we consider that in 2010 out of 57 thousand hectares with coca, 102 thousand hectares were sprayed (UNODC, 2012). Considering our estimative of the elasticity of supply to eradication (-0.21), 2,820

hectares more would have needed to be sprayed to reduce coca cultivation by 1%.[4] Logan (2006) estimated that it costs 640 dollars to spray one hectare. Hence, the marginal cost of decreasing coca in 1% by eradication is about 1,804 thousand dollars.

According to our estimative of the elasticity of supply to changes in the relative price of the alternative, to achieve a 1% decrease in the supply of coca using alternative development, the return of the alternative would have needed to be 1.48 US dollars higher.[5] The marginal cost of alternative development would depend on the number of hectares that benefit from this higher return. If the 57 thousand hectares cultivated with coca in 2010 would have benefit from this incentive, the marginal cost of alternative development would have been 84 thousand US dollars. In other words the marginal cost of reducing coca by 1% using alternative development would be 4% the cost of achieving the same reduction using eradication.

Yet, it could be that in order to discourage farmers from cultivating coca, the higher price of the alternative product need to benefit a larger number of hectares. For instance, if 10% of the territory in Putumayo had benefited from the higher return of the alternative, the marginal cost would have been 369 thousand US dollars.

Alternatively, one would like to know, how many hectares can benefit from alternative development in order to equate the marginal cost of alternative development and eradication and achieve efficiency? Our analysis indicates, that efficiency in anti-drug policy would have achieved if 1.2 million hectares would have benefited from the higher price. In other words, 1% of Colombian territory or 48% Putumayo territory would need to benefit from higher return of the alternative so the marginal cost of eradication and alternative development were equal.

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[4] This is Coca_Hectares*Ratio*(1/$\varepsilon_{sticks/100}$)=57,000*1.78*(1/0.21/100)=2820

6. Conclusions

In the paper we consider the relative effectiveness of eradication and alternative development in the fight against drug production. While we find evidence that this two policies are effective in decreasing coca supply, the elasticity of supply of coca to eradication and alternative development is rather low. To decrease supply in 1% it is required to invest 2 million dollars in anti-drug policies.

Our analysis indicates that normative factors can affect coca investments. This suggests that increasing the population's awareness of the negative effects of coca can be use as a strategy to fight illicit drugs. Campaigns as "Coca la mata que mata", seem to be a positive step in that direction. Authorities can gain support by increasing coverage of the existing programs and negotiating gradual reductions in areas. Our analysis also suggests that marginality and the impossibility of making a living out of legal activities is a strong factor behind coca cultivation. In this case, the emphasis of the policy should be towards increasing the profitability of legal agriculture by, for example, investing in infrastructure or offering minimum prices for legal products.

Using self-reported information on an illicit activity such as coca cultivation may underestimate the dimensions of the problem of coca cultivation. However, our intention has been to unveil some of the factors that affect coca cultivation that cannot be studied with aggregated information. We consider that this study is a first step towards understanding the effect of anti-drug policies and is meant to be indicative.

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[5] Alt_Profit*(1/$\varepsilon_{carrots}$/100)/exchange=550*(1/1.69/100)/2.2

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TABLE 1. REPRESENTATIVENESS OF THE SAMPLE

Variable	Sample			Census	Test Ho: Sampe=Census	
	Obs.	**Mean**	**Std. Err.**	**Mean**	**T-test**	
Socioeconomic Characteristics						
Age	292	41.40	14.325	41.77	-0.44	
Household size	280	3.71	1.439	3.79	-0.96	
Education grade	292	1.59	0.883			
Less than 3 years of education	293	0.51	0.501	0.50	0.37	
4 to 5 years of education	280	0.31	0.465	0.30	0.37	
More than 5 years of education	293	0.19	0.391	0.19	-0.32	
Size of the farm						
Less that 3 hectares	293	0.30	0.459	0.27	1.23	
Between 3 and 10 hectares	293	0.30	0.459	0.30	-0.11	
Between 10 and 50 hectares	293	0.35	0.479	0.27	3.14	***
More than 50 hectares	293	0.04	0.206	-11.59	-8.18	***
Average number of hectares with coca 2005	123	1.41	1.295	1.34	0.61	
Average number of hectares with coca 2003	203	1.85	1.852	1.17	5.25	***

Sources: Original Data Survey, DANE "Censo de Población 2005"; UNODC "Observatorio de Drogas"

*, ** and *** denote rejection of the null hypotesis at 10% 5% and 1% signifcance level, respectively.

TABLE 2. COCA CULTIVATION

Variable	2005			2003		
	Obs.	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**
Coca Cultivation						
Dummy Coca	286	0.43	0.496	293	0.71	0.455
Hectares with coca conditional on cultivating	123	1.41	1.295	203	1.85	1.852
Proportion of farm land with coca conditional on cultivating	122	0.29	0.296	203	0.31	0.295
Perceived proportion of coca farmers in the region	269	0.47	0.269	269	0.79	0.212
Hectares with coca per squared Km in municipality (lagged two years)	291	0.63	0.438	291	5.5	4.824
Economic Benefit						
Net annual income coca (Thousand COP)	239	3507	3336	231	6495	4367
Net annual income alternative (Thousand COP)	231	978	1157	220	1133	1554
Exchange rate December COP to 1 USD		2286			2779	
Erradication and Alternative Development						
Sprayed hectares over total hectares with coca past two years	291	7.94	6.741	291	1.07	0.792
Dummy Voluntary Agreements of coca Substitution	293	0.35	0.478	293	0.35	0.478

Source: Authors Calculations

*, ** and *** denote statistical significance at 10% 5% and 1% level respectively.

TABLE 3. DESCRIPTIVE STATISTICS

Variable	All Farmers n=236		Non Coca farmers n=136		Coca Farmers n=100		Test
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Ho: Non-Coca=Coca
Socioeconomic Characteristics							
Age	41.40	41.83	44.74	13.94	37.88	14.41	***
Dummy Female	0.35	0.36	0.35	0.48	0.36	0.48	
Education Grade	1.59						**
0 = Percentage with no education	8.22						
1 = Percentage with Basic Education	43.15	0.43	0.48	0.50	0.37	0.49	
2 = Percentage with complete primary education	30.14	0.30	0.28	0.45	0.32	0.47	
3 = Percentage with more than primary education	18.46	0.19	0.15	0.36	0.25	0.44	
Risk aversion	3.44						
0 = Percentage missing risk preference	0.05	0.21	0.06	0.24	0.03	0.17	
1 = Percentage risk neutral to risk loving	0.17	0.38	0.16	0.37	0.18	0.39	
2 = Percentage with slight to neutral risk preference	0.06	0.24	0.07	0.25	0.06	0.24	
3 = Percentage with moderate risk preference	0.11	0.31	0.10	0.31	0.12	0.33	
4 = Percentage with intermediate risk preference	0.06	0.24	0.10	0.30	0.02	0.14	
5 = Percentage with severe risk preference	0.08	0.27	0.10	0.31	0.05	0.22	
6 = Percentage with extreme risk preference	0.47	0.50	0.41	0.49	0.54	0.50	
Transport cost (Thousand COL 2005)	2.74	2.32	2.63	2.31	2.89	2.34	
Hectares per capita	5.62	12.38	6.94	15.48	3.83	5.60	
Land Value (Thousand COP 2005)	16,525	21,527	17,216	23,921	15,587	17,837	
Wealth (Thousand COP 2005)	19,158	23,065	20,028	25,571	17,974	19,201	
Morality. Social Norms and Legality							
Level of moral development							*
0 = Missing values stage moral development	0.12	0.32	0.06	0.24	0.20	0.40	
1 = Pre-conventionalist	0.58	0.49	0.62	0.49	0.54	0.50	
2 = Conventionalist	0.25	0.44	0.27	0.45	0.23	0.42	
3 = Post-Conventionalist	0.04	0.20	0.05	0.22	0.03	0.17	
Religion							**
0 = Percentage who do not belong to any Religion	0.08	0.27	0.07	0.25	0.10	0.30	
1 = Percentage Catholics							
2 = Percentage Protestants	0.14	0.34	0.19	0.40	0.06	0.24	
Obligation to comply (Disagree=1.Agree =5)	3.30	0.88	3.42	0.84	3.11	0.91	***

Notes: The test of equal distribution is based on Wilcoxon rank-sum test for continuous variables and chi2 test for distributions

Source: Authors Calculations

*, ** and *** denote statistical significance at 10% 5% and 1% level respectively.

TABLE 4. WHO CULTIVATES COCA AND WHY?

	Dummy Coca Crop=1 (1) ey/ex	Hectares Ha|Crop=1 (2) ey/ex	Total Elasticity	Dummy Coca Crop=1 (3) ey/ex	Hectares Ha|Crop=1 (4) ey/ex	Total Elasticity
Log average profit coca	-1.951+	-1.511	-1.886***	-2.905*	-4.305+	-2.001***
	(1.162)	(1.612)	(1.007)	(1.436)	(2.494)	(0.655)
Log average profit alternative	-2.205*	-4.381*	-4.093***	-2.726*	-3.538	-1.686***
	(1.015)	(1.883)	(1.104)	(1.320)	(2.291)	(0.521)
Sprayed ha/Total coca ha (t-2)	-0.448**	-0.267**	-0.361***	-0.382*	-0.244	-0.209***
	(0.164)	(0.0974)	(0.068)	(0.158)	(0.194)	(0.028)
Ha with coca/Municipal Area (t-2).	0.173***	2.777***	1.709***	0.274***	3.241***	0.955***
	(0.0274)	(0.806)	(0.306)	(0.0433)	(0.894)	(0.117)
Level of risk aversion (Missing=0,low=1 - extreme=6)				0.149	0.548**	
				(0.145)	(0.201)	
Dummy miss risk averssion				-0.101+	-0.0565+	
				(0.0575)	(0.0324)	
Age				-0.499+	-1.489**	
				(0.293)	(0.573)	
Female				-0.112	-0.447*	
				(0.0691)	(0.221)	
Education (None=0,Basic=1, Primary=2, More=3				0.277*	0.888**	
				(0.135)	(0.323)	
Log Land per capita				-0.097	0.030	
				(0.0959)	(0.026)	
Transport cost				0.101	0.357*	
				(0.0804)	(0.140)	
No. Atheo/No. Surveyed people				0.032	0.025	
				(0.054)	(0.0587)	
No. Protestants/No. Surveyed people				-0.452**	-0.622	
				(0.155)	(0.479)	
Moral development.(Missing=0; Pre-Conv=1; Conv=2; Post-Conv=3)				-0.278	-0.705+	
				(0.196)	(0.387)	
Average Obligation to comply.(Compl disagree=1, Compl. Agree=5)				-0.439	-1.900+	
				(0.756)	(0.982)	
Dummy miss stage moral development				0.0282+	0.133*	
				(0.016)	(0.0587)	
Lambda		-4.292***			-4.487***	
		(1.256)			(1.280)	
N	549	326		525	307	549
Groups	289	219		275	207	289
Log Likelihood	-280.8			-238.7		-280.8
Rho	0.619	0.409		0.483	0.416	0.619

Notes: standard errors in parentheses

Source: Authors Calculation

+ p<0.10, * p<0.05, ** p<0.01,*** p<0.001