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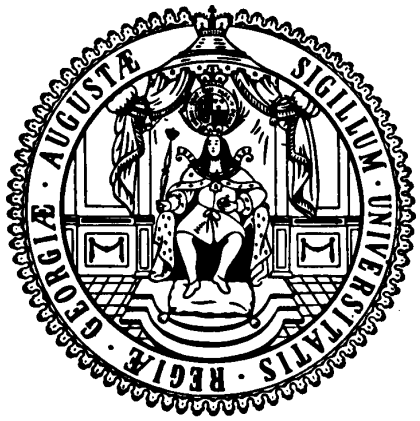

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A survey-based choice experiment on coca cultivation

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Abstract

From 1997 to 2005, an astonishing 5,200 million USD was invested to reduce cocaine production in Colombia, the world's main cocaine producer. However, little is known about the effectiveness of policies targeting coca cultivation. This paper uses a survey-based experiment to evaluate the effects of the two main policies: eradication and alternative development programs. Our results support Becker's (1968) model of crime participation and in addition shed light on other non-monetary factors that affect the coca cultivation decision: religion, legitimacy, remoteness, and poverty are found to be important. We find that coca cultivation is inelastic to increases in perceived risk and relative profit so eradication and alternative development would have a rather small effect on coca cultivation. A simple simulation exercise predicts that investing additional hundred thousand dollars in eradication decreases coca cultivation in only 1.5%.

Keywords: illegal drugs, choice experiment, Colombia, crime.

JEL classification: G11, K42, Z12, Z13

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1. Introduction

Following three international conventions on narcotic drugs (UN, 1961, 1971, 1988), Colombia, the largest producer of cocaine, started an aggressive campaign against production, transformation, and trafficking of drugs in the 1980s. As a result, the two main Colombian drug cartels were dismantled. The areas planted with coca nevertheless started to grow. In the early 1990s, less than 10% of the planted areas with coca in the world were in Colombia; by 2000 this proportion had increased to 74% (UNDCP, 2006). To control the increasing cultivation of coca, the government implemented two policies: eradication or destruction of coca plants and alternative development or provision of economic support for legal crops. Although an astonishing 5,200 million USD (the equivalent of 1% of the Colombian GDP) was spent to control the cocaine supply in Colombia from 1997 to 2005 (ONDCP, 2006), surprisingly little is known about the effectiveness of these anti-drug policies. This paper contributes to the limited literature on the evaluation of the effectiveness of the mentioned two policies on coca cultivation reduction.

Previous empirical studies have tried to evaluate the effectiveness of eradication and alternative development (e.g., Carvajal, 2000; Moreno *et al.*, 2002; Tabares and Rosales, 2005), but faced many problems. First, aggregated information does not allow identification of behavioral factors affecting the decision to get involved in illegal activity. Second, policy levels based on historical and regional information are endogenous, and third, the use of matching estimators does not allow evaluation of the effects of different policy levels (e.g., Díaz and Sánchez, 2004; Moya, 2005). [1] More generally, the use of revealed preference data limits the analysis to the effects of the policy levels that have actually been implemented, while it is hard to predict the effects of significantly different policy levels. An alternative approach to deal with the above problems is to use survey-based experiments where coca farmers indicate how they would behave under various anti-drug policies. This type of stated preference method has commonly been applied to areas such as environmental economics, health

[1] Kennedy *et al.* (1993) and Riley (1991) used an economic model of cocaine production and consumption to simulate the effects of increases in eradication and alternative development, but the measure of effectiveness was assumed rather than measured.

economics, and tax compliance; see for example Alpizar *et al.* (2003), Louviere *et al.* (2000), and Trivedi *et al.* (2005).[2]

The objective of this paper is to study the effectiveness of eradication and alternative development on coca cultivation reduction and to study the effect of other monetary and non-monetary factors on the decision to cultivate coca. We use unique household level data on Colombian farmers from a hypothetical choice experiment on coca cultivation where respondents state how many hectares they would dedicate to coca at different levels of relative profitability of the best alternative crop and at different levels of the probability of having the coca plants eradicated. Since the policy levels are varied, we can identify the separate effects of each policy after controlling for other factors affecting coca cultivation. In particular, following the behavioral model of crime we consider the effects of (1) morality, (2) legitimacy, and (3) social interaction. Our sample consists of both coca and non-coca farmers living in Putumayo, one of the regions with a long tradition of coca cultivation in Colombia. Obviously, there are a number of problems in applying a survey-based questionnaire to something as sensitive as coca farming. Nonetheless, we believe that the approach can serve as a good complement to studies using actual behavior.

The rest of the paper is organized as follows. Section 2 presents a simple model on coca cultivation, Section 3 describes the survey design, and Section 4 comments on the econometric model. Section 5 reports the results and Section 6 concludes the paper.

2. A Simple Model of Coca Cultivation

The decision to cultivate coca can be analyzed in the framework of traditional models of crime (e.g., Becker, 1968; Allingham and Sandmo, 1972; Ehrlich, 1973). Farmers decide how to allocate their land, T, between coca, C, and an alternative crop, A. We assume that the land that is not allocated to coca cultivation, $T - C$, is allocated to an alternative product. Though coca is more profitable than the alternative ($\Pi_C > \Pi_A$), it is also more risky. Coca cultivation is illegal, and authorities may discover and destroy the plants with a probability p. If coca plants are discovered and destroyed, farmers lose their investments and the land is incapacitated, preventing production in the next

[2] The survey-based method we apply is called choice experiment, stated choice, or conjoint analysis, depending on the literature.

period.[3] This investment loss is represented by *F*. The problem that an individual farmer has to solve is to maximize the expected utility, deciding on the amount of land to be cultivated with coca, *C*:

$$\max_{C} E[U] = (1-p)U(Y_g(C)) + pU(Y_b(C)), \qquad (1)$$

where $U(Y_g)$ is the utility when the crops are not detected, and $U(Y_b)$ is the utility when the crops are detected. The perceived income is Y_g and Y_b, respectively, and depends on the amount of coca that is cultivated.

Empirical evidence largely supports the predictions of the traditional models of crime (Cameron, 1988; Freeman, 1999; Eide *et al.*, 2006). However, these models fail to explain why people self-report taxable income correctly, pay TV licenses, or abstain from breaking the law even though the expected cost of being detected is very low (Andreoni *et al.*, 1998; Cohen, 1999; Frey and Torgler, 2007). To explain the departure from self-interested behavior in the rational choice models, the behavioral models of crime consider other non-monetary factors affecting participation in illegal activity. Frey (1990), Hausman and McPherson (1993), Sutinen and Kuperan (1999), and Torgler (2002), among others, suggest that morality, or the intrinsic motivation to do the "right thing," explains why people comply with regulations. Deviating from what is considered to be right creates a sense of sinfulness or guilt. Following Eisenhauer (2004), the moral cost of cultivating coca can be represented by a factor (1- *M*) that weights the profit from coca cultivation (Π_c). *M* is between zero and one, so for an individual with high moral concerns about cultivating coca, *M* is equal to one, and the monetary benefit that he/she receives from cultivating coca is completely reduced by the sense of guilt from any wrongdoing. On the contrary, for an individual with very low moral concerns, *M* equals zero, and the benefit he/she perceives from coca cultivation is equal to the monetary pay-off. A second type of explanation of high compliance levels suggests that compliance with the law also depends on legitimacy or acceptance of the law and support of the authorities (e.g., Tyler, 1990; Feld and Tyran, 2002; Feld and Frey, 2005). People's compliance increases when the laws are consistent with their own sets of moral values but also when the authorities and the procedures are considered fair and effective. Not respecting the law and the authorities may create an internal sense of

[3] In Colombia, the law also dictates imprisonment although this policy is seldom used.

disappointment. We represent this sense of disappointment by a factor (1- L) that weights the profit from coca cultivation. For a complete rebel, not adhering to the authorities is costless, hence L equals zero. For a complete follower, the discomfort of disappointing authorities is high, making L equal to one.[4] Finally, a third type of explanation of why people comply or do not comply with the law is associated with social interaction (e.g., Glaeser *et al.*, 1996; Elster, 1989; Bowles and Gintis, 1998; Manski, 2000; Garoupa, 2003; Calvó-Armengol and Zenou, 2004). Interaction with others can affect individual behavior as it modifies individual preferences, changes expectations, and/or modifies the constraints an individual faces. To capture the effect of social interaction, we assume that there is a social disutility of cultivating coca. We follow an approximation similar to Fortin et al. (2007) and Akerlof (1997) and model the social disutility of cultivating coca as a function, S, that depends on how much coca others in the group cultivate, C_s, and the amount of coca the farmer cultivates, C. We assume that the social disutility of cultivating coca decreases as others in the social group cultivate more coca, $S'(C_s) < 0$. This negative effect can be associated with lower social stigmatization of coca cultivation. Taking into consideration the monetary and non-monetary cost of coca cultivation, the perceived income in case of good and bad luck, Y_g and Y_b, can be written as:

$$\begin{aligned} Y_g &= W + (1-M)(1-L)\Pi_C(C) + \Pi_A(T-C) - S(C_s)C, \\ Y_b &= W + (1-M)(1-L)\Pi_C(C) + \Pi_A(T-C) - S(C_s)C - F(C), \end{aligned} \tag{2}$$

where W represents the initial level of wealth. The formal solution to this optimization problem is presented in Appendix A.

When the farmer is deciding whether to cultivate coca or not, (C=0), the first order condition for an optimum, simplifies to:

$$(1-M)(1-L)\Pi_C^{'} > \Pi_A^{'} + S(C_s) + pF'. \tag{3}$$

Hence, a necessary condition to start cultivating coca is that the value of the marginal profit from coca cultivation has to be larger than the expected marginal cost of cultivating coca. The expected marginal cost depends on the marginal profit of the alternative, the social disutility of cultivating coca, and the expected marginal cost of being discovered cultivating coca.

[4] Since M and L are related with an internalized cost they could be collapsed into a single variable. We preferred to keep them separately to stress the separately effect of morality and legitimacy.

On the other hand, the first order condition for an interior solution requires that the net marginal profit of coca cultivation is larger than the marginal cost of being discovered by authorities:

$$(1-M)(1-L)\Pi_C^{'} - \Pi_A^{'} - S(C_s) > F' \quad (4)$$

If this condition did not hold, there would be complete specialization in coca cultivation. At optimum, when coca is cultivated and farmers do not specialize in coca cultivation, the amount of coca cultivated is decreasing in risk of detection (*p*), marginal cost of loss if coca cultivation is detected (*F'*), moral standard (*M*), and legitimacy, or support to the authorities and the law, (*L*). We also find that the amount of coca cultivated is increasing in marginal profit of coca ($\Pi_C^{'}$), the amount of coca cultivated by others in the social group (C_s), and wealth (*W*). The effect for the marginal profit of the alternative ($\Pi_A^{'}$) cannot be determined. The area cultivated with coca, *C*, is thus a function:

$$C = f\left(\Pi_C^{'}, \Pi_A^{'}, p, F', M, L, C_s\right). \quad (5)$$

3. The Survey

We used a survey-based experiment to measure the responsiveness of farmers to changes in the relative profit of growing an alternative crop and to changes in the probability of eradication (see Appendix B). The survey included a number of questions regarding socioeconomic characteristics of the households, use of land holdings, and production of coca cultivation in the municipality. In addition, it included a choice experiment, a hypothetical risk experiment, and Lind's (1985) test of moral development. In the next section, we explain the experimental design and comment on the measures we used to capture monetary and non-monetary factors affecting behavior. We carefully informed the participants of the academic nature of the study, ensured anonymity, and also ensured that all data from the study was confidential and would be revealed only to the research team.

The choice experiment

In the survey-based choice experiment, we asked the respondents to state how many hectares they would dedicate to coca at various levels of two attributes: the relative profitability of the best alternative crop and the risk of eradication. The respondents

were first reminded of their answers to the questions about how much coca they cultivated at the time, about the profitability of coca and of the best alternative crop, and about their perceived risk of having coca plants destroyed. Figure 1 outlines the scenario.

Figure 1. Scenario of the choice experiment.

In the next section, I would like to ask what you would do if the profitability of the best alternative to coca were different and if the risk of having the plants destroyed changed. I would like you to think what you would do if the situation were different. In this type of study, people tend to answer in the way they think the researcher wants rather than what they would really do. Please consider carefully what you would do if you had to make these decisions. There are no wrong or right answers; it is all a matter of your own preferences. Take into consideration that others would probably do the same as you.
You said that last year you had ___ ha with coca and that the profit from one hectare with coca was ___ while the profit from the best alternative was ___. In addition, you said that the risk of having your plants completely destroyed by authorities was ___. Assuming that everything else is the same as last year, how many hectares would you plant with coca if the profit from one hectare of coca were the same as today, but the profit of the best alternative were ___ and the risk of having the plants destroyed were ___?

This open-ended question allowed for zero coca cultivation or cultivation of more hectares than actual land holdings, reflecting the fact that in the pilot study farmers declared that they would rent or buy more land if the profit from coca cultivation were very high. Each participant answered at most the nine choice sets described in Table 1. There were three possible levels of profitability for the alternatives: same as today, higher than today, and lower than today; and three levels of risk of eradication: higher than today, lower than today, and zero. All participants received the choice sets in the same order[5]. The levels were presented in absolute terms as described below.

[Insert Table 1]

In order to make the choice situation more realistic and familiar for the respondents, attribute levels were customized based on the current situation of the farmer. The profit of the best alternative was customized according to the conversion rates presented in

[5] A number of papers test the effect of ordering of choice sets in choice experiments (see e.g. Carlsson and Martinsson, 2001; Johnson et al., 2000; Layton and Brown, 2000). While the results are mixed, some show an effect of order while some do not, it would have been better to randomize the order of the choice sets. We suggest that future studies randomize the order of the choices.

Table 2. The rates depended on the expected profitability of the best alternative relative to the profitability of coca in 2005. For example, if the expected profit per hectare of coca was 1 million Colombian pesos and the profit per ha of the best alternative was 200,000 pesos, then the expected profit for coca was 5 times the profit for the alternative. Consequently, for a higher expected profit of the alternative (lower ratio than today), the conversion ratio was 2.5. This means that the expected profit of the best alternative crop was 1 million pesos divided by 2.5, or 400,000 pesos. For a lower profit of the best alternative (higher ratio than today), the conversion ratio was 10, making the profit of the best alternative 100,000 pesos. Hence, the respondent was presented with an expected profit of the alternative of 100,000 pesos in the choice sets with lower profitability than today and a profit of 400,000 pesos in the choice sets with higher profitability than today.

[Insert Table 2]

The perceived risk of having the plants destroyed by authorities was measured on a 1-5 scale ranging from very unlikely to very likely. The levels used in the choice experiment were based on the perceived risk levels in 2005; see Table 3. In the choice situations, a lower risk than today means that the risk attribute was one unit less than the perceived risk in 2005, while a higher risk than today means that the risk attribute was one unit more than the perceived risk in 2005. In the case of zero risk, the wording "No risk at all of having the plants destroyed" was used. If a respondent perceived it to be very unlikely to have the plants destroyed by authorities (the lowest risk), then we used the same perceived risk level in the choice sets with lower risks. This means that choice set number 5 was not asked since it corresponded to the current situation of the farmer. Similarly, if a respondent perceived having the plants destroyed by authorities as very likely (the highest risk), then the risk attribute remained the same as perceived in the choice sets with higher risk. This means that choice set number 1 was not asked since it also corresponded to the current situation.

[Insert Table 3]

Hypothetical risk experiment

To capture the effect of financial risk preferences on the amount of coca cultivated, we used a simple risk experiment that follows Binswanger's (1980) design. Table 4 presents the design used in the risk experiment. Participants in the survey were asked to state whether they preferred to cultivate Option A or Option B, which are equivalent in terms of investment and required effort, but differ in profits. The second column in Table 4 describes Option A, which always gives a profit of 1 million pesos (equivalent to 400 USD), whereas Option B yields equal chances between a higher or a lower profit. Each participant answered the five choice sets presented in Table 4. The first choice set where a participant switched from Option B to Option A allows us to calculate a coefficient of risk aversion if we assume the following functional form of the utility function:

$$U(X) = \frac{X^{1-\rho}}{(1-\rho)} \text{ , } \rho \neq 1$$
$$U(X) = \ln X \text{ , } \rho = 1, \tag{6}$$

where ρ represents the coefficient of relative risk aversion and X the profit from the lottery. Table 4 reports the implicit mid-point coefficient of relative risk aversion for each of the choice sets.

[Insert Table 4]

Non-monetary factors and socioeconomic characteristics

Following the behavioral models of crime, non-monetary factors are expected to affect the coca cultivation decision. We therefore included in the survey a number of questions on ethics/morality, in the sense of obligation to comply with the law, and coca cultivation in 2003. To capture the effect of individual socioeconomic characteristics, we also included questions on household socioeconomic characteristics and social capital.

Ethics/morality

We used the Moral Judgment Test proposed by Lind *et al.* (1985) to capture preferences for moral arguments, also called levels of moral development. The test consists of two

social dilemmas. In the first dilemma, a doctor ends the life of a terminal patient who suffers and has no chances to recover. In the second dilemma, some workers break into the administrator office to find evidence that supports allegations of unfair dismissals of their co-workers. The task for the respondents is to state his/her degree of agreement with a series of arguments that justify or oppose the actions taken in the dilemmas. According to the reasoning used to justify moral dilemmas and following the theory of moral development, individuals can be classified into three levels of moral development (Kohlberg, 1969). At the lowest level, pre-conventionalists base their arguments on individualistic reasons (rewards and punishment). At the second level, conventionalists base their moral arguments on social reasons (social norms or maintaining social order), and at the last level of moral development, post-conventionalists motivate their arguments in terms of deeper reasons (human rights and justice).

In addition to this index of moral development, we consider the effect of religious beliefs on the decision to cultivate coca. Colombia is mainly a Catholic country, but in recent years there has been a rapid expansion of Protestantism, which has renewed religious enthusiasm. Given the dynamics of these Protestant churches, we investigate how they have affected coca cultivation.

Sense of obligation to comply with the law

To capture the effect of legitimacy (support to the authorities and the law) on the decision to cultivate coca, we used a measure of conformity with the law. Consistent with the theory of procedural justice (Tyler, 1990), we constructed an index that captured the effect of acceptance of a series of statements about the existence of the law, fairness of the authorities, participation in defining rules, and effectiveness of rules. In particular, we asked participants to state on a 1-5 scale the degree of agreement to the following statements: (i) coca cultivation should be illegal, (ii) authorities should restrict coca cultivation, (iii) those who need alternative development projects the most could benefit from them, (iv) people are treated fairly when complaining about eradication, (v) communities participate in the design and implementation of alternative development projects, and (vi) alternative development projects contribute to decreasing coca cultivation. The index was constructed as the average degree of acceptance to these six statements.

Social interaction

To capture the effect of social interaction on individual decisions, we asked participants to state how many hectares they cultivated with coca in 2003 (note that this is a lagged variable). With this information we constructed a measure of the self-reported proportion of farmers that cultivated coca in each of the surveyed neighborhoods. We expect that the larger the proportion of farmers who self-reported to be cultivated coca in the neighborhood, the more likely farmers will be to cultivate. Living in a neighborhood with a larger proportion of coca farmers may enable farmers to learn better cultivation and law avoidance techniques from their peers, form better expectations of the returns from coca cultivation and allow them to suffer less stigmatization. Another reason why coca cultivation could be high in a given neighborhood is that there are infrastructural reasons that favor coca cultivation (e.g. presence of the state, infrastructure, market conditions). To control for the effect of those infrastructural factors we also used a dummy variable for each municipality.

4. Econometric Model

The decision to cultivate coca can be seen as a two-step procedure where farmers first decide whether to cultivate coca, and then, given that they decide to cultivate coca, decide the number of hectares to cultivate. We will treat these two decisions as separate decisions[6]. The expected indirect utility of coca cultivation for individual *i* in choice situation *t* is given by:

$$V_{it} = \alpha_1 PEradication_t + \alpha_2 \frac{\Pi_{it}^{Alternative}}{\Pi_i^{Coca}} + \beta' z_i + \varepsilon_{it} \quad (7)$$

.

The first two variables are the attributes that we are interested in evaluating in the choice experiment: the risk of eradication ($PEradication_{it}$) and the relative profitability of the alternative versus coca ($\frac{\Pi_{it}^{Alternative}}{\Pi_i^{Coca}}$). z_i is a vector of individual characteristics

[6] We tried to estimate them with correlation, using a simple selection model, but the model did not converge. One reason could be the low number of observations, although with another specification the model could of course converge.

including social norms, morality, and legitimacy and risk preferences. Finally, ε_{it} is the stochastic part of the utility. The probability that respondent *i* in choice situation *t* states that he/she would cultivate coca is:

$$P(Crop) = P(\varepsilon_{it} > -\alpha_1 PEradication_t - \alpha_2 \frac{\Pi_{it}^{Alternative}}{\Pi_i^{Coca}} - \beta' z_i). \quad (8)$$

The fact that each respondent answered several choice sets makes an assumption of independence among responses questionable, since it is likely that the responses are correlated. Following Butler and Moffitt (1982), we therefore specify the error term as:

$$\varepsilon_{it} = u_i + v_{it}; \; u_i \sim N(0, \sigma_u^2); \; v_{it} \sim N(0, \sigma_v^2), \quad (9)$$

where u_i denotes the unobservable individual specific effect and v_{it} denotes the remainder disturbance. The components of the error term are thus independently distributed, and we have that the correlation between the errors is:

$$Corr[\varepsilon_{it}, \varepsilon_{is}] = \rho = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_v^2}. \quad (10)$$

This is a random effects binary probit model. An additional question is whether the effect of the two attributes risk and relative profit depends on a reference point (Kahneman and Tversky, 1979). In our case, the natural reference point is the status quo, i.e., the current levels of perceived risk and relative profit. There are several possible ways to allow for a reference dependence or status quo effect in the utility function; see, e.g., Hu et al., 2006. In order to keep the model tractable we simply divide the respondents into groups. In one group, the current perceived risk was low to medium (1 to 3) with an average of 2.19. In the other group the perceived risk was high (4 to 5) with an average of 4.67. We then allow for different effects of the risk attribute on the probability of cultivating coca for these two groups. In a similar way, we split participants into two relative profit groups: one with a relative profit of at least 0.5 (with an average of 1.6) and one with a relative profit of less than 0.5 (with an average of 0.18). For the first group coca is not much more profitable than the alternative.

Similarly, the number of hectares (*Ha Coca*) that individual *i* decides to cultivate with coca in choice situation *t* depends on the attribute levels, a vector of socio-economic characteristics, and unobserved heterogeneity, ω_{it}. The conditional number of hectares cultivated with coca in choice situation *t* is:

$$Ha\,coca_{it} = \gamma_1 PEradication_t + \gamma_2 \frac{\Pi_{it}^{Alternative}}{\Pi_i^{Coca}} + \delta' z_i + \omega_{it}\,. \tag{11}$$

Once again, the fact that respondents were subject to different policy scenarios makes an assumption of independence among responses questionable, since it is likely that the responses are correlated. We therefore estimate this as a random effects model. In addition, we again allow for different effects of the two attributes for respondents with high and low perceived risk, and high and low current relative profit.

5. Results

In total 152 farmers from four different municipalities in Putumayo (Orito, Mocoa, Puerto Asis, and Valle del Guamuez) participated in the choice experiment. Due to item non-response, 141 farmers are available for analysis. Although some respondents were given a shorter version of the experiment that included only the choice sets where the profitability of the best alternative was the same as or higher than their actual profitability at the time, all respondents are included in the analysis. On average, each respondent answered 6.3 choice sets.

Descriptive statistics

Table 5 presents the descriptive statistics of the variables used in the econometric model. Forty-three percent of the farmers who participated in the stated preference study self-reported to be cultivating on average 1.32 ha with coca in 2005. The expected profit of the alternative was on average half the profit of coca. We find no significant differences in the distribution of the perceived relative profit among municipalities (Mann-Whitney test, $p>0.05$) except for Puerto Asis, which has a significantly lower perceived relative profitability of the alternative than Valle del Guamuez (Mann-Whitney test, $p<0.05$). In addition, we find no significant differences in the distribution

of the perceived relative profitability between coca and non-coca farmers (Mann-Whitney test, $p>0.05$) with the exception of Mocoa and Valle del Guamuez (Mann-Whitney test, $p<0.05$). In Mocoa, non-coca farmers overestimated the relative profitability of the alternative compared with coca farmers and in Valle del Guamuez non-coca farmers underestimated the relative profitability of the alternative compared with coca farmers. Note that 17 participants expected the alternative to be more profitable than coca.

The average perceived risk of having the plants destroyed by authorities in 2005 was 4.032, which is relatively high considering the 1-5 qualitative scale used. We find that there are regional differences in the perceived risk of eradication. The average perceived risk of eradication was significantly lower in Mocoa (3.55) and Orito (3.83) compared with Puerto Asis (4.29) and Valle del Guamuez (4.10) (Mann-Whitney test, $p> 0.05$). This is consistent with the fact that during 2004 and 2005, the number of sprayed hectares as a proportion of total hectares with coca was lower in the former municipalities. Interestingly, coca and non-coca farmers within the same municipality have the same perceptions of the eradication risk (Mann-Whitney test, $p>0.05$) with the exception of Valle del Guamuez.

About one-third of the participants in the choice experiment were women, and the average age of all participants was 40. The educational level of the participants was very low: 40% had two years of education or less. In addition, the participants tended to be very risk averse: 46% were classified as extremely or severely risk averse, 21% were classified as having intermediate or moderate risk aversion, and 23% were risk neutral to risk loving. Most of the participants claimed to be Catholics (80%), while around 12% declared to be Protestants. The remaining 8% declared to be Atheist.

[Insert Table 5]

Based on the Moral Judgment Test developed by Lind *et al.* (1985), 70% of the respondents were classified as pre-conventionalists (the lowest level of moral development), 26% as conventionalists (the intermediate level of moral development), and the remaining 4% as post-conventionalists (the highest level of moral development). These results are consistent with Aguirre's (2002) findings on moral development in

Colombian teenagers. No significant differences were found in the level of moral development between coca and non-coca farmers (proportion test, $p<0.01$). Due to time limitations, 10% of the participants in the choice experiment did not take the Moral Judgment Test, but no significant differences were found between those who did take the test and those who did not with respect to age, gender, and educational level.

Descriptive results of the choice experiment

Tables 6 and 7 present the raw results of the choice experiment for the nine choice sets used. Table 6 displays the proportion of farmers who would cultivate coca in different scenarios, and Table 7 shows the number of hectares that would be cultivated. The share of respondents who would cultivate coca and the conditional number of hectares that would be cultivated with coca decrease significantly when the relative profitability of the alternative increases and when the risk of having the plants destroyed increases. The exceptions are marked a, and b. The effect on the proportion of farmers who would cultivate coca is non-linear for increases in relative profit of the alternative and risk of eradication. The proportion of coca farmers decreases relatively less from the zero to the low risk (low to same relative profit) in Table 6 than from the low risk to the high risk (same to high relative profit).

[Insert Table 6]

[Insert Table 7]

Compared with the self-reported behavior in 2005, where 43% of the farmers cultivated coca and cultivated on average 1.32 ha, we find that increasing the risk of destroying the plants significantly decrease the proportion of farmers who would cultivate coca (proportion test, $p<0.05$), but does not significantly decrease the number of hectares cultivated with coca (Wilcoxon test, $p>0.05$). Further analysis reveals that about 10% of the farmers declared an intention to start cultivation or to cultivate more hectares if the risk were to increase. This can be interpreted either as risk seeking behavior or as a threat to authorities. None of the participants exhibited consistent risk-seeking behavior

through all nine choice sets, indicating that some strategic bias may be present in our sample.

Econometric results

Table 8 presents the results of (1) the random effects probit model for the decision whether or not to cultivate coca and (2) the random effects model for the conditional decision on how many hectares to cultivate with coca. The econometric model results are robust to different specifications. We report the marginal effects evaluated at the sample mean. For the constant and the correlation coefficient, we report the coefficients. For the continuous variables in the probit model, the marginal effect is the marginal increase in the probability to cultivate coca associated with a marginal increase in the corresponding variable. For dummy variables in the probit model, the marginal effect is the increase in the probability to cultivate coca associated with a discrete change from zero to one. For the linear model, the estimated coefficients show the marginal change in hectares with coca.

The estimated correlation between the error terms across decisions, *rho*, is large and highly significant in both models, which means that we cannot reject the random effects model in favor of a more restrictive model with no correlation.

[Insert Table 8]

Our results support the traditional economic model of crime since increases in risk significantly decrease both the probability to cultivate coca and the number of hectares with coca. Similarly, increases in the relative profitability of the alternative reduce both the likelihood to cultivate coca and the number of hectares cultivated with coca. We also find that the effect of the policies depends on the initial perceived level of risk and relative profit. Farmers who stated a lower initial perceived risk were more responsive to increases in risk than farmers who stated a higher initial perceived risk. Similarly, farmers who initially stated a lower perceived relative profit of the alternative were more responsive to increases in the relative profit. This suggests that the two policies would be more effective if they could be targeted to certain farmers: those with a low perceived risk of eradication and a low relative profit. This could for example be areas

where other economic activities are not profitable, or areas where there has been little eradication before and hence farmers have a low perceived risk.

Our results also support behavioral models of crime, since other non-monetary variables significantly affect the likelihood to cultivate coca. Consistent with the hypothesis of habituation and social capital depreciation, respondents who self-reported to be cultivating coca in 2005 were both more likely to state that they would cultivate coca and more likely to state that they would cultivate more hectares with coca. Farmers with a high degree of acceptance of the authorities and the law were less likely to cultivate coca. Interestingly, and contrary to the prediction of the cognitive theory of moral development, the level of moral development is not significant in explaining the likelihood to cultivate coca, but religious beliefs are. We find that Protestants are more likely to declare cultivating coca and cultivate more coca than Catholics. Social capital (trust and participation in communitarian organizations) has no significant effect on the decision to cultivate coca, but higher level of trust increase the number of hectares cultivated with coca. One explanation could be that if there is trust, then they trust their peers not to report the illicit behavior to the authorities. This could be associated with a social norm that accepts coca cultivation, and this is reinforced through trust. Regarding individual characteristics, contrary to what we expected, farmers who were more educated and who were more risk averse were more likely to cultivate coca. One possible explanation of the positive effect of education that would require further investigation is that the higher income from coca cultivation could allow parents to educate his kids, who later on also become coca farmers. The positive correlation between risk aversion and the likelihood to cultivate coca can be explained by the higher perceived risk of commercializing the legal product successfully (possibility to sell the product, price stability, etc.). Remoteness in the sense of living farther away from the market (high transport costs), increases the likelihood of coca cultivation and the amount of hectares cultivated with coca. Those who were relatively richer in terms of larger land holdings were less likely to cultivate coca but could afford to establish larger areas with coca. Female respondents were more likely to state that they would cultivate more hectares with coca. Finally, we find that the three municipality dummy variables are significant in the probit model, which indicates that farmers living in municipalities that are farther away from Mocoa were more likely to start cultivating

coca. This effect could be interpreted as the effect of isolation from the main markets and from the State institutions[7]. Farmers living in Puerto Asis cultivated significantly fewer hectares with coca than farmers from Mocoa. After controlling for municipal effects, we find no significant effects of density of coca in the neighborhood on the likelihood to cultivate coca. This could indicate that the social interaction effect is explained by characteristics in the municipalities rather than by a social norm shared by neighbors.

Policy implications

From a policy perspective, it is important to analyze the effect of changes in the levels of eradication and in the profitability of the alternative crop. One way of comparing the relative effects of increases in the relative profit of the alternative with the risk of having the plants destroyed is to look at the total elasticity. The total elasticity for the unconditional number of hectares with coca was calculated using the total marginal effect:

$$\frac{\partial E[Ha_i]}{\partial x_i} = \frac{\partial P[Crop_i = 1]}{\partial x_i} E[Ha_i \mid Ha_i > 0] + \frac{\partial E[Ha_i \mid Ha_i > 0]}{\partial x_i} P[Crop_i = 1], \quad (12)$$

where Ha_i is the number of hectares dedicated to coca for farmer i, and x_i is a covariate. Table 9 reports the total elasticities of eradication (risk of crops destroyed) and alternative development (relative profitability) estimated from our econometric model. All the elasticities are calculated at sample mean. The estimates show that the farmers are more sensitive to increases in risk than to increases in relative profitability of alternative crops. Both the risk and relative profit elasticities are inelastic which means that the effects of increased spraying or increased relative profit would be rather small.

[Insert Table 9]

One way of evaluating how reasonable the estimated elasticites are is to use them to predict the change in the amount of hectares cultivated with coca from 2003 to 2005. During this period, the self-reported number of hectares with coca in our population decreased by 54%. At the same time, the perceived risk increased by 36.8% and the

[7] The main institutions are based in Mocoa, the state capital.

expected relative profit of the alternative increased by 53%. If we assume that the total change in the number of hectares is only due to the change in perceived risk and expected relative profit, we can predict the change in hectares using the elasticites. These predictions are reported in Table 9 as well. The predicted total change in the number of hectares with coca is 46.4%, which is not statistically significantly different from the actual change, using a t-test. Despite this being a simple test of the validity of the estimates, it tells us that the estimates are at least reasonable. We will therefore now use these elasticities to evaluate the different policies.

From a policy perspective, it is interesting to compare the policies considering costs. It is not easy to obtain estimates of the cost of increasing the risk of growing coca or the profitability of the best alternative. However, we will make some simple estimations based on the results of our survey and secondary information. We do the analysis considering the four municipalities included in our study and take 2005 and a reference year. The available data is very uncertain, and therefore the following analysis should be interpreted with great care. From 2003 to 2005 the perceived risk of eradication increased by 36.8% according to our survey data. During the same time, there was an increase in the number of hectares sprayed by 35%. Using these numbers, and assuming that the perceived risk increased only due to spraying, we can say that a 1% increase in perceived risk can be achieved with a 0.95% increase in the number of sprayed hectares. According to Logan (2006) the cost of spraying one ha with coca is 640 USD. Hence, if the authorities would increase their spending on eradication by 100,000 USD (i.e., spray an additional 156 ha), and thereby increase eradication by 2.21%, the perceived risk of eradication would increase by 2.32%. According to our estimated model, the total elasticity for perceived risk is 0.66. This means that a 2.32% increase in perceived risk of eradication reduces coca cultivation by 1.54%. To achieve the same reduction in coca cultivation through higher profit of the alternative, the relative profit would need to increase by 3.73% given our estimated elasticity of relative profit in 2005 (-0.413). This implies that the profit per hectare of the alternative would need to increase from 333 USD to 345 USD. If only the 3039 hectares cultivated with coca in the area in 2005 would benefit from the 12.45 USD increase in profit, then the total cost of the policy would be 37,835 USD. Thus, using these assumptions, increasing the relative profit of alternative crops would be less costly than increasing eradication.

However, there are a number of critical assumptions. If the number of hectares that receive the increase in relative profit were higher than 8,050, then eradication would be more efficient. If the cost of spraying were twice the value estimated by Logan (2006),[8] then increases in relative profit would be more efficient when 3039 ha benefit from a higher profit. The cost of achieving the same reduction in hectares would only be 18,963 USD. Alternatively, one could increase profit for as many as 16,100 ha at the same cost.

Table 10 presents the comparison on the efficiency of eradication and alternative development, standard errors are calculated using the Delta method (Greene, 2003.) We compare both policies assuming that an additional 100,000 USD are invested in spraying for various scenarios. Depending on the assumptions about the cost of spraying one hectare, the predicted reduction of coca will be different. The predicted reduction in hectares is presented in the third row. The columns refer to different assumptions about the cost of spraying while the last four rows present different assumptions about the number of hectares that are targeted with increases in relative profit of growing the alternative crop. In the first column we assume that the cost of spraying one hectare is 640 USD. In the next two columns we assume that the cost of spraying is two and three times the cost estimates in Logan (2006). For the cost of alternative development we present four cases. The first one is the base case scenario where 3,039 hectares with coca are targeted. The next one shows the number of hectares that makes the cost of alternative development the same as the total cost of eradication, when the cost of eradication is 640 USD. In the last two rows we increase the number of hectares so that the cost of increasing relative profit is higher than the cost of eradication when the cost of spraying one hectare is 1,280 USD and 1,920 USD respectively.[9]

[Insert Table 10]

[8] For example indirect effects of spraying are not included in his calculations (e.g. loss in production of legal crops or environmental damage.)

[9] The results of course depends on the values of the elasticites at which we evaluate the policies. Even if we double the elasticities, the effects of the two policies are still small. However, the relative efficiency of the two policies do change. For example, if we double the risk of eradication elasticity then the maximum number of hectares that should be targeted with alternative development in order to equal the cost of the two policies would decrease from 8 050 ha to 4 025 ha. If instead we double the relative profit elasticity, the number of hectares would double from 8 050 ha to 16 100 ha.

Some warnings regarding this simplified analysis are in order. We are comparing policies based only on financial costs, but if we consider the non-monetary costs of eradication such as water contamination, destruction of natural areas, productivity losses in soils, and negative health effects, then another picture could very well emerge. To our knowledge, no previous studies have quantified the environmental impact of eradication. From a distributional perspective, it could be preferable to give monetary incentives to the farmers living in these regions as they are generally poorer than the national average. Finally, alternative development could have long-term effects not achieved through eradication. When farmers decide to substitute or reduce coca cultivation, they implicitly accept a lifestyle change and consequently become more likely to avoid coca cultivation in the future. In any case, with these limitations in mind, it is clear that the choice between alternative development and eradication is rather sensitive to the costs of spraying one hectare and the number of hectares that benefit from alternative development. Thus, our simple policy analysis does not provide a simple answer.

Validity tests

The hypothetical choice experiments used to capture individual preferences may be subject to multiple limitations. For instance, due to the illicit nature of coca farming, participants may want to appear morally correct and therefore underreport cultivation. In addition, participants may respond in ways they think the interviewer expects, or their behavior could reflect strategic bias. Attempting to avoid the policy, participants may for example falsify their preferences, reporting increases in coca cultivation as a response to increases in the probability of eradication. They may also try to attract compensation by overreacting to positive incentives such as increases in the profit from legal alternatives. Inconsistencies could of course also appear due to cognitive limitations, fatigue effects, or simply random responses. Given the above limitations of the methodology, we carry out a number of consistency tests. For example, a respondent who states that he cultivates coca today should also state that he/she would cultivate if the risk of eradication were reduced, or if the relative profitability of coca were increased. Similarly, a farmer who states that he/she does not cultivate coca should not cultivate if the risk were increased, or if the relative profit were reduced. Comparing a

subject's responses within the experiment is referred to as an internal consistency test. Comparing the responses in the experiment with his/her current behavior is referred to as an external consistency test. In total, 18 respondents made at least one inconsistent choice in the choice experiment, and 29 made choices in the choice experiment that were inconsistent with their actual behavior. However, many respondents were both internally and externally inconsistent. Accounting for this, a total of 36 of the 152 respondents were inconsistent. Still, this is a non-negligible fraction of the respondents, although we believe it is inevitable that any choice experiment will contain inconsistent responses. We should also remember that the educational level of the respondents was low, meaning that the respondents may not deliberately have falsified their preferences. We estimated the models in Table 8 after removing inconsistent responses, and the results were similar. The absolute values of marginal effects for the risk and relative profit attributes are somewhat larger in the probit model and smaller in the linear model. The most important difference is that the marginal effect of the relative profit attribute for those with a high perceived relative profit of the alternative is insignificant in both models. Most of the other control variables have the same sign and significance, with some exceptions.

6. Discussion

This paper contributes to the literature evaluating the main policies against coca cultivation: eradication and alternative development. We used a hypothetical survey method to measure the effects on current behavior of the two policies. The experiment gave us valuable information that would have been difficult to obtain from data on actual behavior. Consistent with Becker's (1968) model of crime, we found that farmers react to changes in economic incentives. Increases in the risk of eradication and increases in the relative profit of alternative crops reduce the proportion of coca farmers and the number of hectares cultivated with coca. However, the effects of these two policies are small. According to our estimations, a 1% increase in the risk of eradication would decrease the area cultivated with coca in 0.66%, while a 1% increase in relative profit would decrease the area cultivated with coca in 0.47%. Based on a very simple simulation, we estimated that spending hundred thousand dollars extra in eradication would have decreased coca cultivation by only 1.5%. The same reduction in coca

cultivation could have been achieved more efficiently if no more than eight thousand hectares had benefited from a twelve-dollar increase in the profit of the best alternative. Our cost estimates are subject to multiple assumptions and therefore should be interpreted with great care. Future research should focus on estimating the costs of these two policies more precisely.

We also found that other non-monetary variables explain the extent of coca cultivation. Previous experience in cultivating coca, legitimacy of the authorities and religion have significant effects on the decision to crop coca. Farmers who live far away from the main regional market and who have less land are more likely to cultivate coca.

A number of respondents gave answers that were inconsistent with their current behavior. Yet, the results of the econometric analysis were not to any large extent affected by these inconsistencies. The data is highly consistent and the estimated elasticities give an accurate prediction of the observed reduction in coca cultivation from 2003 to 2005.

In our analysis, we used a partial equilibrium analysis that assumes that other conditions are unchanged. However, programs that are implemented on a large scale can have effects on labor and land markets that are not analyzed here. Additionally, we ignored the dynamic characteristics of coca cultivation, assuming that farmers independently decide how to allocate land in each choice set. However, since coca plants are perennial, the amount of land cultivated with coca depends on past decisions. We asked farmers about how large they perceived the risk of eradication to be, assuming that they were able to imagine how the situation would be different if the risk were higher or lower. There is a risk though that this task may have been too demanding considering the low educational levels of the participants. Despite several limitations, this study does contribute to the limited body of literature evaluating policies against coca cultivation, and we do consider it relevant for policy purposes.

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Appendix A. Comparative statics of the model on coca cultivation

The decision on the amount of coca to be cultivated depends on the solution to the optimization problem:

$$\max_{C} E[U] = (1-p)U(Y_g(C)) + pU(Y_b(C)) \text{ ; s.t. } C \geq 0, \tag{A.1}$$

where

$$Y_g = W + (1-M)(1-L)\Pi_C(C) + \Pi_A(T-C) - S(C_s)C,$$
$$Y_b = W + (1-M)(1-L)\Pi_C(C) + \Pi_A(T-C) - S(C_s)C - F(C).$$

We assume decreasing returns to scale for land:

$$\frac{\partial \Pi_C}{\partial C} = \Pi_C^{'} > 0, \frac{\partial^2 \Pi_C}{\partial C^2} = \Pi_C^{''} < 0 \quad \frac{\partial \Pi_A}{\partial (L-C)} = \Pi_A^{'} > 0 \quad \frac{\partial^2 \Pi_A}{\partial (L-C)^2} = \Pi_A^{''} < 0 . \tag{A.2}$$

The cost of being discovered cultivating coca is assumed to increase with the amount of coca that is cultivated:

$$\frac{\partial F}{\partial C} = F' > 0 . \tag{A.3}$$

The social disutility of cultivating coca is assumed to decrease with the amount of coca cultivated by others:

$$\frac{\partial S}{\partial C_s} = S'(Cs) < 0 . \tag{A.4}$$

The first order conditions are:

$$\frac{\partial \ell}{\partial C} = (1-p)U'(Y_g)\, a + pU'(Y_b)\, b + \mu = A + B + \mu = 0, \ \mu C = 0 \ \text{ and } \mu \geq 0, \tag{A.5}$$

where

$$a = (1-M)(1-L)\Pi_C^{'} - \Pi_A^{'} - S(C_s),$$
$$b = (1-M)(1-L)\Pi_C^{'} - \Pi_A^{'} - S(C_s) - F'$$
$$A = (1-p)U'(Y_g)a$$
$$B = pU'(Y_b)b.$$

When the restriction binds we have that $\mu > 0$ and the farmer does not cultivate any coca, $C = 0$. In the limit, when the farmer is deciding whether to cultivate coca or not, $U(Y_g) = U(Y_b)$ and the first order condition reduces to:

$$(1-M)(1-L)\Pi_C^{'} - \Pi_A^{'} - S(C_s) - pF' \geq 0. \tag{A.6}$$

When the farmer does cultivate coca, $\mu = 0$. A necessary condition to start cultivating coca is that it pays off, $a = (1-M)(1-L)\Pi_C^{'} - \Pi_A^{'} - S(C_s) > 0$. Hence, we must have

that $b = (1-M)(1-L)\Pi_C^{'} - \Pi_A^{'} - S(C_s) - F' < 0$. Otherwise there would be complete specialization in coca cultivation. The second order condition for an optimum is:

$$\frac{\partial^2 \ell}{\partial C^2} = (1-p)U''(Y_g)\,a^2 + pU''(Y_b)\,b^2 + (1-p)U'(Y_g)\,a' + pU'(Y_b)\,b' = \Delta < 0. \qquad \text{(A.7)}$$

In order to say something more specific about behavior we have to make some assumption about the utility function. We assume that absolute risk aversion, $R(Y) = \frac{-U''(Y)}{U'(Y)}$, is decreasing so that:

$$R(Y_g) = \frac{-U''(Y_g)}{U'(Y_g)} < \frac{-U''(Y_b)}{U'(Y_b)} = R(Y_b). \qquad \text{(A.8)}$$

And defining, $\frac{\partial \Pi_C}{\partial \Pi_C^{'}} = \prod_{c\Pi_C^{'}}^{'}$, and $\frac{\partial \Pi_A}{\partial \Pi_A^{'}} = \prod_{A\Pi_A^{'}}^{'}$.

We can differentiate the first order condition (A.4) to investigate the effect of the various parameters on the amount of coca that is cultivated. From this we can show that the amount of coca cultivated is decreasing in risk of detection (*p*), marginal cost of loss if coca cultivation is detected (*F'*), moral standard (*M*), and legality or respect to the authorities and the law (*L*):

$$\frac{\partial C}{\partial p} = \frac{-1}{\Delta}\left[-U'(Y_g)a + U'(Y_b)b\right] < 0 \qquad \text{(A.9)}$$

$$\frac{\partial C}{\partial F'} = \frac{1}{\Delta}\left[pU''(\mathrm{Y_{b.}})\mathrm{b} + pU'(Y_b)\right] < 0$$

$$\frac{\partial C}{\partial M} = \frac{1}{\Delta}\left[((R(Y_g) - R(Y_b))B)\Pi_C + ((1-p)U'(Y_g) + pU'(Y_b))\Pi_C^{'}\right](1-L) < 0$$

$$\frac{\partial C}{\partial L} = \frac{1}{\Delta}\left[((R(Y_g) - R(Y_b))B)\Pi_C + ((1-p)U'(Y_g) + pU'(Y_b))\Pi_C^{'}\right](1-M) < 0.$$

The amount of coca cultivated is increasing in marginal profit of coca ($\Pi_C^{'}$), the amount of coca cultivated by others in the social group (C_s), and wealth (W):

$$\frac{\partial C}{\partial \Pi_C^{'}} = \frac{-1}{\Delta}\left[((R(Y_g) - R(Y_b))B)\prod_{c\Pi_C^{'}}^{'} + \right. \qquad \text{(A.10)}$$

$$\left. (1-p)U'(Y_g) + pU'(Y_b)\right](1-M)(1-L) > 0$$

$$\frac{\partial C}{\partial C_s} = \frac{1}{\Delta}\left[((R(Y_g) - R(Y_b))BS'(C_s)C + ((1-p)U'(Y_g) + pU'(Y_b))S'(C_s)\right] > 0$$

$$\frac{\partial C}{\partial W} = \frac{-1}{\Delta}\left[((R(Y_g) - R(Y_b))B\right] > 0 \,.$$

We cannot determine the sign of the effect for marginal profit of the alternative (Π'_A):

$$\frac{\partial C}{\partial \Pi'_A} = \frac{-1}{\Delta}\left[((R(Y_g) - R(Y_b))B)\prod\nolimits_{A\Pi'_A}' - ((1-p)U'(Y_g) + pU'(Y_b))\right]. \qquad \text{(A.11)}$$

Appendix B. Survey

Production Survey

Good morning [afternoon]. My name is _____. I am doing a study for Universidad de los Andes in Bogotá. This study consists of this survey and a workshop that will take place this afternoon. In the survey we will like to ask you about coca production in the municipality, productive alternatives to coca and governmental programs. The results from this study will be used only for academic purposes. Throughout the study, your identity will be secret so we won't ask your name, where you live or any other question that enables to identify you or your family. Moreover, responses from individual households will not be shown alone. We appreciate your participation in this study so we will compensate your time and effort. In the workshop you will have the chance to gain some money.

1. Date of birth (YY/MM/DD)__ __/__ __/__ __
2. Last three digits ID card__ __ __
3. Municipality_____
4. Date__ __/__ __/__ __
5. Starting time__ __: __ __
6. Enumerator_____

1. Doctor's Dilemma

A woman had cancer and she had no hope being saved. She was in terrible pain and so weakened that a large dose of a painkiller such as morphine would have caused her death. During a temporary period of improvement, she begged the doctor to give her enough morphine to kill her. She said she could no longer endure the pain and would be dead in a few weeks anyway. The doctor complied with her wish.

7. Do you disagree or agree with the doctor's behaviour?

Strongly Disagree				Strongly Agree
1	2	3	4	5

In a scale one to five, how acceptable do you find the following arguments in favour of the doctor? Suppose someone said he acted rightly.

8. because the doctor had to act according to his conscience. The woman's condition justified an exception to the moral obligation to preserve life.

Strongly Disagree				Strongly Agree
1	2	3	4	5

9. because the doctor was the only one who could fulfil the woman's wish; respect for her wish made him act as he did.

Strongly Disagree				Strongly Agree
1	2	3	4	5

10. because the doctor only did what the woman talked him into doing. He need not worry about unpleasant consequences.

Strongly Disagree				Strongly Agree
1	2	3	4	5

11. because the woman would have died anyway and it didn't take much effort for him to give her an overdose of a painkiller.

Strongly Disagree				Strongly Agree
1	2	3	4	5

12. because the doctor didn't really break a law. Nobody could have saved the woman and he only wanted to shorten her suffering.

Strongly Disagree				Strongly Agree
1	2	3	4	5

13. because most of his fellow doctors would presumably have done the same in a similar situation.

Strongly Disagree				Strongly Agree
1	2	3	4	5

How acceptable do you find the following arguments against the doctor? Suppose someone said that he acted wrongly.

14. because he acted contrary to his colleagues' convictions. If they are against mercy-killing the doctor shouldn't do it.

Strongly Disagree				Strongly Agree
1	2	3	4	5

15. because one should be able to have complete faith in a doctor's devotion to preserving life even if someone with great pain would rather die.

Strongly Disagree				Strongly Agree
1	2	3	4	5

16. because the protection of life is everyone's highest moral obligation. We have no clear moral criteria for distinguishing between mercy killing and murder

Strongly Disagree				Strongly Agree
1	2	3	4	5

17. because the doctor could get himself into much trouble. They have already punished others for doing the same thing

Strongly Disagree				Strongly Agree
1	2	3	4	5

18. because he could have had it much easier if he had waited and not interfered with the woman's dying.

Strongly Disagree				Strongly Agree
1	2	3	4	5

19. because the doctor broke the law. If one thinks that mercy-killing is illegal, then one should refuse such requests.

Strongly Disagree				Strongly Agree
1	2	3	4	5

2. Workers' Dilemma

Due to some seemingly unfounded dismissals, some factory workers suspect the managers of eavesdropping on their employees through an intercom and using this information against them. The managers officially and emphatically deny this accusation. The union declares that it will only take steps against the company when proof has been found that confirms these suspicions. Two workers then break into the administrative offices and take tape transcripts that prove the allegation of eavesdropping.

20. Would you disagree or agree with the workers' behavior?

Strongly Disagree				Strongly Agree
1	2	3	4	5

In a scale one to five, how acceptable do you find the following arguments in favour of the two workers' behaviour? Suppose someone argued they were right.

21. because they didn't cause much damage to the company.

Strongly Disagree				Strongly Agree
1	2	3	4	5

22. because due to the company's disregard for the law, the means used by the two workers were permissible to restore law and order.

Strongly Disagree				Strongly Agree
1	2	3	4	5

23. because most of the workers would approve of their deed and many of them would be happy about it.

Strongly Disagree				Strongly Agree
1	2	3	4	5

24. because trust between people and individual dignity count more than the firm's internal regulations.

Strongly Disagree				Strongly Agree
1	2	3	4	5

25. because the company had committed an injustice first, the two workers were justified in breaking into the offices.

Strongly Disagree				Strongly Agree
1	2	3	4	5

26. because the two workers saw no legal means of revealing the company's misuse of confidence, and therefore chose what they considered the lesser evil.

Strongly Disagree				Strongly Agree
1	2	3	4	5

In a scale one to five, how acceptable do you find the following arguments against the two workers' behaviour? Suppose someone argued they were wrong

27. because we would endanger law and order in society if everyone acted as the two workers did

Strongly Disagree				Strongly Agree
1	2	3	4	5

28. because one must not violate such a basic right as the right of property ownership and take the law into one's own hands, unless some universal moral principle justifies doing so.

Strongly Disagree				Strongly Agree
1	2	3	4	5

29. because risking dismissal from the company on behalf of other people is unwise.

Strongly Disagree				Strongly Agree
1	2	3	4	5

30. because the two should have run through the legal channels at their disposal and not committed a serious violation of the law.

Strongly Disagree				Strongly Agree
1	2	3	4	5

31. because one doesn't steal and commit burglary if one wants to be considered a decent and honest person.

Strongly Disagree				Strongly Agree
1	2	3	4	5

32. because the dismissals of the other employees did not affect them and thus they had no reason to steal the transcripts.

Strongly Disagree				Strongly Agree
1	2	3	4	5

3. Household information

I would like to ask some questions about you, your family and your community

33. The head of the household is

Man	1
Woman	2

34. How many years have you been living in the municipality? ____

35. What is the highest grade you completed?

None	1
1 a 11, please specify _____	
Technical	3
University	4

36. How many people are there in your household? I mean people who are normally resident or share expenses.

Kids	
Adults	

37. Do you belong to a religious denomination?

No	1
Catholic	2
Other, please specify _____	3

38. Independently of whether you go to church or not, how important is religion in your life in a scale from one to five

Not Important				Very Important
1	2	3	4	5

39. Do you belong to a …. *[Mark all the relevant options]*

Farmers group	1
Political group	2
Cultural or sport group	3
Cooperative	4
Parents association	5
Water users association	6
Communal action group	7
Other group or association	8

_____

40. How many times did you do voluntary work in this community last year? ____

41. To how many people beyond your immediate family could you turn to for help

    a. if your family suffered a serious economic setback such a crop loss? ____

    b. if your family needed a small amount of money which would be enough to pay for expenses for your household for one week ____

    c. if your family needed credit to buy agricultural inputs such as seeds, pesticides, etc. ____

42. Please indicate your level of agreement with the statement “Most people in this municipality can be trusted” On a scale from 1 to 5,

Strongly Disagree				Strongly Agree
1	2	3	4	5

43. In a scale from 1 to 5, please indicate how much confidence you have in the following organizations I am going to name.

    a. The armed forces and police

Not at all				A great Deal
1	2	3	4	5

    b. National Government

Not at all				A great Deal
1	2	3	4	5

    c. Local/municipal Government

Not at all				A great Deal
1	2	3	4	5

    d. Communitarian organizations

Not at all				A great Deal
1	2	3	4	5

44. Do you belong to

Forest Guarding Families	1
Productive projects	2
Voluntary Substitution Agreements	3
Productive projects PLANTE-PNDA	4
Credits PLANTE	5
United Nations Projects	6
Other governmental project	7
_____	
None	8

4. Agricultural production

I would like to ask some questions about the productive activities in your farmland.

45. The farm land operated by the household is

Household owned with titles	1
Household owned without titles	2
Rented	3
Shared cropped	4
Administrated by the household	5
Other, specify _____	

46. Who decides on the products to be grown in the farm land operated by the household?

_____

47. How many hectares of land are operated by the household? ____

48. In your farm land the number of hectares of [read list] is approximately [validate using graph]

The pastures	
The forest	
Stubble	
The ponds	
Crops	
_____	
_____	
_____	

[If they have not mentioned coca before ask]

Coca and _____ ____

49. How much is the weekly cost of food?
								Pesos

50. How much is the household average monthly income from:
    a. selling agricultural products produced in the farm
								Pesos
    b. working outside the farm land operated by the household?
								Pesos
    c. from money or goods sent by people not living in the household?
								Pesos
    d. other sources? Which? _____
								Pesos

51. How much is the household average monthly expenses on wages, agricultural inputs as seeds, fertilizers and pesticides and payments for share cropping.
								Pesos

52. How much would it cost to the household to buy the products produced in the farm land operated by the household and consumed by the household?
								Pesos

53. What is the minimum income that the household would require to satisfy basic food, clothing and housing needs?
								Pesos

54. Does any member of the household own any land including land outside this municipality?
    No, [go to 47] 1
    Yes 2

55. If that land were to be sold, how much would it be worth?
								Pesos

56. What is the estimated value of the life stock and agricultural equipment owned by the household?
								Pesos

57. How much does it cost to reach the closest market from your farm land
    a. Per person ____ Pesos
    b. Per kilo, ____ Pesos

5. Coca production in the municipality

	a. Three years ago?		b. Last year?	
58. What was the best agricultural alternative to coca in the municipality?				
	Coca?	Best Alternative?	Coca?	Best Alternative?
Per Hectare year, what was the:				
59. Income				
60. How often do you get that income?				
61. Cost				
62. Profit				
63. How much does it cost to establish one hectare				
64. Once that has been established, how long does it last? Specify time unit				
65. How easy is to sell the product Very difficult/difficult/more or less easy/easy/very easy				
66. Where do you sell the product? Farm=1, Neighborhood=2, Town=3, Outside town=4				
67. How easy was it to obtain a credit to produce Very difficult/difficult/more or less easy/easy/very easy				
68. How often is it affected by plagues, bad weather and other conditions Never/Almost never/some times/often/very often				
69. In a one to five scale, how much does the price that you receive change?				
70. How like was to have your crops completely destroyed by authorities? Very unlikely/unlikely/more or less likely/likely/very likely				
71. What happened if the authorities discovered some one cultivating coca?				

72. In the last five years, how many times were your coca plants sprayed or destroyed by authorities?

73. The destruction of your fields was
Very little/little/partial/almost all/all

74. How often did you see helicopters monitoring agricultural activities, airplanes spraying coca fields or soldiers manually destroying coca fields in the municipality

e. Three years ago?

Never				Very Often
1	2	3	4	5

f. Last year?

Never				Very Often
1	2	3	4	5

75. For how many years have you been cropping coca?

76. In a scale from one to ten, how many people would you say were cropping coca
a. Three years ago?
b. Last year?

In the next section, I would like to ask what you would do if the profitability of the best alternative to coca were different and if the risk of having the crops destroyed changed. I would like you to think what you would have done if the situation were different. In this type of study, people tend to answer in the way they think the researcher wants rather than what they would really do. Please consider carefully what you would do if you had to make these decisions. There are no wrong or right answers; it is all a matter of your own preferences. Take into consideration that others would probably do the same as you.

You said that last year you had …… ha with coca and that the profit from 1 ha coca was …… while the profit from the best alternative was …… In addition, you said that the risk of having your crops completely destroyed by authorities was …… Assuming that everything else is the same as last year, how many hectares would you plant with coca if the profit from 1 ha of coca were the same as today, but the profit of the best alternative were …… and the risk of having the crops destroyed were ……

77.

Profit from coca	Risk	HA
Actual	Higher	
Higher	Higher	
Lower	Higher	
Lower	Lower	
Actual	Higher	
Actual	Lower	
Higher	Lower	
Higher	Zero	
Lower	Zero	
Actual	Zero	

78. Suppose you have 1 ha of land and you are deciding whether to crop product A or product B. Both products are equivalent in terms of the effort, and capital that they require but they differ in the return they offer. Product A gives a stable profit, whereas product B can give with equal chance a high or a low profit. Which option would you prefer if:

	Profit From Option A is	And Profit From Option B		Preferred Option
		when there is Bad luck is	And when there is Good luck is	
	$	$	$	
1	1 000 000	900 000	1 800 000	
2	1 000 000	800 000	2 400 000	
3	1 000 000	600 000	3 000 000	
4	1 000 000	200 000	3 800 000	
5	1 000 000	0	4 000 000	

Do you agree or disagree with the following

79. People in the municipality crop coca due to external pressure to crop

Strongly Disagree				Strongly Agree
1	2	3	4	5

80. Coca should not be cropped

1	2	3	4	5

81. Coca should not be cropped because it is illegal

1	2	3	4	5

82. Coca production harms the family

1	2	3	4	5

How?

83. Coca production harms the community

1	2	3	4	5

How?

84. Coca production harms the users

Strongly Disagree				Strongly Agree
1	2	3	4	5

85. Cropping coca is the only way to guaranty subsistence of the family

1	2	3	4	5

86. Many people in the municipality crops coca

1	2	3	4	5

87. My family and friend think that cropping coca is not bad

1	2	3	4	5

88. People in the municipality talk openly about coca

1	2	3	4	5

89. Authorities should restrict coca production due to the negative impacts that is has to the society

1	2	3	4	5

90. The community participates in the design of projects of alternative development

1	2	3	4	5

91. Alternative development helps reducing coca crops

1	2	3	4	5

92. Out of ten families how many benefit from alternative development

93. Those who need it the most can get access to Alternative Development programs

94. People is fairly treated when bring complains about eradication

1	2	3	4	5

95. Finishing Time: __ __ : _