Effects of Ending Payments for Ecosystem Services: removal does not crowd prior conservation out

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Effects of Ending Payments for Ecosystem Services: removal does not crowd *prior* conservation out

Lina Moros⁵, María Alejandra Vélez⁶, Alexander Pfaff⁷, Daniela Quintero⁸

Abstract

We implemented a decision experiment in the field with rural peasants in Colombia to test the effects of introducing then partially or totally removing Payments for Ecosystem Services (PES). We consider individual and collective payments and different rules for removal. We find that there is clearly no behavioral ‘crowding-out’ when a PES is created then ended. Even a simple pre-versus-post-PES comparison finds ‘crowding in’, if anything, with contributions higher after PES was removed than before PES was introduced. Comparing to a control, without PES, strengthens that conclusion. We discuss four possible mechanisms explaining these findings: recognition or gratitude; lack of negative emotions; pre-existing and persistent intrinsic motivations, and evocation of pro-environmental behavior.

Key words: lab in the field experiment, pro-environmental behavior, payment for ecosystem services, incentives, Colombia.

JEL Codes: Q 01, Q 52, Q57, Q 58

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Efectos de finalizar los Pagos por Servicios Ambientales: la terminación no desplaza la conservación *previa*

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Resumen

Implementamos un experimento económico en campo con campesinos en Colombia para probar los efectos de introducir y luego eliminar parcial o totalmente los Pagos por Servicios Ambientales (PSA). Consideramos pagos individuales y colectivos y diferentes reglas de terminación. Encontramos que no hay evidencia de un "crowding-out" comportamental cuando se crea un PSA y luego se termina. Incluso una simple comparación antes y después de PSA encuentra "crowding-in", con contribuciones más altas después de que se eliminó el PSA que antes de que iniciara. La comparación con un grupo de control, sin PSA, refuerza esta conclusión. Discutimos cuatro posibles mecanismos que explican esto: reconocimiento o gratitud; falta de emociones negativas; motivaciones intrínsecas preexistentes y persistentes, y evocación de conductas pro-ambientales.

Palabras clave: experimento económico en campo, comportamiento pro-ambiental, Pagos por Servicios Ambientales, incentivos, Colombia.

Código JEL: Q 01, Q 52, Q57, Q 58

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1. Introduction

Programs to provide payments for ecosystem services (PES) have been increasing globally. Salzman, Bennett, Carroll, Goldstein and Jenkins (2018) report 550 active programs with an estimated of US\$36-42 billion in annual transactions. From a global perspective, there is increasing interest in achieving Reductions in Emissions from Deforestation and forest Degradation (REDD+). Locally, unlike protected areas (PAs), PES compensate those who provide ecosystem services (ES), which can increase acceptance and participation among rural dwellers.

Yet, to date, PES programs have not always had expected impacts, i.e., generated additional flows of ecosystem services. There are multiple reasons for these shortfalls. Payments can be too low to sufficiently shift incentives, e.g., if transfers are below the costs of shifting from prior to desired land uses. Programs often fail to target threats, allowing enrollment of parcels that would have the same land use – and thus same ES – without PES. In pressured settings, monitoring and sanctioning can also be costly, financially and politically, undermining conditionality and thus reducing likely impacts. Here we consider one additional challenge, which is that the introduction of external financial incentives could shift individual motivations.

In particular, we consider what happens when PES programs end, as seems likely for most. Payments implies costs for the purchasers of services that they would, naturally, prefer to limit by paying only temporarily. Purchasers may hope that an incentivized ‘green’ practice will become the preferred behavior for providers over time and that payments are then no longer needed (e.g., as silvopastoral practices that are found to be locally profitable). In stark contrast to such hopes, scholars and practitioners have suggested that PES programs, as other external interventions based on incentives, might cause individual preferences to shift against those who intervened. In short, if providers already were regularly carrying out some ‘green’ practices, being paid might ‘crowd out’ their reasons for doing so and subsequently will hinder the expected change in targeted behavior (Deci, Koestner and Ryan, 1999).

Such ‘crowding out’ of motivations and behaviors surely can happen. A large literature in psychology (Deci et al., 1999, Ryan and Deci, 1985; 2000), behavioral economics (Frey, 1994; Kahneman, Knetsch, and Thaler, 1986; Bowles and Polania-Reyes, 2012; Gneezy and Rustichini, 2000;) and public policy (Le Grand, 2003; Titmuss, 1970; Moller, Buscemi, McFadden, Hedeker

and Spring, 2013) has suggested for over 30 years that extrinsic incentives can, in fact, displace intrinsic motivations (*motivational crowding*) and pro-social and pro-environmental behaviors (*behavioral crowding*). Early literature focused on the negative effects of external incentives on motivations and behaviors in different contexts (Bowles, 2008; Rode, Gómez-Baggethun, and Krause, 2015). Bowles (2008) and Bowles and Polania-Reyes (2012), discussed the violation of the separability assumption, where the effects of incentives and “moral sentiments” are interactive rather than additive. This implies that the joint effect of moral and economic motivation is not simply the sum of their separate effects (Bowles, 2008, p.1606). In fact, experimental evidence in various domains has shown that in most cases incentives undermine ethical motives, and in few cases, explicit incentives might reinforce and enhance ethical motives (See review in Bowles and Polania-Reyes, 2012).

In the particular context of incentives for conservation, recent studies are beginning to provide a nuanced perspective on this interaction (see Akers and Yasué, 2019 for a review) and are instead focusing on what Engel (2016) named the “devil in the details”: the discursive, institutional, design and implementation conditions affecting PES outcomes both in terms of behavioral and motivational change. For instance, PES schemes that facilitate interpersonal communication and reinforce pre-existent levels of trust (Andersson et al., 2018), provide non-monetary or collective benefits (Agrawal, Chhatre and Gerber, 2015; Kaczan, Pfaff, Rodriguez and Shapiro-garza, 2017; Moros, Vélez and Corbera, 2019), reinforce feelings of autonomy or of social relatedness (Grillos, Bottazzi, Crespo, Asquith and Jones, 2019), or promote asset-building activities to restore transformed ecosystems (Calle, 2020; Pagiola, Honey-Rosés and Freire-González, 2016; 2020) all have the potential to go in the opposite direction, i.e., to ‘crowd in’ pro-social including pro-environmental behaviors even after payments end (see Annex 1 for additional summary of the literature).

Persistence is related to behavioral and motivational crowding. If crowding-out occurs, persistence of pro-environmental behaviors once payments end will be less likely. The opposite is expected if crowding-in happens (Dayer, Lutter, Sesser, Hickey and Gardali, 2018). Now, ending or interruptions of payments can happen in different manners and for different reasons. For instance, changes in eligibility criteria in a PES scheme in Colombia due to the involvement of a new stakeholder resulted in the removal from future PES of over 130 former participants (Moros, 2019). Armed conflict has also affected implementation of PES program in Colombia,

causing interruption in payments. In Ecuador, the SocioBosque PES program paused for two years due to financial limitations (Etchart, Freire, Holland, Jones and Naughton-Treves, 2020). In Uganda, a program was planned for two years, after which payments ended (Jayachandran, De Laat, Audy, Pagiola and Sedano Santamaria, 2017). In México, hundreds of early participants have not had contracts renewed, due to budgetary constraints or due to preferences given program rules (Izquierdo-Tort, 2020).

In this context of seemingly frequent program interruptions and program endings a natural follow-up question is: *what happens if payments end? and does it matter if only some recipients are removed?* To address them, we implemented a decision experiment in the field in Colombia, which recently launched a new PES National Regulation (Ministerio de Ambiente 2017 Law 870) and is contemplating a significant expansion of PES programs nationwide with enrollment of at least 1,000,000 hectares in new PES by 2030 (DNP, 2017). Even at this ambitious scale, the initiative surely will include targeting of some and exclusion of others. Further, surely it will eventually include some *removal* of payments, since these PES programs are likely to end at some point. We focus on both total removal and partial or targeted removal in which some recipients are removed but others are not. Our research informs policy design by exploring the behavioral consequences of removing participants from a PES program. We do so for individual and for collective payments as well as for different rules for selecting who is removed when removal is partial.

We report here on the behavioral impacts of our PES removal strategies. Our study captures some details of as well as challenges for an ongoing conservation scheme in Colombia called “miPáramo!” launched in the Norte de Santander region, in 2018. That program promotes the conservation of forests in the *páramo* of Santurbán, a key ecosystem for water provision and regulation in northeast Colombia and a disputed territory due to gold-mining potential. Currently, the program is discussing the introduction of monetary incentives for conservation. They fear payments might negatively affect intrinsic motivations.

We find no behavioral ‘crowding out’ when payments are started then ended. Even a simple comparison over time between pre-PES and post-PES behavior if anything finds, for all but one treatment, behavioral ‘crowding in’, with post-PES contributions higher than pre-PES or at worst no statistically significant difference. For all treatments, this finding is stronger in regressions comparing to a control without PES. Relative to recent literature on the end of

payments for conservation (e.g. Kaczan, Swallow and Adamowicz, 2019, Salk, Lopez and Wong, 2017), we add clear experimental evidence against behavioral ‘crowding out’.

Below, the rest of the paper is as follows. Section 2 describes the setting in which we carried out our lab-in-the-field experiment. Section 3 describes our methods, including the game that we created for this purpose. Section 4 provides descriptive statistics and Section 5 results. Finally, Section 6 offers some discussion, including consideration of implications for policies.

Figure 1. Municipalities with miPáramo in Norte de Santander (Google Earth Platform 2020 map).

2. Setting

Research was conducted in the municipalities of Pamplona, Cúcuta, Cucutilla and Mutiscua, within the department of Norte de Santander, northeast Colombia. These municipalities are part of the buffer area that delimit the *páramo* or Andean highland wetland of Santurbán. That is an important ecosystem with several agricultural production systems, small-scale mining, as well as conservation practices. It supplies water to many cities (Duarte-Abadía and Boelens, 2016). Generally, this region has seen multiple environmental conflicts due to the

establishment of large-scale mining operations and agricultural practices within ecologically sensitive areas, such as the *páramo* (Duarte-Abadía and Boelens, 2016).

To contribute to the protection of this ecosystem, the *miPáramo!* program emerged as a joint public-private initiative to promote the deployment of economic resources towards conservation of forests in the *páramo* (Figure 1). It aims to support sustainable productive practices. The program was launched in 2018 with the support of the *Alianza BioCuenca*, which links public and private institutions for conservation. To date *miPáramo!* has 1,072 active participants in 9 municipalities of Norte de Santander and Santander. Our participants are active or potential participants of the *miPáramo!* program.

3. Methods

To examine the effects of PES removal, we used a framed field economic experiment based on Moros et al. (2019) to capture the core tension between conservation and agricultural expansion (Kaczan et al., 2017; Midler, Pascual, Drucker, Narloch and Soto, 2015; Narloch, Pascual and Drucker, 2012). We piloted it in October 2019 with 40 students at Universidad de Los Andes, in Bogotá, and 40 rural farmers in Norte de Santander. We do not use these pilot data for analysis. Pilots were used to train research assistants and adjust protocols.

Data for analyses was collected during October and November 2019 in four municipalities (Table 1). We invited farmers who participated in *miPáramo* initiative plus other potential beneficiaries to participate in our economic experiment and a post-experiment survey. A member of each municipality phoned local farmers. During each call, a farmer was invited to engage in the experimental session at a specific date, time and place in the municipality. The number of sessions per municipality depended on the number of potential participants. Participants were randomly allocated over sessions in a municipality.

Table 1. Experimental observations.

<i>Municipality</i>	<i># of participants</i>
Pamplona	52
Cácota	60
Mutiscua	128
Cucutilla	68
TOTAL	308

After the experiments, we asked each participant to answer the post-experimental survey, which included socio-demographic questions concerning the farmer, productivity questions about their farms, questions about their environmental motivations to preserve forests, and questions about their emotions during the economic experiment (see the full protocol in Annex 2). In the present study, we focus on the behavioral and socio-demographic data.

3.1 Sessions

Fifteen experimental sessions were conducted, in Spanish, with the support of six research assistants. The sessions were conducted in the municipality's local library or community hall and lasted about 3 hours. Sessions had a minimum of 16 participants and a maximum of 24.

At the beginning of each session, an informed-consent document was provided to all and read out loud to explain the activity and ask if each farmer would like to participate. For those who opted to participate, a research assistant read the instructions out loud (same person in all sessions). A practice round was done before forming experimental groups at random. Before the games, we asked participants about the number of water sources on their lands. This information was used to implement the removal rule for some treatments.

3.2 Forest-Conservation Game

Each participant was randomly assigned to a group of four. In each round (t), each person (i) received 4 units of land and decided whether to conserve the forest (f) or plant crops (c). For every unit of land that she assigned to forest (X_f), each participant received \$200 pesos. For every unit of land that she assigned to crops (X_c), each participant received \$600 pesos. In addition, for every unit of forest that was conserved by other members of one's group, each participant receives \$200 pesos. That is, each participant benefits from every forest unit in her group, i.e., her own as well as others' contributions and with the same returns. The private return from own forest, though, is much lower than that for crops, as currently the case in the Norte de Santander region and other regions with high risk of deforestation.

This game can be expressed by the equation below, where $\sum_k X_{fk}$ the sum of units in forest contributed by the other members (k) of one's group and the m captures the non-monetary benefits from conservation, including social preferences and environmental motivations. Manipulating this – from 1a to 1d – emphasizes costs and benefits of choosing own forest:

$$\pi_{it} = \$600x_{cit} + \$200x_{fit} + (\$200 \sum_{k=1}^3 k X_{fk}) + m(X_{fit})$$

[1a]

$$\pi_{it} = \$600(4 - x_{fit}) + \$200x_{fit} + (\$200 \sum_{k=1}^3 k X_{fk}) + m(X_{fit})$$

[1b]

$$\pi_{it} = \$2,400 - \$600x_{fit} + \$200x_{fit} + (\$200 \sum_{k=1}^3 k X_{fk}) + m(X_{fit})$$

[1c]

$$\pi_{it} = \$2,400 - \$400x_{fit} + (\$200 \sum_{k=1}^3 k X_{fk}) + m(X_{fit})$$

[1d]

The participants were randomly assigned to control group (CG) and treatment groups (TG). In CG, a participant played the game for 12 rounds, deciding in each round how many units of land to allocated to forest, in light of the payoffs ([1a-d] above and see table in Annex 3). For example if one participant decides to allocate 3 units of land to crops and 1 to forests, while the other members of her community conserved 7 units of forest in total, her earnings would be $\$600(3) + \$200(1 + 7) = \$3,400$. Rewriting that to focus on the disincentive to choosing forest, even though it helps others, $\$2400 - \$400(1) + \$200(7) = \$3,400$. In principle the m term in [1a-d] could push one towards forest, including for helping others.

3.3 Treatments: payments & removals

Our treatments (TG) involve three sequenced stages of four rounds each: (1) a baseline with no PES; (2) the introduction of PES for all; and (3) a partial or a total removal of payments. In the second stage, we vary whether the payment is based on individual forest or, instead, a function of group conservation. Either way, in the third stage, groups face one of three types of PES removal: total removal (TR), i.e., all groups in a session were removed from PES; or partial removal (PR), i.e., the majority of the groups in a session were removed from PES, for which who was removed was selected randomly (PRR) or based on the number of water sources (PRW). Participants were informed about removal before starting round 9. For the latter selection, groups that had fewer water sources on average across members were removed. Table 2 below presents all of the treatments and observations by treatment.

All payments introduced in second stage were framed as if an environmental organization (EO) was interested in paying for conservation of forests in the community. The private individual payment was an additional \$450 to participant (i) for each unit of forest (Annex 4 shows the payoff table). The expressions below summarize the new individual earnings:

$$\pi_{it} = \$2.400 - \$600x_{fit} + (\$200 + \$450)x_{fit} + (\$200 \sum_{k=1}^3 k X_{fk}) + m(X_{fi})$$

[2c]

$$\pi_{it} = \$2.400 + \$50x_{fit} + (\$200 \sum_{k=1}^3 k X_{fk}) + m(X_{fi})$$

[2d]

In the collective payment, participants were paid based on the group's forest conservation. The EO offers an additional payment of \$1,800 to each participant if her group managed to conserve 16 units of forest. This is not easy for a group, far harder than many thresholds in such games, since it could only be achieved if each member of the community allocated all 4 units of land to forest, i.e., none to crops (Annex 5 lays out the entire payoff table for this collective variation). The expression below summarizes the implied individual earnings – including the payment based on group performance on conservation:

$$\pi_{it} = \$2.400 - \$400x_{fit} + (\$200 \sum_{k=1}^3 k X_{fk}) + m(X_{fi}) + \{\$1.800 \text{ if } \sum X_f = 16\}$$

[3d]

Table 2. Summary of treatments, stages and observations

	Treatment	Definition	Stage 1 (rounds 1-4)	Stage 2 (rounds 5-8)	Stage 3 (rounds 9-12)	n
	NO PES	Control Group (CG)	BL for all	BL for all	BL for all	44
IND - PR	IND-PRR	Individual Payment with Partial Removal, removing Randomly some groups	BL for all	Individual PES for all	Individual PES for only some groups in the session (denoted as NE)	40

	IND-PRW	Individual Payment with Partial Removal, removing some groups based on the number of water sources in their group	BL for all	Individual PES for all	Individual PES for only some groups in the session (denoted as NE)	40
IND-TR		Individual Payment with Total Removal	BL for all	Individual PES for all	NO PES for all	40
COL-PR	COL-PRR	Collective Payment with Partial Removal, removing Randomly some groups	BL for all	Collective PES for all	Collective PES for only some groups in the session (denoted as NE)	44
	COL-PRW	Collective Payment with Partial Removal, removing some groups based on the number of water sources in their group	BL for all	Collective PES for all	Collective PES for only some groups in the session (denoted as NE)	60
COL-TR		Collective Payment with Total Removal	BL for all	Collective PES for all	NO PES for all	40

4. Descriptive Statistics

4.1 Checking Randomization

Table 3 offers descriptive statistics by treatment, pooling removal rules (water vs. random) as we did not find robust differences between the two (see Table 5 with tests) and denoting removed with “R” versus non-removed with “NR”. Average age was about 50 years, except for collective total removal (~40). Gender shares varied. For education, the control (No PES) displayed least education and collective total removal the most. For income, the individual partial removal NR participants had highest income (\$2,245,000 COP) while individual total removal

participants were lowest (\$514,000 COP). The control (No PES) had the highest percentage of people who had cleared forest before (47%), while the individual partial removal NR had the lowest (17%). Finally, the individual total removal had highest average percent who had received prior conservation payments in real life (30%), while the individual partial removal non-removed (NR) participants reported the lowest such average value (17%).

Table 3. Descriptive Statistics of control variables and t-tests between CG's and TG's.

Treatment	Obs.	Age (Years)	Gender (1=female)	Education (years)	Income (K pesos)	Have Cut? (1=yes)	Been Paid? (1=yes)
COL-PR_R	68	50.18***	0.309	6.368***	764.9***	0.235***	0.176
COL-PR_NR	36	53.56	0.333	6.500***	683.3***	0.194***	0.194
COL-TR	40	39.15***	0.525***	8.600***	603.5***	0.125***	0.125***
IND-PR_R	56	52.21	0.554***	6.554***	740.2***	0.339***	0.179
IND-PR_NR	24	51.50	0.500***	7.958***	2,145***	0.167***	0.167
IND-TR	40	51.95	0.400**	6.050**	514.3	0.450	0.300***
NO PES	44	53.05	0.318	5.409	485.2	0.477	0.205

*** p<0.01, ** p<0.05 Indicating differences against NO PES group.

Overall, there are some statistically significant differences in Table 3. Notably, the collective total removal and individual partial removal NE treatments display differences with No PES. We control for these differences in the regression analysis presented below.

4.2 With & Without Payments

Figure 2 shows the average units of land allocated to forest by round, for each group, again pooling the two removal rules (water vs. random) but separating whether participants were removed (R) or not (NR). It includes the control group without PES. Recall, in Round 5 the individual or collective payment was introduced, and then in Round 8 all the PES were partially or totally removed.

Figure 2 shows that, as expected, the introduction of PES in stage 2 raises contributions (see statistical tests of these differences in Table 4 below). Not surprisingly, given the very challenging setup of full contributions by all to achieve collective compliance, collective performances appear to be more variable (and see analog in Moros et al., 2019). Generally, very much in keeping with the literature, we see a downward trend in contributions in the NoPES control, and somewhat of a downward trend in contributions in stage 2 for all treatments.

Figure 2. Individual Average Forest by Group – All treatments

Payments continue to be effective for those not removed in stage 3. In fact, in round 9 we observe significantly increased conservation compared to round 8 for COL-PR_NR (from 2.75 to 3.55 $p=0.005$) but this is not the case for IND-PR_NR (from 2.875 to 2.95 $p=0.80$). In neither case is conservation behavior in round 9 significantly different from round 5, but for the case of collective payments that had a downward drift in Stage 2, the stage 3 re-start effectively leaves stage 3 looking like stage 2, which can also be said of individual payments. Clearly in contrast, for those removed from payments it appears contributions drift down.

Table 4. T-tests comparing differences between Stage 1 and Stage 2 within each TG.

Treatment	Obs.	Mean Stage 2	Mean Stage 1	diff.	St.Err.	t-value	p-value
COL-PR_R	272	2.919	1.698	1.22***	0.109	11.25	0
COL-PR_NR	144	3.028	1.722	1.306***	0.146	8.95	0
COL-TR	160	2.756	1.756	1***	0.152	6.6	0
IND-PR_R	224	2.688	1.554	1.134***	0.105	10.85	0
IND-PR_NR	96	2.948	1.646	1.302***	.176	7.4	0
IND-TR	160	2.857	1.813	1.044***	0.123	8.45	0
NO PES	176	1.71	2.006	-0.295**	0.132	-2.25	.025

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

5. Results

5.1 Comparing Removal Rules

In the third stage of the game, participants could face a partial removal (PR) where the majority of groups in the session were removed either randomly (PRR) or based on the number of water sources held by the members of their community (PRW). We conducted a t-test and did not find robust statistically significant differences when comparing forest allocated in stage 1 and stage 3 for different removal rules (water vs. random), as reported in Table 5 (see Annex 6 for a detailed figure of all treatments, including water vs. random). Only the removed individuals in the partial removal with collective payments report some differences at 10%. Further, in a regression framework, this is not significant (see Annex 7). Therefore, in the following analysis we present the results pooling the partial-removal rules.

Table 5. Differences in differences comparing Stage3 and Stage 1 for partial removal treatments

Treatment	RANDOM WATER		RANDOM		WATER		RANDOM WATER		Diff. A vs. B	St.Err.	t-value	p-value
	Obs.	Obs.	Mean Stage 3	Mean Stage 1	Mean Stage 3	Mean Stage 1	Diff. A Stage3 vs. Stage1	Diff. B Stage3 vs. Stage1				
COL-PR_R	28	40	1.661	1.848	1.794	1.594	-0.188	0.2	-0.388	0.202	-1.9	*0.059
COL-PR_NR	16	20	3.078	1.672	3.288	1.763	1.407	1.525	-0.119	0.316	-0.4	0.71
IND-PR_R	28	28	2	1.688	1.705	1.42	0.313	0.286	0.027	0.229	0.1	0.907
IND-PR_NR	12	12	2.729	1.521	2.833	1.771	1.209	1.063	0.146	0.474	0.3	0.761

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

5.2. Removal Results

We effectively have two measures of behavioral ‘crowding out’: within-subject comparison of stages 1 and 3 for treated groups, a purely temporal difference (tests in Table 6 below); and for difference-in-differences, a between-subject comparison of the very same temporal differences. We compare the trends for the treated to those for controls. That comparison matters because, as seen in Figure 2 above, contributions fall over time within the control.

For the treated participants, Figure 2 shows a fall in units of forest for removed participants in stage 3 (dotted lines), when comparing with stage 3. However, that is not at all surprising: to first order, if payments induce contributions (stage 2 vs. stage 1), then we might expect that the removal of those incentives could be expected to lower contributions once again. Without a dynamic argument, such as about ‘crowding’, stage 3 could well equal stage 1.

Moving to that post-PES-versus-pre-PES comparison, in general, we did not find evidence of ‘crowding out’, either when comparing to control group or without comparing to control group. We can see this in Figure 2, in fact: all of the treatments except one stay flat or even rise over time (Stage 3 versus Stage 1); and for the one treatment that falls over time, it fell less than the drop over time for No PES controls. Thus, we do not see ‘crowding out’ and, if anything, we appear to observe ‘crowding in’.

Table 6. T-tests comparing Stage 1 and Stage 3 for removed total removal and NO PES.

Treatment	Obs.	Mean Stage 3	Mean Stage 1	diff.	St.Err.	t-value	P-value
COL-PR_R	272	1.739	1.698	0.041	0.103	0.4	0.696
COL-TR	160	1.425	1.757	-0.331**	0.137	-2.45	0.016
IND-PR_R	224	1.853	1.554	0.299***	0.114	2.65	0.009
IND-TR	160	1.763	1.813	-0.05	0.139	-0.35	0.718
ALL (4)	816	1.713	1.693	0.021	0.06	0.35	0.73
NO PES	176	1.546	2.006	-0.46***	0.128	-3.6	0.001

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

To further examine these suggestive differences, we do an individual-level panel regression. With 308 participants and 12 rounds, we have 3,388 observations in total. In Table 7, we use land in forest as the dependent variable and do a random-effects-by-individual Tobit. Column (1) has no controls, column (2) adds socio-demographic controls, then column (3) adds as a control ‘group forest in the previous round’ to take game dynamics into account.

We compare the changes over time for the treated participants, after versus before treatments, with the changes over time for controls that never received treatment (NoPES). We use dummies for both treatments (separating removed from non-removed) and stages, then to see if stage effects differ by treatment, we interact the treatment and stage dummies.

Overall, there are no significant differences in stage 1 compared to No PES once we control for socio economic characteristics, except for IND-PR_R. Also, all treatments increased conservation behavior in stage 2, and there is no difference across treatment according to our post-estimation tests.

The interactions of Stage 3 and treatments are of specific interest. Looking at COL-PR_R-ST3 and IND-PR_R-ST3 coefficients in Table 7, model 3, for collective and individual removal, respectively, we find no support for behavioral crowding-out. Both coefficients are positive and statistically significant at 5% and 1% respectively, suggesting in fact behavioral crowding-in among removed participants when compared to control group. For the case of total removal, IND-TR-ST3 is positive and significant at 10% and there is no effect of COL-TR-ST3 clearly suggesting for both types of payments no crowding-out. Thus, the regressions confirm the simpler table and figure above.

Regarding differences among payment types, post estimation tests show that the crowd in effect for those removed is greater for individual payment than collective payment ($p < 0.01$), but there is not significant difference between collective and individual payment when total removal. Also, regarding those non-removed more conservation behavior is observed in the collective payment compared to the individual payment ($p < 0.05$). The collective payment we implemented had a very stringent threshold that required high levels of coordination among group members (threshold=16 units of forest). Further investigation should explore the role of less stringent collective thresholds where collective action is easier to achieve and thus might increase conservation levels during the payment and even after removal (i.e threshold=12).

6. Discussion

This paper set out to explore the partial or total removal of payments for ecosystem services and its effect on conservation behaviors, using a lab-in-the-field experiment in rural Norte de Santander, Colombia. We find no evidence of behavioral ‘crowding out’ when incentives are removed for some or all. In fact, our results suggest some form of ‘crowding in’.

These results lean against warnings about the reduction of intrinsic motivations and thus a decrease in pro-environmental behaviors once an incentive is introduced and then removed (Ezzine-de-Blas, Corbera and Lapeyre, 2019; Rode et al. 2015; Cárdenas, 2000). Some have mentioned a “no pay, no care” perception among some former participants once a PES program ends (Fisher, 2012). Yet our results fit better with recent evidence of ‘crowding in’ (see Akers and Yasué, 2019 for a review). We find this despite a potential for fairness reactions to partial removal.

Overall, our results show that removed participants do not preserve less units of forest compared to control groups when PES is removed. In other words, our study finds no evidence of behavioral crowding-out when an incentive is removed for some (partial removal) or for all (total removal). One possible explanation of our findings is a “recognition or gratitude effect” (Bowles, 2008). In fact, in previous qualitative studies we have found that in contexts of weak state presence PES participants frequently perceive payments positively, even when removed, because payments somehow functioned as a long-awaited recognition by the state (Moros, 2019). They are a good thing while they last. Once payments are removed, former participants continue with their pre-PES conservation levels. In contexts of high deforestation risk (as modeled in our experimental design where the agricultural opportunity cost is high), where there is a tradeoff between conservation and agriculture for marginalized farmers, the “recognition or gratitude effect” may also be playing an important role. Payments, even for a limited period of time, might be perceived as a welcome, just re-distribution of the costs of conservation (Moros, Corbera, Vélez and Flechas, 2020). Further qualitative studies regarding the perceptions of removed PES participants are needed to calibrate this effect.

A second likely and related explanation has to do with emotions prompted by removal. We do believe removal could activate negative emotions such as frustration or perceptions of injustice. However, in our study, this was not the case or at least not strong enough to affect behavior. Preliminary analysis of emotions suggests that there are no differences in positive (e.g. joy), negative (e.g. injustice) or neutral (e.g. surprise) emotions in removed versus non-removed participants or the control groups. We will study it further as links between emotions and behavior certainly requires further research.

A third possible explanation is related to pre-existent and persistent intrinsic motivations. It is worth highlighting that for both control and treatment groups, we observed positive contributions in Stage 1, which requires some intrinsic motivations. Removal of incentives may not have been strong enough to erase these initial motivations. Yet we think that this interaction between incentives, motivations and behaviors is sufficiently interesting that in further research we will focus more closely on changed motivations *per se*.

In contexts of deforestation frontiers where forest cover loss is driven by shifting agriculture (i.e. sub-Saharan Africa) or illicit economies (i.e. Colombia and Perú), intrinsic motivations may well not be sufficient to preserve and sustainably manage key ecosystems.

Farmers face trade-offs between subsistence and conservation. Thus, we suggest further work to explore the roles motivations play on deforestation frontiers (see Rueda, Vélez, Moros and Rodríguez, 2019). In fact, according to the COM-B model, effective behavioral change requires three conditions: capabilities, motivations, and opportunities (Michie, van Stralen and West, 2011). Opportunities, defined as “all the factors that lie outside the individual that make the behavior possible” (Michie et al. 2011: 11), are usually highly constricted in such contexts hampering the preservation and sustainable use of key strategic ecosystems.

One final explanation of our findings is that the incentives themselves, i.e., the willingness of somebody to pay for the forest, signals desirable behaviors, a “frame-shifting effect” of incentives (Bowles, 2008, Ezzine-de-blas et al., 2019). ‘Crowding out’ hypotheses are linked to framing around markets that could signal self-interest as appropriate. However, framing might work in the opposite way: PES are likely to make more salient the interdependence between ecological and socio-economic systems, prompting pro-environmental behaviors (see, for instance, Lliso, Pascual, Engel and Mariel, 2020 as well as Bernal-Escobar, Engel, and Midler, In preparation for some further discussion concerning such framing effects).

It might also be worth distinguishing the different contexts and reasons for PES removal. Some programs are finite by design (e.g., Uganda), which might mean that people who sign up are well aware and more grateful than surprised when payments end as was expected. Other programs end or have discontinuities in payments due to implementation or political challenges (e.g., Ecuador and México). Those reasons could induce quite different reactions. Finally, yet other PES programs may adjust over time as a matter of public policy, e.g., for Cundinamarca in Colombia a shift in political focus and eligibility criteria. Reactions to this again might well differ.

Stepping back, almost all of these considerations suggest that in design and implementation, those promoting PES might want to pay considerable attention to communication with the potential participants. That could include being aware of local perceptions regarding who implements the PES and why. Legitimacy and trust might play a role in the local responses. Local institutions, including community organization, also matters – and, further, might well interact with individual motivations and behaviors. All of these elements require research. Our findings are consistent with the crowding in hypothesis, but devil is in the details.

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Table 7 Testing for crowding-in or out

VARIABLES	Model 1	Model 2	Model 3
Dummy Stage2	-0.396** (0.162)	-0.396** (0.162)	-0.378** (0.181)
Dummy Stage3	-0.630*** (0.162)	-0.630*** (0.162)	-0.561*** (0.182)
COL-PR_R	-0.414* (0.248)	-0.272 (0.245)	-0.224 (0.261)
COL-PR_NR	-0.369 (0.288)	-0.250 (0.284)	-0.194 (0.303)
COL-TR	-0.294 (0.280)	0.060 (0.284)	0.012 (0.302)
IND-PR_R	-0.608** (0.258)	-0.501** (0.255)	-0.493* (0.273)
IND-PR_NR	-0.434 (0.327)	-0.196 (0.328)	-0.171 (0.351)
IND-TR	-0.255 (0.280)	-0.225 (0.273)	-0.219 (0.291)
COL-PR_R_ST2	2.249*** (0.211)	2.246*** (0.211)	2.029*** (0.241)
COL-PR_NR_ST2	2.427*** (0.248)	2.425*** (0.248)	2.191*** (0.281)
COL-TR_ST2	1.931*** (0.238)	1.930*** (0.238)	1.845*** (0.269)
IND-PR_R_ST2	1.958*** (0.216)	1.955*** (0.216)	1.835*** (0.247)
IND-PR_NR_ST2	2.298*** (0.279)	2.302*** (0.279)	2.132*** (0.315)
IND-TR_ST2	1.802*** (0.234)	1.804*** (0.234)	1.629*** (0.265)
COL-PR_R_ST3	0.641*** (0.207)	0.641*** (0.207)	0.525** (0.233)
COL-PR_NR_ST3	3.034*** (0.252)	3.033*** (0.251)	2.702*** (0.290)
COL-TR_ST3	0.154 (0.234)	0.155 (0.234)	0.199 (0.262)
IND-PR_R_ST3	1.039*** (0.215)	1.038*** (0.215)	0.933*** (0.245)
IND-PR_NR_ST3	2.271***	2.274***	1.993***

	(0.278)	(0.278)	(0.318)
IND-TR_ ST3	0.566**	0.566**	0.460*
	(0.233)	(0.233)	(0.262)
Age		0.010**	0.011**
		(0.005)	(0.005)
Gender		-0.063	-0.083
		(0.132)	(0.132)
Education		-0.025	-0.025
		(0.017)	(0.017)
Household Income		-0.000	-0.000
		(0.000)	(0.000)
Cut-down forest before		0.308**	0.321**
		(0.145)	(0.145)
Previous Payment		0.131	0.125
		(0.160)	(0.160)
Group forest previous round			0.057***
			(0.011)
Constant	2.017***	1.480***	1.012***
	(0.194)	(0.369)	(0.387)
Observations	3,696	3,696	3,388
Number of exp_id	308	308	308

Standard errors in parentheses

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

Annexes

Annex 1. Summary relevant literature on Motivational/behavioral crowding

Study	Country	Motivational/ behavioral crowding	Method	Crowd out	Crowd in
1. Vollaard (2008)	South Africa and Namibia	Behavioral	Lab-in-the- field experiment: Common Pool Resources game	No evidence	No evidence
2. Agrawal, Chhatre and Gerber (2015)	India	Motivational	Quasi- experimental Before and after Matching with non- participants	When participants received private economic benefits	When participants received communal assets or collective benefits
3. Narloch et al. (2012); Midler et al. (2015)	Perú and Bolivia	Behavioral	Lab-in-the- field experiment: public goods game with threshold	Collective payments crowd out social norms	Individual payments crowd in social norms
4. Chervier, Le Velly and Ezzine-de- Blas. (2017)	Cambodia	Motivational	Quasi- experimental Matching with non- participants	Participants reported more money related reasons to protect forests and were more likely to rule breaking after payments cease	No evidence
5. Handberg and Angelsen (2017)	Tanzania	Behavioral	Lab-in-the- field experiment:	No evidence	No evidence

			Public goods game		
6. Kaczan, Swallow and Adamowicz (2016)	Tanzania	Behavioral	Lab-in-the-field experiment: Dictator game	No evidence	No evidence
7. Salk, López and Wong (2017)	Lao PDR	Behavioral	Lab-in-the-field experiment: Common pool resources game	No evidence after incentive removal	No evidence after incentive removal
8. Andersson, K. P., Cook, N. J., Grillos, T., Lopez, M. C., Salk, C. F., Wright, G. D., & Mwangi, E. (2018)	Bolivia, Indonesia, Peru, Tanzania and Uganda	Behavioral	Lab-in-the-field experiment: Common pool resources game	No evidence after incentive removal	Users conserved more after incentive removal specially when they were able to communicate
9. Etchart, N., Freire, J. L., Holland, M. B., Jones, K. W., & Naughton-Treves, L. (2020)	Ecuador	Behavioral	Quasi-experimental: Matching combined with fixed effects panel regression analysis	In areas of high deforestation risk	In areas of low deforestation risk
10. Pagiola, S., Honey-Rosés, J., & Freire-González, J. (2016)	Colombia	Behavioral	Household survey to PES participants and control groups before and after	No evidence after incentive removal	In an asset building PES program

11. Pagiola, S., Honey-Rosés, J., & Freire-González, J (2020)	Nicaragua	Behavioral	Household survey to PES participants before and after; detailed land-use maps	No evidence after incentive removal	In an asset building PES program
12. Calle (2020)	Colombia	Behavioral	Satellite images before and after	No evidence after incentive removal	When comparing silvopastoral farms relative to the surrounding landscape
13. Grillos, T., Bottazzi, P., Crespo, D., Asquith, N., & Jones, J. P. (2019)	Bolivia	Motivational	Randomized Control Trial	No evidence after incentive removal	Crowding in of pro-environmental values
14. Moros, L. Corbera, E. Vélez, M. (2019)	Colombia	Behavioral and motivational	Lab-in-the-field experiment: public goods game with threshold	Crowding out of intrinsic motivations when premium price is introduced	Crowding in of social motivations when collective payment is introduced. Crowding in of conservation behaviors with individual and collective payments
15. Jayachandran, S., De Laat, J., Audy, R., Pagiola, S. P., & Sedano Santamaria, F. (2018)	Uganda	Behavioral	Randomized Control Trial	No evidence after incentive removal	Not evidence of crowding-in but slower rate of deforestation among former PES participants

16. Le Velly, G., Sauquet, A. & Cortina-Villar, S. (2017)	Mexico	Behavioral	Satellite images and community surveys	Potential lack of permanence of the PES program	No evidence after incentive removal
17. Maca-Millán, S., Arias-Arévalo, P. & Restrepo-Plaza, L. (2020)	Colombia	Motivational	Lab-in-the-field experiment: Threshold public good game & post-experiment survey	Crowding-out after incentive removal	Potential crowding-in if PES programs integrate plural motivations and values

Annex 2. Survey Protocol and Informed Verbal Consent

Post-motivations Survey

We appreciate your participation in this activity and in this survey. After this survey you will receive your total earnings.

How many properties (plots of land) do you have?

Where do you live? Town_____ Property_____ Other_____

What town do you live in?

How long have you lived there?

What size is the most important property for you in economic terms?*

Do you have forest in any of your properties?

How much forest area does it have?*

Have you or someone in your home cut down forest on any of your properties since you acquired it?

How much have you logged in total? (unit options: block, hectare, other)

I'm going to read you a sentence. I ask you to please tell me if you agree with that sentence using the following scale: 1 is NO, 2 is A LITTLE, 3 is YES, OK, 4 is COMPLETELY AGREED

→I would take care of forests only if I am paid to do so

Do you have cattle?

How many heads?

I'm going to read you a sentence. I ask you to please tell me if you agree with that sentence using the following scale: 1 is NO, 2 is A LITTLE, 3 is YES, OK, 4 is COMPLETELY AGREED

→I would feel guilty if I clear the forests

Do you have crops?

How much area do you have in crops?*

I'm going to read you a sentence. I ask you to please tell me if you agree with that sentence using the following scale: 1 is NO, 2 is A LITTLE, 3 is YES, OK, 4 is COMPLETELY AGREED

→ I enjoy when I take care of forests

From your main property (the most important in economic terms) you:

- a) Have promise or sales papers but there is no title deed
- b) Have possession but have no title deed
- c) Have a title deed but is NOT registered in the registry office
- d) Have a title deed and it is registered in the registry office
- e) Other
- f) Don't know, don't report

I'm going to read you a sentence. I ask you to please tell me if you agree with that sentence using the following scale: 1 is NO, 2 is A LITTLE, 3 is YES, OK, 4 is COMPLETELY AGREED

→ I don't see what I can obtain by conserving the forest

Including yourself, would you tell me how many people live in YOUR household?

What is your highest level of education?

What is the highest level of education attained by a member of your household?

Mark down Female ___ or Male ___ according to biological sex

How old are you?

I'm going to read you a sentence. I ask you to please tell me if you agree with that sentence using the following scale: 1 is NO, 2 is A LITTLE, 3 is YES, OK, 4 is COMPLETELY AGREED

→ I'm the type of person who don't clear the forest

How much is your household income monthly?

I'm going to read you a sentence. I ask you to please tell me if you agree with that sentence using the following scale: 1 is NO, 2 is A LITTLE, 3 is YES, OK, 4 is COMPLETELY AGREED

→ I feel proud for taking care of forests

Are you a member of any organization or productive association?

You would say that the people in YOUR town:

- a) help each other a little
- b) help each other a lot
- c) don't help each other

I'm going to read you a sentence. I ask you to please tell me if you agree with that sentence using the following scale: 1 is NO, 2 is A LITTLE, 3 is YES, OK, 4 is COMPLETELY AGREED

→ I would take care of forests only if I am paid to do so

What's your occupation?

What economic activity generates the highest income for you?

I'm going to read you a sentence. I ask you to please tell me if you agree with that sentence using the following scale: 1 is NO, 2 is A LITTLE, 3 is YES, OK, 4 is COMPLETELY AGREED

→I would regret it if I clear the forests

Do you belong to MiParamo project?

Did you answer the MiParamo characterization survey?

If not, who answered the survey?

In which stage of the MiParamo project is your property?

Have you participated in any conservation incentive program where you have received any payment -in cash or in kind - for activities related to forest conservation or water sources?

What type of payment? Cash_____ In-kind_____ both_____

If cash: how much? how many times?

If in-kind: what have you received? How many times?

I'm going to read you a sentence. I ask you to please tell me if you agree with that sentence using the following scale: 1 is NO, 2 is A LITTLE, 3 is YES, OK, 4 is COMPLETELY AGREED

→I would be criticized by my neighbors if I clear the forests

Now, we are going to ask you some questions about how you felt during the activity. (The set of emotions where randomly read to the participant from top to bottom or bottom-up)

What emotions did the activity generate in you? Answer using a scale between 0 and 4, where 0 means "You did NOT at all experience the emotion" and 4 means "You FULLY experienced that emotion"

- a) Rage
- b) Frustration
- c) Injustice
- d) Surprise
- e) Envy
- f) Joy
- g) Happiness

I'm going to read you a sentence. I ask you to please tell me if you agree with that sentence using the following scale: 1 is NO, 2 is A LITTLE, 3 is YES, OK, 4 is COMPLETELY AGREED

→I do not cut down the forests because of fear to fines that might be imposed by environmental authorities

In the third part of the game payments were suspended for some groups. Did you belong to a group where there was suspension of payments?

***Note: The following questions were asked to participants in sessions where the treatments with removal were allocated.**

In the third part of the activity payments were suspended for some groups or all groups. How fair do you think the suspension of payments from the environmental organization was? Answer using a scale between 1 and 4, where 1 means “Not fair” and 4 means “Completely fair”

What emotions did the removal from the payment generate in you? Answer using a scale between 0 and 4, where 1 means “You did NOT at all experience the emotion” and 4 means “You FULLY experienced that emotion”

- a) Rage
- b) Frustration
- c) Injustice
- d) Surprise
- e) Envy
- f) Joy
- g) Happiness

To what scale did the removal from the payments affect your decisions during the activity? Answer using a scale between 1 and 4, where 1 means “It did not at all affect my decisions” and 4 means “It completely affected my decisions”

Thank you very much for your participation.

*For these questions, the measurement unit of each answer was verified.

Informed Verbal Consent (translation from Spanish).

You have been invited to participate in this exercise as part of a research project related to sustainable productive practices.

The objective of this activity is to understand how people make their decisions. Therefore, we will learn from what you decide. This activity lasts three hours. Your answers will be anonymous which means that when we analyze your answers they will not be associated to your name.

This activity does not imply any risk to you. In fact, this exercise could benefit you with the earnings you obtain. Your earnings depend on the decisions you make and the decisions made by the other members of your group. The earnings of this activity are between \$ 20,000 and \$ 50,000 pesos.

Your decisions as well as your earnings are private. Your participation is absolutely voluntary. You can leave at any time without any justification. However, if you withdraw before finishing the activity, we cannot pay you what you have earned.

We use cash because we want to recreate real-life situations in which the decisions you make have an economic cost for you. The cash you receive today is yours and only the research team will know the exact amount you earned.

I, XXX, professor at XXX, certify this information will be used in a responsible manner for academic and educational purposes. I also certify that each participant will receive the earnings obtained during the activity in cash.

Annex 3. Payoff table baseline

Mi decisión		4 unidades de bosque y 0 en cultivos	3 unidades de bosque y 1 en cultivos	2 unidades de bosque y 2 en cultivos	1 unidades de bosque y 3 en cultivos	0 unidades de bosque y 4 en cultivos
Bosque de los demás	0	\$ 800	\$ 1,200	\$ 1,600	\$ 2,000	\$ 2,400
	1	\$ 1,000	\$ 1,400	\$ 1,800	\$ 2,200	\$ 2,600
	2	\$ 1,200	\$ 1,600	\$ 2,000	\$ 2,400	\$ 2,800
	3	\$ 1,400	\$ 1,800	\$ 2,200	\$ 2,600	\$ 3,000
	4	\$ 1,600	\$ 2,000	\$ 2,400	\$ 2,800	\$ 3,200
	5	\$ 1,800	\$ 2,200	\$ 2,600	\$ 3,000	\$ 3,400
	6	\$ 2,000	\$ 2,400	\$ 2,800	\$ 3,200	\$ 3,600
	7	\$ 2,200	\$ 2,600	\$ 3,000	\$ 3,400	\$ 3,800
	8	\$ 2,400	\$ 2,800	\$ 3,200	\$ 3,600	\$ 4,000
	9	\$ 2,600	\$ 3,000	\$ 3,400	\$ 3,800	\$ 4,200
	10	\$ 2,800	\$ 3,200	\$ 3,600	\$ 4,000	\$ 4,400
	11	\$ 3,000	\$ 3,400	\$ 3,800	\$ 4,200	\$ 4,600
	12	\$ 3,200	\$ 3,600	\$ 4,000	\$ 4,400	\$ 4,800

Annex 4. Payoff table for individual payment

Mi decisión		4 unidades de bosque y 0 en cultivos	3 unidades de bosque y 1 en cultivos	2 unidades de bosque y 2 en cultivos	1 unidades de bosque y 3 en cultivos	0 unidades de bosque y 4 en cultivos
Bosque de los demás	0	\$ 2,600	\$ 2,550	\$ 2,500	\$ 2,450	\$ 2,400
	1	\$ 2,800	\$ 2,750	\$ 2,700	\$ 2,650	\$ 2,600
	2	\$ 3,000	\$ 2,950	\$ 2,900	\$ 2,850	\$ 2,800
	3	\$ 3,200	\$ 3,150	\$ 3,100	\$ 3,050	\$ 3,000
	4	\$ 3,400	\$ 3,350	\$ 3,300	\$ 3,250	\$ 3,200
	5	\$ 3,600	\$ 3,550	\$ 3,500	\$ 3,450	\$ 3,400
	6	\$ 3,800	\$ 3,750	\$ 3,700	\$ 3,650	\$ 3,600
	7	\$ 4,000	\$ 3,950	\$ 3,900	\$ 3,850	\$ 3,800
	8	\$ 4,200	\$ 4,150	\$ 4,100	\$ 4,050	\$ 4,000
	9	\$ 4,400	\$ 4,350	\$ 4,300	\$ 4,250	\$ 4,200
	10	\$ 4,600	\$ 4,550	\$ 4,500	\$ 4,450	\$ 4,400
	11	\$ 4,800	\$ 4,750	\$ 4,700	\$ 4,650	\$ 4,600
	12	\$ 5,000	\$ 4,950	\$ 4,900	\$ 4,850	\$ 4,800

Annex 5. Payoff table for collective payment (\$1,800)

Mi decisión		4 unidades de bosque y 0 en cultivos	3 unidades de bosque y 1 en cultivos	2 unidades de bosque y 2 en cultivos	1 unidades de bosque y 3 en cultivos	0 unidades de bosque y 4 en cultivos
Bosque de los demás	0	\$ 800	\$ 1,200	\$ 1,600	\$ 2,000	\$ 2,400
	1	\$ 1,000	\$ 1,400	\$ 1,800	\$ 2,200	\$ 2,600
	2	\$ 1,200	\$ 1,600	\$ 2,000	\$ 2,400	\$ 2,800
	3	\$ 1,400	\$ 1,800	\$ 2,200	\$ 2,600	\$ 3,000
	4	\$ 1,600	\$ 2,000	\$ 2,400	\$ 2,800	\$ 3,200
	5	\$ 1,800	\$ 2,200	\$ 2,600	\$ 3,000	\$ 3,400
	6	\$ 2,000	\$ 2,400	\$ 2,800	\$ 3,200	\$ 3,600
	7	\$ 2,200	\$ 2,600	\$ 3,000	\$ 3,400	\$ 3,800
	8	\$ 2,400	\$ 2,800	\$ 3,200	\$ 3,600	\$ 4,000
	9	\$ 2,600	\$ 3,000	\$ 3,400	\$ 3,800	\$ 4,200
	10	\$ 2,800	\$ 3,200	\$ 3,600	\$ 4,000	\$ 4,400
	11	\$ 3,000	\$ 3,400	\$ 3,800	\$ 4,200	\$ 4,600
	12	\$ 5,000	\$ 3,600	\$ 4,000	\$ 4,400	\$ 4,800

Annex 6. Individual Average Forest by Group – All treatments differentiating between COL &, IND, WATER & RANDOM and REMOVED & NON REMOVED

Annex 7. Regression including all treatments (PR and TR) and interactions with the dummy_wr (1= water; 0= else) only for removed treatments in all stages.

VARIABLES	Model 1	Model 2	Model 3
Dummy Stage2	-0.395** (0.162)	-0.395** (0.162)	-0.381** (0.181)
Dummy Stage3	-0.629*** (0.162)	-0.630*** (0.162)	-0.568*** (0.182)
COL-PR_R	-0.215 (0.309)	-0.138 (0.303)	-0.126 (0.323)
COL-PR_R_WR	-0.330 (0.314)	-0.218 (0.307)	-0.165 (0.328)
COL-PR_NR	-0.368 (0.286)	-0.250 (0.282)	-0.199 (0.302)
COL-TR	-0.294 (0.279)	0.072 (0.282)	0.021 (0.300)

IND-PR_R	-0.446 (0.308)	-0.308 (0.303)	-0.323 (0.325)
IND-PR_R_WR	-0.321 (0.340)	-0.374 (0.330)	-0.343 (0.354)
IND-PR_NR	-0.434 (0.326)	-0.188 (0.326)	-0.167 (0.349)
IND-TR	-0.254 (0.278)	-0.224 (0.271)	-0.222 (0.290)
COL-PR_R_ST2	1.589*** (0.262)	1.586*** (0.262)	1.437*** (0.294)
COL-PR_R_ST2_WR	1.136*** (0.272)	1.137*** (0.271)	1.056*** (0.303)
COL-PR_NR _ ST2	2.423*** (0.247)	2.421*** (0.247)	2.208*** (0.281)
COL-TR _ ST2	1.929*** (0.237)	1.927*** (0.237)	1.858*** (0.268)
IND-PR_R _ ST2	2.187*** (0.261)	2.184*** (0.261)	2.064*** (0.297)
IND-PR_R _ ST2_WR	-0.442 (0.286)	-0.440 (0.286)	-0.407 (0.320)
IND-PR_NR _ ST2	2.295*** (0.278)	2.299*** (0.278)	2.147*** (0.314)
IND-TR _ ST2	1.800*** (0.233)	1.802*** (0.233)	1.644*** (0.265)
COL-PR_R _ ST3	0.339 (0.260)	0.339 (0.259)	0.282 (0.290)
COL-PR_R _ ST3_WR	0.505* (0.263)	0.505* (0.262)	0.423 (0.293)
COL-PR_NR _ ST3	3.030*** (0.251)	3.028*** (0.251)	2.727*** (0.290)
COL-TR_ST3	0.154 (0.233)	0.154 (0.233)	0.203 (0.261)
IND-PR_R _ ST3	1.053*** (0.258)	1.053*** (0.258)	0.962*** (0.292)
IND-PR_R _ ST3_WR	-0.032 (0.283)	-0.032 (0.283)	-0.030 (0.317)
IND-PR_NR _ ST3	2.269*** (0.277)	2.271*** (0.277)	2.015*** (0.317)
IND-TR _ ST3	0.565** (0.232)	0.565** (0.232)	0.471* (0.261)
Age		0.011**	0.011**

		(0.005)	(0.005)
Gender		-0.085	-0.104
		(0.131)	(0.132)
Education		-0.024	-0.024
		(0.017)	(0.017)
Household Income		-0.000	-0.000
		(0.000)	(0.000)
Cut-down forest before		0.308**	0.319**
		(0.143)	(0.144)
Previous Payment		0.143	0.141
		(0.159)	(0.160)
Group forest previous round			0.053***
			(0.011)
Constant	2.017***	1.447***	1.012***
	(0.193)	(0.367)	(0.386)
Observations	3,696	3,696	3,388
Number of exp_id	308	308	308

Standard errors in parentheses

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