



# Economic vs non-material incentives for participation in an in-kind payments for ecosystem services program in Bolivia

Tara Grillos \*

Harvard University, 79 JFK Street, Cambridge, MA 02138, United States



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## ABSTRACT

This study examines the motivations that drive participation in a compensation program for environmental conservation in Bolivia. Previous research on payments programs suggests that institutions that appeal to both economic and non-material incentives should be encouraged. This program attempts such a strategy, offering in-kind compensation for conservation while simultaneously attempting to engage with environmental values and traditional social norms. I take advantage of a comprehensive household survey conducted prior to the offer of the program and employ means-comparison tests and multi-level regression analysis to compare those who chose to participate with those who did not. My research examines whether motivations for participating in this program reflected purely financial calculations regarding the costs and benefits of the program, or whether non-financial motivations such as environmental or social beliefs and norms played a role as well. I find evidence that the program's effort to engage with social motivations was successful and that social factors, not financial incentives alone, affect participation in the program. Findings also suggest that environmental values did not play a very large role, and that the financial determinants of participation are related mainly to prohibitive costs or barriers to entry, rather than the size of anticipated benefits.

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## 1. Introduction

Direct compensations for ecosystem services, often in the form of Payments for Ecosystem Services (PES), have been used across the world for over a decade to promote a variety of environmental behaviors (Landell-Mills and Porras, 2002). However, the motivations behind and institutional aspects of such incentive schemes remain understudied (Vatn, 2010; Muradian et al., 2010), and recently there has been renewed interest in the factors that influence participation in such schemes (Bremer et al., 2014). Understanding the different motivations that drive people to participate in conservation programs can help make those programs more successful and is also of interest to the many scholars who study the effects of such programs on pre-existing motivations.

Previous studies on motivations to participate in PES programs have either focused exclusively on material factors or have relied on qualitative data collected after the decision to participate has already been made. In this study, I use a distinct approach, first, by taking into account both material and non-material motivations for participation. Second, I make use of a comprehensive household survey conducted prior to the decision to participate, thus mitigating the risk of survey bias. Finally, I

look at the decision to participate in the context of a PES program that made explicit attempts to engage with non-financial motivations for conservation, by using in-kind rather than monetary compensation and by framing the program with respect to pre-existing social norms about reciprocity.

In reviewing the previous literature on factors affecting participation, I identify several broad categories of motivations (financial, environmental and social) that have been used to explain the decision to participate (or opt out of) such compensation programs, and discuss useful subcategories of each to guide my later analysis. I then identify questions in the household survey that relate to each of those categories. I first compare means of participants and non-participants on each category of factors affecting participation, using standard bivariate logit models to test for significance. Finally, I run a series of multi-level mixed effects logit models combining the different categories of motivations to arrive at a best-fit model that demonstrates which variables are robust to the inclusion of others.

My findings suggest that material factors play a large role in determining participation, in part by creating barriers to entry that limit the participation of certain households. I find no convincing evidence that environmental beliefs motivate participation in the program, but my results do suggest that the program's efforts to engage with social norms of reciprocity and cooperation was successful. I conclude that social embeddedness, in addition to material factors, helps motivate participation in the program.

\* Corresponding author at: Institute of Behavioral Science, University of Colorado, 1440 15th Street, Rm 265, Boulder, CO 80309, United States.  
E-mail address: [tara.grillos@colorado.edu](mailto:tara.grillos@colorado.edu).

## 2. Literature on Payments for Ecosystem Services Programs

### 2.1. Rationale for a Socially-oriented PES

Increasingly, scholars suggest that PES programs are not comprised purely of market-based incentives, but rather must be viewed as institutions with significant social dimensions. Conceptualizing such incentives from a strictly rational choice perspective is subject to “commodity fetishism,” which obscures the social interactions that underscore economic transactions (Kosoy & Corbera, 2010). Compensation systems do not stand alone, but rather require interplay with multiple existing social and political institutions (Corbera et al., 2009). A more practical conceptualization of these incentives would take into account power structures and social embeddedness (Muradian et al., 2010).

Bolstering this notion that PES programs are more than the sum of their financial incentives is a long-standing body of literature demonstrating that people do not always respond to incentives in the ways that rational choice theory would predict, and that pre-existing, non-material motivations can actually be reduced by the introduction of monetary incentives (Titmuss, 1971; Frey, 1994; Deci et al., 1999; Gneezy and Rustichini, 2000; Bowles, 2008). In the context of conservation programs specifically, several studies provide evidence for such adverse effects of financial incentives (Cardenas et al., 2000; Jack, 2009; Velez et al., 2010; Kerr et al., 2012; García-Amado et al., 2013; Agrawal et al., 2015). In a review of 18 empirical studies on crowding effects of economic incentives for conservation, Rode et al. (2014) lament that more concrete evidence is inhibited by a lack of baseline information about pre-existing motivations “prior to policy intervention”. They conclude that there is some evidence of crowding out of non-material motivations by the introduction of economic incentives, but that crowding in may also occur, with results varying widely depending on the particular institutional design and wider social context under consideration (Rode et al., 2014).

In addition to influencing preferences by establishing incentives, institutions can also serve the role of signaling to individuals the mind-set that is most applicable in a given circumstance (Vatn, 2005, 2009). When monetary compensation is made salient, it invokes norms associated with market conditions, such as purely self-interested behavior, while the use of in-kind compensation can potentially avoid this (Heyman and Ariely, 2004; Kerr et al., 2014). Even the framing of programs as “compensations” rather than payments or incentives can influence their success (Wunder and Vargas, 2005; Vatn, 2010). Independent of intentional framing by policy-makers, perceptions of compensations can be influenced by interactions with pre-existing norms, identities and beliefs (Cárdenas and Ostrom, 2004; Cardenas, 2011; Velez and Lopez, 2013). One study concluded that “PES should not be viewed as a market panacea transcending the local institutional context, but rather as a potentially complementary instrument within a broader rearrangement of environmental governance” (Van Hecken et al., 2012).

Cranford and Mourato (2011) observe that, ironically, suggested improvements on PES in the literature, such as the use of in-kind compensations and a focus on cooperation and reciprocity (Farley and Costanza, 2010; Fisher et al., 2010; Muradian et al., 2010; van Noordwijk and Leimona, 2010), reflect a return to elements of the community conservation schemes over which PES was originally meant to be an improvement. After reviewing the pros and cons of each, they propose a two-stage approach that begins by creating a supportive institutional environment for conservation norms and then introduces more explicit financial incentives (Cranford and Mourato, 2011). Other scholars also propose hybrid approaches as a potential solution (Wunder, 2006; García-Amado et al., 2013).

Fundación Natura Bolivia, an NGO working in the lowlands of Bolivia, has implemented such a hybrid approach to incentive-based environmental conservation. Its *Acuerdos Recíprocos por el Agua*

(Reciprocal Watershed Agreements, or RWA) program takes advantage of long-standing community norms regarding reciprocity and introduces a system of in-kind compensations for forest conservation and watershed protection. This study seeks to examine whether motivations for participating in this program reflect purely material factors, such as the size of anticipated economic incentives, or whether the effort to engage with non-material motivations was successful.

Given the emphasis of previous literature on both institutional design and social context, this more socially-oriented approach to PES may be expected to have different outcomes than more traditional PES programs reviewed in previous literature. However, in order to provide some context for this analysis, the next section reviews prior literature about the decision to participate in PES programs.

### 2.2. Determinants of Participation in PES Programs

Previous findings regarding the determinants of participation in PES can be grouped according to either material factors or non-material motivations for participation. Material factors, i.e. those suggested by rational choice theories of human behavior, may relate not only to the expected size of the economic incentive, but also to “factors affecting ability and eligibility to enroll” (Bremer et al., 2014), or what I will refer to as “barriers to entry”. Non-material motivations can be classified as either pro-nature, referring to value placed on the environment, or pro-social, relating to relationships with other people and encompassing social norms, reciprocal obligations or altruism (Rode et al., 2014).

An econometric study meant to disentangle various determinants of participation in Costa Rica's PES program found that there were three major influences: land size, household economic and demographic factors and access to information (Zbinden and Lee, 2005). Others have also observed that participants in compensation programs tend to be larger landowners (Grieg-Gran et al., 2005; Kollmair and Rasul, 2010), either because those with smaller properties find it difficult to meet the requirements (and thus face a barrier to entry) or because the incentive payments (and therefore the size of financial motivation) are lower for small landowners and therefore less attractive to them (Miranda et al., 2003; Pagiola et al., 2005; Bremer et al., 2014). Incentive programs typically require formal property title (another barrier to entry), which may also result in a skew toward wealthier and more educated participants (Landell-Mills and Porras, 2002; Wunder, 2008), potentially increasing economic inequality (García-Amado et al., 2011). A fear of land expropriation or a more general distrust of institutions is another factor that seems to influence the decision to participate in such programs (Miranda et al., 2003; Southgate and Wunder, 2009), because it affects beliefs about the expected size of the economic incentive.

Taken together, these material factors affecting participation all relate either to barriers to entry or to financial motivations, though in some cases a single variable could be related to both, as in the case of land size. Factors relating to financial motivations include anything that directly affects the expected economic value of participating in the payment scheme. That includes the size of compensation, the direct costs of compliance with requirements, and beliefs about the likelihood that promised compensation will actually be delivered. Barriers to entry are factors that may prohibit someone from participating, even if they are motivated to do so. For example, a lack of land title would make one ineligible for the program, a lack of awareness of the program would make it impossible to sign up, and a lack of wealth could mean that one has no access to alternative resources, making it impossible to comply with the conservation requirements.

More recently, there has been an increased focus on non-material motivations for participation, mostly related to environmental attitudes or beliefs. In Mexico, researchers found that perspectives on the values and impact of forest conservation were critical drivers of participation in PES programs (Kosoy et al., 2008). A study in Ecuador found that motivations for enrolling in that nation's SocioPáramo program included, in addition to access to alternative sources of income and low opportunity

cost, the value that people placed on the watershed services provided by conservation (Bremer et al., 2014). However, these studies involved interviews conducted after the decision to participate or not, which raises some concerns about survey bias. It may be the case that environmental motivations for conservation came about as a result of participation in these conservation programs, rather than serving as motivations for participation in the first place. Decisions that were based primarily on financial motivations may later be justified with other language either to please surveyors or to reduce cognitive dissonance (Festinger, 1962; Akerlof and Dickens, 1982).

Given the emphasis on social factors within the literature reviewed in Section 2.1, one might expect a greater focus on these factors in studies on motivations. With respect to social motivations, some studies examine social capital as a potential outcome of forest conservation (Miranda et al., 2003), as a variable affecting its success (Cranford and Mourato, 2011), or as one of the non-material motivations that may be crowded out by monetary incentives (Rode et al., 2014). Fewer explicitly examine social norms as a motivation for participation in compensation schemes in the first place (Chen et al., 2012; Bremer et al., 2014). This is perhaps due to confounding factors, as Bremer et al. (2014) observe that some measures of social embeddedness may also be indicators of barriers to entry in the form of information access. After all, a socially isolated individual is less likely to be aware of the existence of the program or have access to information about how to enroll in it.

Table 1 below provides a summary of these multiple factors affecting participation, divided into material factors (either in the form of barriers to entry or direct financial motivations) and non-material motivations (either environmental or social motivations). It is worth noting here that environmental motivations may be based on some intrinsic value that one assigns to nature, or on a belief that conserving the environment provides instrumental material benefits even absent an external incentive program. Social motivations may similarly be due to some intrinsic value that one places on cooperation and protection of common resources, or to instrumental value based on the internalization of social norms that dictate such cooperation and impose social costs on non-cooperators.

This review has focused on the PES literature because the RWA program analyzed in this paper was conceived of as a variant on a typical PES scheme. However, as described in Section 2.1, even seemingly small changes to social context or institutional design (for example, describing the program as compensations rather than as payments) may lead to differing outcomes. Thus, one should not necessarily expect particular findings from previous literature on PES to be replicated in this context, which differs in several important ways, in particular by making use of in-kind compensations and explicit framing of the program with respect to pre-existing reciprocity norms.

However, more long-standing literature on other types of environmental compensation programs suggests that at least the broad overview of possible factors affecting participation (as presented in

Table 1) may be more broadly applicable. For example, a review of 160 research reports on the decision to participate in biodiversity policies emphasized that in addition to the design and implementation of the policy itself, there was a need to consider social influences and individual characteristics related to both willingness and ability; it concluded that financial incentives were necessary but not sufficient to promote participation (Siebert et al., 2006). A more recent analysis of 419 studies related to agri-environmental schemes (incentive-based measures commonly offered to farmers in the European Union) highlighted the role of material factors such as opportunity cost in reducing participation, as well as “limiting factors”, such as overly rigorous requirements, financial constraints, and information access; it also identified the lack of a successor as a factor that reduces participation (Uthes and Matzdorf, 2013). These observations echo those in the PES literature about the importance of barriers to entry and the potential existence of non-material motivations that may affect willingness to participate.

This study attempts to distinguish between different material and non-material factors affecting participation in a variant of PES that used in-kind compensations and framing with respect to pre-existing reciprocity norms. Unlike previous quantitative studies of motivations to participate in PES, it includes understudied non-material categories of motivation. Unlike previous studies that address non-material motivations in PES, it takes advantage of quantitative data. It compares participants with non-participants using responses to a survey conducted prior to the decision to participate. Finally, it examines the motivation to participate in a context that explicitly attempted to engage with pre-existing social norms. Variables are identified which indicate how likely each person is to benefit financially (or incur costs) from the program, as well as how much they identify with various environmental and social norms, and how socially embedded they are in pre-existing institutions within the community.

### 3. Background

#### 3.1. Santa Cruz, Bolivia & Pre-existing Institutions

During the 1990s, Bolivia introduced several laws that increased decentralization across various sectors (Andersson, 2003, 2013; Kohl, 2003; Pacheco, 2004). A new Forestry Law and Agrarian Reform Law regularized land titling in rural areas and recognized the forest rights of private landholders' and indigenous peoples (Pacheco, 2004). The *Ley de Participación Popular* (Law of Popular Participation) explicitly required grassroots participation in the planning process through the creation of community-level organizations called *organizaciones territoriales de base* or OTBs,<sup>1</sup> most of which were formed through the formalization of pre-existing community institutions. Particularly in rural areas, OTBs often involve intense social obligations to engage in communal work (Albó et al., 1989). Through the Law of Popular Participation, the Bolivian government legitimized almost fifteen thousand of these local organizations and granted them responsibility to create community development plans and mobilize community members to contribute labor to public goods (Kohl, 2003).

It was through these community institutions that a local NGO, Fundación Natura Bolivia (Natura), offered its system of compensations for ecosystem services in five municipalities in Santa Cruz that belong to the Area Natural de Manejo Integrado (mixed-use natural area) Rio Grande – Valles Cruceños (ANMI RG-VC). Natura identified 130 rural communities within the study area and randomly selected 65 of them in which to offer their compensations. The compensations contracts

**Table 1**  
Summary of factors affecting participation in compensation schemes.

<i>Material factors affecting participation</i>	
Barriers to entry (Ability/eligibility to enroll)	• Land title
Financial motivations (Expected value of participation)	• Awareness of the program • Wealth/access to alternative income sources • Size of compensation  • Direct costs of compliance • Belief that compensation will be provided
<i>Non-material motivations for participation</i>	
Environmental motivations	• Beliefs in intrinsic value of the environment • Beliefs in instrumental value of the environment
Social motivations	• Pro-social beliefs (intrinsic value of cooperation) • Social embeddedness (exposure to social norms)

<sup>1</sup> “Organización territorial de base” translates roughly to “organizations with a territorial basis”. The term OTB is sometimes used to refer both to the organization itself and to the geographical area it represents. The geographical area is typically analogous to a village, but not always. However, to avoid confusion between the organization and the geographical community, I use the term “village” throughout this paper when referring to the geographical unit, and “OTB” only when referring to the community-based organization itself.



are called *Acuerdos Recíprocos por el Agua* (Reciprocal Watershed Agreements) or RWAs, meant to evoke the informal institution of reciprocity norms that are common in many Bolivian communities (Capuma, 2007).

A qualitative study of a previous Fundación Natura program (which also used reciprocity framing but differed slightly from the program analyzed in this paper) reviewed the reciprocal labor sharing arrangements, *minga* and *ayni*, that are common throughout the region (Bétrisey and Mager, 2014). According to their review, *minga* typically takes the form of a social event in which community members (usually men) come together to help one household with a large task or to create public goods within the community. In exchange, the host usually provides, music, food and drinks. There is also an expectation that the *minga* host should participate when another community member calls his own *minga*. *Ayni* is slightly different in that it tends to involve a direct one-to-one interaction in which one community member offers assistance, with the expectation of help in return, though not necessarily of the same form (Bétrisey and Mager, 2014). While these traditions are less common today, they have in some cases taken on new forms to retain relevance, and even where the institutions are no longer practiced, people cite their continued influence on community social dynamics. In interviews, farmers cited reciprocity as a key element in their decision to participate (Bétrisey and Mager, 2014). This study uses a comprehensive baseline survey to see whether quantitative evidence confirms such ex-post justifications in this context.

### 3.2. Reciprocal Watershed Agreements

The RWAs offered in the ANMI Rio Grande are similar to previous programs implemented by Fundación Natura Bolivia in that they provide in-kind, rather than monetary, compensations for conservation (Asquith et al., 2008) and use framing meant to highlight pre-existing reciprocity norms (Bétrisey and Mager, 2014). However, this was the first time they were able to offer the RWAs at this scale and also the first time they could collect a full household survey of the beneficiaries prior to introducing the RWA contracts. This program also differs from previous versions of RWA in that it did not involve a direct one-to-one exchange between specific parties, but rather was framed as reciprocal with respect to benefits received from the actions of other community members and from the environment itself.

The communities included in Natura's intervention are rural farming communities, where cattle are a common form of savings. The most abundant crop by far is maize, but on average households maintain between two and three different crops. Sixty-seven percent of households own cattle, ranging from 1 to over 100. On average, households own about ten cows. Prior to this survey and subsequent intervention, RWAs had never been offered within the villages included in my analysis.

Natura offers three types of contracts in the 65 villages in its treatment area. Level 1 and 2 contracts are available for forested land within 100 m on either side of the water source, which is considered the most high impact conservation area. Level 1 contracts pay more and have stricter requirements than Level 2. Level 1 contract-holders agree not to deforest and also to remove cattle from the stream area. Level 2 is a provisional contract meant for those who are not able to immediately remove their cattle from the area. They agree not to deforest and receive a reduced rate while they incrementally remove cattle, at which point they will have the option to upgrade to a Level 1 contract. Those with land not within 100 m of the water source are eligible for Level 3 contracts, which pay less than either Level 1 or 2. The terms are similar to Level 2 contracts – cattle are allowed but the number of cattle in the area under conservation must be gradually reduced.

In all three cases, compensations are delivered in the form of goods intended for use in conservation activities or conservation-neutral poverty alleviation. These include barbed wire and staples to prevent cattle from entering the water source, cement to harvest water or build shelter

for the cattle, plastic tubing and water tanks for irrigation, corrugated iron for housing renovations, lawn seed for improving pasture land, and fruit tree seedlings and beekeeping equipment for environmentally friendly income generating activities.

In each village where the program was offered, Natura visited the community 18 times in six rounds of three visits each. During each of the six rounds, technicians made a first visit in which they presented the compensations in an informational meeting through the OTB. During the second visit, they gave people the opportunity to sign contracts. During the third visit, they gave the first set of compensations. This sequence of three visits was repeated six times in total, such that community members had six opportunities over the course of three years to participate in the program. This repetition was built into the program in part to alleviate fears of land expropriation on the part of some landowners.

## 4. Data and Methods

### 4.1. The Survey Data

Prior to implementing the RWAs in the Vallegrande region, Fundación Natura implemented a comprehensive household survey in all 130 villages identified within the region. This is the survey on which all analyses in this paper are based, and it was conducted in a separate visit several months prior to the beginning of the first round of visits that comprise the treatment described in the previous section. At the time of the survey, it had not yet been determined which villages would be offered the RWAs. This was done to avoid bias introduced by the expectation of NGO programming.

This survey was intended to capture every household in the survey area. It included sections on household members and demographics, household assets and income generating activities, land use, institutional environment and environmental and social values and beliefs. Natura also conducted an additional village-level survey of the OTB leaders in each village, which asked about the existence of various organizations within the community as well as some characteristics of the village itself. Of the original 130 villages surveyed, 65 were randomly selected to receive the RWA treatment, which involved six rounds of visits to each village, as described above in Section 3.2.<sup>2</sup> My key dependent variable is the decision to participate in the program or not. Since there is no comparable decision that was made in the villages that have not yet been offered RWAs, these non-selected villages are excluded from my analysis.

The list of contract-holders from the six rounds of meetings was then matched to the initial survey in order to assess how those who took up contracts differed from those who did not (within the 65 villages where the contracts were offered). In matching the contract database to the initial survey, some households appeared who had not been captured in the initial survey. There were 121 of these unmatched contracts, which represents 22.9% of all contract-holding households and 9.3% of the original household survey respondents.<sup>3</sup> The household survey was applied to these households, but only after they had decided to take up the contract. A major advantage of this survey data is its timing prior to decision-making, and these late additions are not directly comparable to those original pre-intervention surveys. In addition, it is not possible to identify comparable households who were not included in the original survey and did not later take up contracts. As a result,

<sup>2</sup> Fundación Natura does have plans to return to the other 65 villages to offer the RWA program at a later date, but as of the time this analysis was conducted, only 65 had received the program.

<sup>3</sup> Natura conducted a follow-up survey to understand why these households were not picked up in the original baseline. Many lived in the community only part-time, or moved from one community in the survey area to another, or live in Santa Cruz with jobs in the city, but continue to own property back in the village, but these accounted for just over 25% of the un-surveyed participants. The rest simply could not be located by the survey team at the time of the original survey.

these late additions are excluded from the main analysis. However, I do include them in a separate analysis as a robustness check of the key findings.

From the comprehensive household survey conducted by Fundación Natura, I selected only those variables that are directly linked to one of the theoretical categories presented earlier in Table 1. I identified survey questions that represent either material factors affecting participation (barriers to entry or financial motivations) or non-material motivations for participation (either environmental or social).

Questions relating to material factors affecting participation included the amount of land of various types and the number of cattle owned by the household (both of which affect the size of compensation and costs of compliance, but are also proxies for wealth/access to alternative income sources). Other questions representing barriers to entry included whether the household had land title at the time of the survey, whether the household participated in other economic activities (not dependent on the land), and whether or not the household had taken a loan in the last year. Finally, a series of questions were asked regarding how much (on a four-point scale) the respondent trusts in various institutions, including the municipal government, the departmental government and external institutions or NGOs. These trust questions were then loaded into a single composite called “distrust of institutions” using principal components analysis. Distrust of institutions is related to the belief that promised compensation will actually be provided, and thus affects the expected value of compensation.

Environmental motivation questions asked about agreement with various pro-environment statements (on a 5-point Likert scale). In addition, there were questions that asked whether the quality or quantity of water is a problem for the community and whether the forest is in better, the same or worse condition than five years ago. Respondents were asked to list benefits they receive from the forest, which I recoded as a binary variable identifying those who could name no benefits at all. They were asked to name ways in which people can protect the environment, which I recoded as a binary variable to identify those people who named not cutting trees (a requirement of the program) as an environmental protection strategy. Finally, respondents were asked to choose the two most important values that may be taught to children in the home (from a pre-defined list). I recoded this question as a binary variable identifying those respondents who prioritized protecting the environment above other values on the list.

Questions related to social motivations took two forms: measures of social embeddedness (participation in various community organizations and activities and for how many generations the family has lived in the community), and agreement with various statements related to social norms and community cooperation (rated on a 5-point Likert scale). The full text of all survey questions used in this analysis can be found in Appendix A.

#### 4.2. Analytical Methods

This study compares those who chose to participate in the RWA compensation scheme with those who did not, in an effort to see whether they differ significantly with respect to material factors (including barriers to entry and financial motivations), as well as with respect to indicators of non-material motivations for conservation, including environmental and social norms and beliefs. My dependent variable throughout all analyses in this paper is the binary decision made by each household to either participate in the program (sign up for an RWA contract) or not.

Because my dependent variable is binary, logistic regression is the appropriate class of models for my research question (McFadden, 1974; Train, 2002). While probit models are also a possibility for binary outcome variables, I opt to use the logistic function because of the possibility of converting the coefficients into odds ratios for a more intuitive interpretation of effect size. My final model specifications all take the form of multi-level mixed effects logit models (using Stata's `melogit`

command), where village is used to define the level structure. This data is inherently hierarchical in structure, because the program which provided the opportunity to take-up the RWA contracts was implemented at the village level, through each village's OTB, and take-up varies substantially across villages, from 0% take-up in one village to a maximum of 86%. Mean take-up by village was 39.2% with a standard deviation of 23.2%. This suggests that unobservable village-level factors, perhaps related to the facilitation of the information session or the functioning of the OTB, could influence the likelihood of participation. A multi-level model is the most appropriate approach for this hierarchically structured data (Gelman and Hill, 2006; Goldstein, 2011).

The multi-level mixed effects logit model allows for a random intercept at the village level, meaning that individuals with the same observable characteristics but living in different villages may have a different predicted probability of participating in the program. I define  $p_{ij}$  as the binary response variable indicating whether a person decides to participate in the program or not, and  $\pi_{ij} = \Pr(p_{ij} = 1)$ , the probability that individual  $i$  in village  $j$  decides to participate in the program. The log odds-ratio of the probability of participation in the program can then be modeled as follows (Guo and Zhao, 2000):

$$\log \frac{\pi_{ij}}{1-\pi_{ij}} = \alpha + \beta'x'_{ij} + u_j$$

where  $\alpha$  is a constant,  $x'_{ij}$  is the vector of covariates for person  $i$  in village  $j$ ,  $\beta'$  is the related vector of coefficients, and  $u_j$  is the random effect at the village level, which is assumed to be normally distributed with mean 0 (Guo and Zhao, 2000). In this case,  $x'_{ij}$  includes demographic controls for the head of household (age and education), as well as covariates that serve as indicators of the material factors and non-material motivations believed to determine participation, as outlined in Table 1.

After identifying the survey questions that related directly to each category of effects presented in Table 1, the first step in my analysis was to simply compare participants to non-participants on each of these variables individually using bivariate logit regressions with robust, clustered standard errors at the village level. The coefficients and  $p$ -values from each bivariate logit model are reported along with descriptive statistics. This was done in order to be transparent about the full range of variables that were considered for inclusion in my final multivariate regression models.

Next, I turn to the more rigorous multi-level regression models that will be used in my main model. I independently evaluated each category of variables (material factors, environmental motivations and social motivations) through a taxonomy of fitted logit models, after checking for multicollinearity. For each category, I identified the combination of variables that provided the best fit to the data by comparing the Akaike information criterion (AIC), Bayesian information criterion (BIC) and Wald Chi-squared statistics. I removed a variable from the final model specification if it fit three criteria: (1) It was not itself statistically significant, (2) It did not substantively alter which other variables were statistically significant, and (3) It reduced the goodness-of-fit of the model according to at least one of the three goodness-of-fit statistics. Once I had identified the best fitting model for each conceptual category, I combined these into a single model, and once again created a taxonomy of fitted models, using an iterative addition and deletion of variables to identify the final, combined model with the best relative fit to the data.

## 5. Results

### 5.1. Descriptive Statistics and Bivariate Logit Regressions

Table 2 shows differences in means between participants and non-participants on variables relating to the different categories of factors affecting participation. It also reports the coefficients and  $p$ -values from bivariate logit models (with clustered errors at the village level) to give a sense for whether the differences in means are significant.

**Table 2**

Factors affecting participation: descriptive statistics and bivariate logit regressions.

	Non-participants		participants		Bivariate logit models	
	Mean	se	Mean	se	Coefficient	p-Value
Material factors						
Land title	0.64	0.02	0.85	0.02	1.14	0.00**
Home ownership	0.77	0.01	0.89	0.02	0.92	0.00**
# of rooms in home	2.74	0.04	3.26	0.08	0.25	0.00**
Owens cattle	0.58	0.02	0.87	0.02	1.60	0.00**
# of cattle	8.65	0.55	15.26	0.82	0.02	0.00**
Total land	23.76	2.32	42.82	4.3	0.00	0.12
Unused forested land	3.88	0.59	6.35	1.3	0.01	0.08
Pasture land	18.79	2.31	31.88	3.35	0.00	0.14
Cultivated land	2.33	0.16	3.03	0.16	0.06	0.43
No alternative income	0.63	0.02	0.67	0.02	0.18	0.27
Loans	0.10	0.01	0.14	0.02	0.31	0.09
Distrust of institutions	0.04	0.03	−0.08	0.04	−0.15	0.08
Non-material motivations						
<i>Environmental motivations</i>						
Perceives no forest benefits	0.09	0.01	0.05	0.01	−0.55	0.01*
Prioritizes environment as a value	0.39	0.02	0.44	0.02	0.22	0.07
Names not cutting as way to conserve	0.72	0.02	0.74	0.02	0.09	0.57
Water quality/quantity is a problem	0.65	0.02	0.67	0.02	0.07	0.66
Forest better condition than 5 years ago	1.76	0.03	1.76	0.04	−0.01	0.93
"Environment improves incomes"	4.61	0.03	4.71	0.04	0.16	0.06
"Must harm envt. to improve life"	1.44	0.04	1.36	0.05	−0.07	0.29
"Gov. should make laws to protect envt"	3.57	0.05	3.67	0.08	0.04	0.31
"If neighbors don't conserve, I don't"	1.91	0.05	1.82	0.07	−0.05	0.26
<i>Social motivations</i>						
Generations in the community	1.98	0.03	2.29	0.05	0.28	0.00**
Is OTB member	0.73	0.01	0.88	0.02	0.95	0.00**
Frequency of OTB attendance	0.86	0.03	1.18	0.04	0.40	0.00**
Does community work	0.52	0.02	0.73	0.02	0.92	0.00**
Frequency community work	2.04	0.15	3.38	0.39	0.04	0.03*
Participates in minga/ayni	0.36	0.02	0.49	0.02	0.57	0.00**
"People cooperate in this community"	3.67	0.05	3.93	0.07	0.13	0.01**
"People help me if I need it"	3.54	0.05	3.64	0.08	0.05	0.25
"If you work more, should earn more"	4.63	0.03	4.69	0.04	0.07	0.20
"If you earn more, must share w/others"	2.84	0.06	2.77	0.08	−0.03	0.49
"All contribute equally to problems"	0.76	0.02	0.78	0.03	0.08	0.71
"All suffer equally from problems"	0.90	0.01	0.88	0.02	−0.18	0.45
Total households	888		407			

\*\*\* p &lt; 0.001.

\* p &lt; 0.05.

\*\* p &lt; 0.01.

Among survey respondents, those who ultimately chose to participate in RWA are more likely to have formal land title (a requirement of participation). They are less distrustful of institutions. They own more land on average and are more likely to own their own homes and have larger homes (indicators of wealth). They are also more likely to own cattle, and if they own cattle, are likely to own more of them.

With respect to pro-environmental norms and beliefs, survey respondents who are participants and non-participants differ on only one of these survey questions. Among non-participants, respondents

are more likely to be unable to name any benefits provided by the forest. But even for this variable, the significance level (from a bivariate logit) is lower than for other variables representing material factors or social motivations. Questions about social beliefs did not differ significantly between the two groups of respondents, with the exception that program participants were more likely to agree with the statement "Generally, people in my community cooperate to resolve community problems." With respect to social embeddedness, however, participants were more likely to have participated (and to have participated more frequently) in various forms of social organization, and their households lived in the community for more generations, on average.

## 5.2. Multi-level Mixed Effects Logit Models

After specifying a series of multi-level mixed effects logit models, first for each category of factors affecting participation on its own, and then all together, I arrive at a final model specification that includes 16 variables. In Model 1 of Table 3, I present a truncated version of that final, best-fit model. This final, combined model also included controls for distrust of institutions, whether the household had taken loans, as well as five variables measuring environmental values, but none of these were statistically significant in any of my combined model specifications, so I have suppressed their results in Table 3 to save space. In Appendices B–E, I include a portion of the taxonomy of fitted models (including the full version of the final model), which demonstrates that the significance of key variables is quite robust to the inclusion or removal of other variables and not specific to this particular model specification (although this model is the one with the best fit to the data).

In the final, best-fit model, several variables relating to material factors are significant: land title, livestock ownership and number of rooms in the home. Several variables relating to social embeddedness are also

**Table 3**

Factors affecting participation (multi-level mixed effects logit models).

	(1)	(2)	(3)	(4)
Age	−0.00386 (0.00604)	−0.00395 (0.00605)	−0.00393 (0.00609)	−0.00369 (0.00601)
Education	−0.00505 (0.0226)	−0.00395 (0.0227)	−0.00310 (0.0226)	−0.00331 (0.0225)
Land title	0.969*** (0.155)	0.975*** (0.157)	0.989*** (0.156)	0.982*** (0.156)
Owens cattle	1.211*** (0.202)	1.198*** (0.203)	1.197*** (0.205)	1.200*** (0.206)
No. rooms	0.208*** (0.0558)	0.212*** (0.0551)	0.213*** (0.0555)	0.213*** (0.0549)
No Alternate income	−0.264 (0.182)	−0.255 (0.183)	−0.227 (0.184)	−0.265 (0.186)
Community work	0.693*** (0.187)	0.700*** (0.187)	0.697*** (0.186)	0.191 (0.292)
Generations in village	0.157* (0.0667)	0.155* (0.0670)	0.145* (0.0649)	0.162* (0.0683)
Is OTB member	0.689** (0.216)	0.680** (0.219)	0.210 (0.287)	0.691** (0.223)
Village still uses minga/ayni		0.324 (0.328)	−0.460 (0.515)	−0.214 (0.451)
Interaction: Minga * OTBMember			0.905* (0.422)	
Interaction: Minga * CommunityWork				0.761* (0.373)
Constant	−4.211*** (0.519)	−4.434*** (0.583)	−4.036*** (0.597)	−4.093*** (0.612)
Village-level constant	0.873*** (0.206)	0.858*** (0.193)	0.861*** (0.194)	0.905*** (0.202)
AIC	1270.0	1270.9	1269.2	1268.0
BIC	1361.7	1367.7	1371.0	1369.9
Chi2	227.0	224.4	227.7	225.7
Observations	1204	1204	1204	1204

Standard errors in parentheses.

\* p &lt; 0.05.

\*\* p &lt; 0.01.

\*\*\* p &lt; 0.001.



significant: number of generations in the community, OTB membership and participation in community work. None of the variables relating to environmental motivations appear to be significant after controlling for the other categories.

The village-level random effects are consistently significant and large, indicating that village-level characteristics are indeed important as well. Explaining village-level variation is not the main focus of this paper, and many such village-level effects are likely related to internal social dynamics, which are not easily measured through survey data. Although the main focus of this paper is to explain individual decision-making within a given village setting, I take advantage of one village-level survey question and add it to the regression in Model 2 of Table 3. This variable was a question to the OTB leader in each village about whether or not the traditional norms of *minga/ayni* are still common practice in that village. The variable is not significant on its own, but when cross-level interactions are added between it and the two most significant measures of social embeddedness at the individual level (OTB membership and participation in community work), both of these interaction terms are significant, indicating that an individual's social embeddedness has the biggest impact on his/her decision to participate in villages where traditional reciprocity norms are still common practice.

### 5.3. Robustness Checks

In order to rule out the possibility that results are a construct of particular choices made in the course of data analysis, I re-ran my main model using several robustness checks (the results of which are reported in Appendix F). First, I re-ran the model including participants who had not appeared in the original baseline survey (using a separate, but identical, household survey that was conducted later, after the decision to participate had been made). Next, I re-ran the same model, but this time considering as participants only those who took up Level 1 or Level 2 contracts, which pay more and have higher impact than Level 3. Finally, in order to check the robustness of results to the particular model type, I used the same set of variables but this time specified a standard logit model with clustered, standard errors, which is an alternate, though inferior, method of accounting for unobservable village-level effects (Williams, 2000). In all cases, substantive results with respect to my variables of interest are unchanged (the same six key variables all remain statistically significant). In only one case (the inclusion of participants unaccounted for at baseline), a binary variable representing the lack of alternative income not dependent on the forest (another 'barrier to entry') also became significant, but this was the only substantive difference that resulted from the robustness checks.

## 6. Discussion

### 6.1. Material Factors Affecting Participation

The RWA program used in-kind compensations rather than monetary payments and made efforts to engage with norms of reciprocity and cooperation. Material factors suggested by rational-choice theory still play a large role in motivating participation in the program, but these material factors seem to reflect barriers to entry rather than the draw of actual financial incentives. Participants in the compensation program are more likely to have formal land title, have larger homes and to own cattle. Lack of formal land title represents a clear barrier to entry to the program, and owning a larger home is a proxy for wealth, the lack of which represents another barrier to entry. Because the compensation program requires removal of cattle from associated land, cattle ownership increases the costs of compliance with the contracts and is therefore related to the size of the financial motivation to participate, but it could also represent a barrier to entry, as it is another important proxy for wealth in this setting.

If cattle ownership affects the decision to participate through raising the costs of compliance, we should expect it to decrease the likelihood to participate. On the other hand, if cattle ownership affects the decision to participate because it represents wealth and therefore a lack of barriers to entry, then we should expect it to increase the likelihood to participate. Because the coefficient on cattle ownership is positive throughout my model specifications, the most likely interpretation is that it proxies for wealth.

This highlights the role of barriers to entry which may prohibit households from participating in the program even if they do have a desire to enroll. This also confirms the findings of previous studies that those who are likely to benefit most from such compensation schemes are those who are already relatively better off. This raises some questions about the potential for such programs to increase inequality in the community.

### 6.2. Environmental Motivations for Participation

Contrary to several recent studies of PES, in which participants cite environmental reasons in interviews regarding their motivations, I do not find any evidence that participants are motivated by any intrinsic valuation of the environment. There do not seem to be very significant differences between participants and non-participants with respect to environmental beliefs or values. According to bivariate logit regressions, contract-holders are less likely to say that they perceive no benefits from the forest, and according to some restrictive multi-level logit models, they are more likely to prioritize the environment over other values. However, none of these variables are significant when controlling for material and social factors affecting participation.

An important caveat here is that internal beliefs such as environmental values are more difficult to measure with survey questions than are the other categories of factors affecting participation. Questions used to measure environmental beliefs are necessarily different than those used to measure material characteristics, such as land title, or social embeddedness, such as participation in community work, because the latter two are more observable by nature and perhaps less subject to desirability bias. Questions measuring agreement with statements about the environment are likely to elicit a positive response regardless of an individual's level of personal investment in the environment. Indeed, across all survey respondents, people are likely to state high levels of agreement with pro-environment statements. On the other hand, other variables about environmental motivations are less subject to this bias. For example, selecting the environment as a priority over other objectively important values to be taught to children in the home (being a good student, sharing with others, etc.) is less of an obvious "correct answer", and indeed, less than half of respondents choose the environment in response to this question. This was the variable with the highest statistical significance within this category, but it was no longer significant after controlling for other determinants of participation.

These findings stand in direct contrast to some recent studies in which interviewees cite environmental motivations as one of their reasons for having decided to participate in PES programs. This could be a result of the greater social orientation of this program, such that in this context social concerns overpowered environmental ones. It could also be because interviews conducted after the decision to participate are subject to survey bias, due to a desire to please the implementing organization. Alternatively, it may represent an actual change in perceptions of environmental value after participating in a conservation program. This latter explanation can and should be tested with future research using endline data from this same program, once it is available. After collection of endline data, future research could also make use of ex-post interviews in this same setting to see if results differ substantively from findings of the pre-treatment survey. This could help to establish whether the difference in findings is a result of the different institutional design used in this setting (in-kind payments, reciprocity

framing) or due merely to methodological differences and ex-post survey bias.

### 6.3. Social Motivations for Participation

Finally, social embeddedness is a strong determinant of participation in the RWA scheme. Measures of this include: whether a household reports that they participate in community work, whether they participate in the pre-existing decision-making institution in the community (the OTB), and the number of generations the family has resided in the village. Those who choose to participate in the program are more socially embedded in the community than those who do not participate, suggesting that social motivations may indeed play a role in the decision to participate.

One objection to this interpretation is that those who are relatively socially isolated may simply be less likely to have heard that the program even exists. This is of particular concern with respect to OTB membership, as information about the program was delivered through the OTB. Although two other measures of social embeddedness are significant even when controlling for OTB membership, one could still argue that social involvement in general leads to higher awareness of opportunities that exist in the village. Under this interpretation, social embeddedness simply represents yet another barrier to entry to the program, rather than a proxy for the influence of social norms.

However, I provide evidence to rule out this alternate interpretation in Table 3. If social embeddedness is significant only because it proxies for awareness of the existence of the program, then we have no reason to expect its effect to vary with the strength of social norms at the village level. The cross-level interaction terms included in Models 3 and 4 demonstrate that the effect of social embeddedness on the decision to participate is stronger in those villages where the traditional practices of *minga/ayni*, associated with reciprocity norms, are still very common. Thus even if social embeddedness is correlated with exposure to information about the program, that information is more effective at motivating participation where traditional reciprocity norms are still salient. This suggests that its effect likely occurs not through mere awareness of the program, but rather through successful engagement with norms of reciprocity and communication.

Results suggest that Fundación Natura's RWA program was successful at framing the program in ways that engage with pre-existing social norms to promote participation in the program. It is unclear to what extent the framing of RWAs as *minga/ayni*, or the use of in-kind compensations, or the prior existence of cultural reciprocity norms each contributed to this. However, a safe conclusion to draw from this is that an awareness of existing cultural and political institutions in the design of compensation schemes can aid in promoting participation in conservation activities.

## 7. Conclusions

In summary, my findings suggest that: (i) Material factors, particularly in the form of barriers to entry, play a large role in determining participation in the program. These factors skew participation toward

wealthier community members, with potential implications for long-term equity of the program. (ii) Intrinsic valuation of the environment does not appear to play a large role in the decision to participate in the compensation program, though this may be due to the difficulty of measuring internal beliefs. (iii) Social embeddedness is a strong predictor of participation, more so in communities where pre-existing norms surrounding reciprocity are still salient.

These findings relate directly to various streams of existing literature. First, they empirically corroborate assertions by other scholars that compensation programs are experienced partly as social institutions (Kosoy & Corbera, 2010; Muradian et al., 2010; Vatn, 2010; Van Hecken et al., 2012). The Reciprocal Watershed Agreements program, in accordance with advice from other scholars, employs a hybrid approach mixing supportive norms with direct compensation (Wunder, 2006; Farley and Costanza, 2010; Cranford and Mourato, 2011; García-Amado et al., 2013). It failed to avoid distributional problems due to barriers to entry, as found in previous studies of more traditional payments programs (Miranda et al., 2003; Grieg-Gran et al., 2005; Pagiola et al., 2005; Zbinden and Lee, 2005; Kollmair and Rasul, 2010; Bremer et al., 2014), but it seems to have succeeded at engaging social norms around reciprocity, which helps to establish baseline information about non-material motivations, which was found lacking in a review of the literature on motivation crowding in compensation programs (Rode et al., 2014).

If, in engaging social norms to encourage participation, the program also managed to reinforce and strengthen those norms, then this may have positive spillover effects for other areas of collective action within these communities. In addition, the engagement and potential strengthening of social norms may reduce the risk of crowding out that is so often cited in such compensation programs.

Future research should revisit this context with additional data currently being collected by Fundación Natura. It should ask: (i) whether social motivations also result in higher rates of compliance with the contracts; (ii) whether, when material compensations end, those motivated by social factors are more or less likely than others to experience crowding out; and (iii) whether participation in the program itself has an impact on an individual's social or environmental beliefs.

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## Appendix A. Full Text of Survey Questions Used in Analysis (Translated From Spanish)

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Questions related to financial motivations and costs of compliance

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How many hectares do you have available in total, including ranch, brush, forest, cloud forest and farmland?

How many hectares of forest that you aren't using?

Do you or someone in your household have one of the following documents? Title? Deed? Sanitation Certificate?

How many hectares of grazing or pastureland do you have available?

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(continued on next page)



**Appendix A.** (continued)Questions related to financial motivations and costs of compliance

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Do you or someone in your household have one of the following documents? Title? Deed? Sanitation Certificate?

How many hectares of cultivated land do you work on, whether your own lands or not?

Do you or someone in your household have one of the following documents? Title? Deed? Sanitation Certificate?

Do you own your home or rent it?

How many rooms does it have?

Do you own cows?

How many cows do you own in total?

What kinds of other economic activities did you or other members of the household engage in during the last year?

Have you or anyone else in your household taken a loan during the last 12 months?

Now I'd like to speak with you about how much trust you have in some organizations. For each one, I'd like to know if you always trust, usually trust, sometimes or never trust this kind of organization.

The municipal government? The departmental government? Institutions or NGOs?

Questions related to social motivations

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Since which generation has your family lived in this community? 1. Your own generation, 2. Your parents', 3. Your grandparents', 4. Great-grandparents, 5. Even earlier

Now I would like to speak about your family's participation in community organizations. Of the following, can you tell me if somebody in your family or you yourself participates, holds an officer's position currently or held a position in the past? In the OTB?

In how many OTB meetings did you or someone in your household participate in last month?

Have you or someone else in your household done work for the community in the last 12 months?

Can you remember how many times in the last 12 months?

Do you participate in minga, faena or ayni?

Now I will read some statements and I would like to know if you agree with each one. There is no correct answer, I just want to know your opinion.

- Generally, the people in my community cooperate to resolve community problems.
- The majority of people in my community help me if I need it.
- If a person works more than others, it's fair that they earn more money.
- If a person earns more than others, they must share with the rest.

Do all members of your community contribute equally to the [environmental] problem?

Do all members of your community suffer equally from the [environmental] problem?

Questions related to environmental motivations

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I'm going to present you with some values that may be taught to children in the home. Of these values, can you choose the two that you think are the most important? Independence, Creativity, Protecting the Environment, Sharing with Others, Obedience, Being a Good Student, Being Successful

What benefits does your family receive from the forest? Can you name three benefits?

Would you say that the quality or quantity of water is a problem in your community?

Now I will read some statements and I would like to know if you agree with each one. There is no correct answer, I just want to know your opinion.

- In order to improve quality of life, it is necessary to harm the environment.
- We can have higher economic incomes if we protect the environment.
- The government should be responsible for imposing laws that tell people what they can do with their lands so that they do less harm to the environment.
- If your neighbors don't do anything for the environment, then you shouldn't either.

Do you think that the forest is in better, the same or worse condition compared with how it was five years ago?

What can people in your community do to protect the environment? Can you give me three ideas?

## Village-level questions

How many OTB meetings did your community hold in the last month?

Is community work mandatory [through the OTB] in this community?

Do people [in this village] use minga/faena or ayni when they do work?

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**Appendix B. Material Factors Affecting Participation (Multi-level Mixed Effect Logit Models)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Land Title		1.122*** (0.135)	0.860*** (0.132)	0.764*** (0.132)	0.783*** (0.133)	0.783*** (0.132)	0.798*** (0.131)
Owns cattle			1.335*** (0.185)	1.235*** (0.193)	1.267*** (0.190)	1.252*** (0.193)	1.218*** (0.199)
No. rooms				0.230*** (0.0483)	0.227*** (0.0478)	0.227*** (0.0474)	0.229*** (0.0465)
No alternate income					−0.242 (0.164)	−0.217 (0.166)	−0.204 (0.167)
Loans						0.359 (0.221)	0.393 (0.228)
Distrust of institutions							−0.0330 (0.0840)
Constant	−0.617*** (0.145)	−1.476*** (0.180)	−2.278*** (0.227)	−2.800*** (0.231)	−2.664*** (0.244)	−2.709*** (0.245)	−2.717*** (0.249)
Village-level constant	0.939*** (0.223)	0.856*** (0.207)	0.694*** (0.169)	0.766*** (0.183)	0.780*** (0.183)	0.792*** (0.187)	0.769*** (0.187)
AIC	1504.6*	1458.7**	1401.1	1382.5	1382.0	1381.2	1365.4
BIC	1514.9	1474.2	1421.8	1408.3	1413.0	1417.4	1406.5
Chi2		69.28	105.4	140.6	148.0	164.9	168.2
Observations	1294	1294	1293	1292	1292	1292	1271

Standard errors in parentheses.

\*  $p < 0.05$ .\*\*  $p < 0.01$ .\*\*\*  $p < 0.001$ .**Appendix C. Environmental Motivations for Participation (Multi-level Mixed Effect Logit Models)**

	(1)	(2)	(3)	(4)	(5)	(6)
Prioritizes environment		0.327** (0.122)	0.317** (0.121)	0.295* (0.122)	0.256* (0.119)	0.254* (0.116)
Must harm environment			−0.121 (0.0737)	−0.126 (0.0742)	−0.125 (0.0740)	−0.123 (0.0741)
No Forest benefits				−0.332 (0.248)	−0.310 (0.242)	−0.354 (0.258)
Gov't should impose laws					0.0664 (0.0455)	0.0645 (0.0468)
Conserve only if neighbors do						−0.0121 (0.0513)
Constant	−0.617*** (0.145)	−0.741*** (0.152)	−0.566** (0.190)	−0.508** (0.190)	−0.725** (0.247)	−0.699** (0.269)
Village-level constant	0.939*** (0.223)	0.973*** (0.231)	1.029*** (0.242)	1.058*** (0.252)	1.073*** (0.253)	1.069*** (0.250)
AIC	1504.6	1494.3	1476.3	1441.4	1435.3	1434.8
BIC	1514.9	1509.8	1496.9	1467.0	1466.1	1470.6
Chi2		7.153	9.656	13.08	13.19	13.30
Observations	1294	1288	1280	1244	1234	1233

Standard errors in parentheses.

\*  $p < 0.05$ .\*\*  $p < 0.01$ .\*\*\*  $p < 0.001$ .**Appendix D. Social Factors Affecting Participation (Multi-level Mixed Effect Logit Models)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Community work		0.899*** (0.158)	0.851*** (0.159)	0.741*** (0.157)	0.706*** (0.157)	0.698*** (0.157)	0.682*** (0.158)
Generations in village			0.229** (0.0759)	0.207** (0.0783)	0.200* (0.0801)	0.203* (0.0801)	0.201* (0.0801)
Is OTB member				0.717*** (0.217)	0.579** (0.194)	0.625** (0.198)	0.598** (0.196)
No. of OTB meetings					0.183 (0.0947)	0.188* (0.0935)	0.182 (0.0933)
People help if I need it						−0.0375 (0.0390)	−0.0675 (0.0408)
People cooperate							0.0773

(continued on next page)

## Appendix D. (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	−0.617*** (0.145)	−1.205*** (0.191)	−1.654*** (0.257)	−2.151*** (0.290)	−2.193*** (0.298)	−2.106*** (0.333)	(0.0465) −2.249*** (0.342)
Village-level constant	0.939*** (0.223)	0.963*** (0.228)	0.940*** (0.222)	0.909*** (0.218)	0.895*** (0.216)	0.895*** (0.218)	0.902*** (0.216)
AIC	1504.6	1466.2	1457.1	1441.7	1438.8	1437.9	1437.1
BIC	1514.9	1481.7	1477.7	1467.5	1469.8	1474.0	1478.4
Chi2		32.33	41.56	52.85	51.35	53.91	60.16
Observations	1294	1293	1293	1287	1287	1286	1284

Standard errors in parentheses.

\*  $p < 0.05$ .\*\*  $p < 0.01$ .\*\*\*  $p < 0.001$ .

## Appendix E. Combined Model (Multi-level Mixed Effect Logit Models)

	(1)	(2)	(3)
Age	−0.0105 (0.00571)	−0.00556 (0.00581)	−0.00386 (0.00604)
Education	0.00547 (0.0223)	0.000780 (0.0219)	−0.00505 (0.0226)
Land title	0.915*** (0.135)	0.898*** (0.144)	0.969*** (0.155)
Owns cattle	1.192*** (0.196)	1.168*** (0.197)	1.211*** (0.202)
No. rooms	0.255*** (0.0488)	0.222*** (0.0533)	0.208*** (0.0558)
No alternate income	−0.166 (0.171)	−0.204 (0.170)	−0.264 (0.182)
Loans	0.348 (0.228)	0.218 (0.235)	0.196 (0.239)
Distrust of institutions	−0.0266 (0.0829)	0.0382 (0.0843)	0.0528 (0.0851)
Community work		0.698*** (0.172)	0.693*** (0.187)
Generations in village		0.140* (0.0632)	0.157* (0.0667)
Is OTB member		0.663** (0.209)	0.689** (0.216)
Prioritizes environment			0.0203 (0.134)
Must harm environment			−0.0468 (0.0758)
No forest benefits			−0.135 (0.266)
Gov't should impose laws			0.0880 (0.0485)
Conserve only if neighbors do			0.0614 (0.0479)
Constant	−2.387*** (0.374)	−3.761*** (0.459)	−4.211*** (0.519)
Village-level constant	0.802*** (0.195)	0.778*** (0.198)	0.873*** (0.206)
AIC	1352.9	1313.7	1270.0
BIC	1404.3	1380.4	1361.7
Chi2	188.0	207.9	227.0
Observations	1262	1258	1204

Standard errors in parentheses.

\*  $p < 0.05$ .\*\*  $p < 0.01$ .

## Appendix F. Robustness Checks

	(1)	(2)	(3)
	Including latecomer contract-holders	Including only more demanding contracts	Standard logit w/ clustered Errors
Age	−0.00297 (0.00538)	−0.00651 (0.00649)	−0.00580 (0.00572)
Education	0.0290 (0.0201)	−0.0184 (0.0212)	−0.0117 (0.0202)
Land title	1.187*** (0.159)	1.013*** (0.186)	0.913*** (0.158)
Owns cattle	1.173*** (0.195)	0.986*** (0.206)	1.300*** (0.207)
No. rooms	0.195*** (0.0480)	0.154** (0.0584)	0.161** (0.0595)
No alternate income	−0.448** (0.166)	−0.221 (0.195)	−0.160 (0.176)
Loans	0.121 (0.224)	0.226 (0.245)	0.152 (0.219)
Distrust of institutions	0.0567 (0.0835)	−0.0259 (0.0874)	0.0366 (0.0873)
Community work	0.663*** (0.169)	0.899*** (0.191)	0.676*** (0.168)
Generations in village	0.187** (0.0698)	0.149* (0.0714)	0.142* (0.0697)
Is OTB member	0.360* (0.156)	0.646** (0.206)	0.673*** (0.188)
Prioritizes environment	−0.0104 (0.139)	0.0215 (0.147)	−0.00484 (0.135)
Must harm environment	0.0380 (0.0659)	−0.0555 (0.0727)	0.00956 (0.0711)
No forest benefits	−0.259 (0.269)	0.0306 (0.302)	−0.128 (0.241)
Gov't should impose laws	0.0611 (0.0487)	0.0877 (0.0571)	0.0546 (0.0451)
Conserve only if neighbors do	0.0300 (0.0462)	0.0568 (0.0602)	0.0121 (0.0453)
Constant	−3.834*** (0.511)	−4.231*** (0.581)	−3.953*** (0.466)
Village-level constant	1.039*** (0.223)	0.852*** (0.219)	
AIC	1415.7	1179.0	1333.3
BIC	1508.9	1270.7	1419.9
Chi2	286.7	142.0	224.9
Observations	1310	1204	1204

Standard errors in parentheses.

\*  $p < 0.05$ .\*\*  $p < 0.01$ .\*\*\*  $p < 0.001$ .\*\*\*  $p < 0.001$ .

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