

Generating New PES Institutions and Increased Impacts in Mexico: **a framed field experiment on coordination & sanctions in Matching Fund sites**

Alexander Pfaff , Luz A. Rodriguez* and Elizabeth Shapiro*

Abstract**

While states pay landowners in the big payment-for-ecosystem-services (PES) programs, PES can be locally organized. Downstream actors, e.g., may offer incentives to upstream. Even – or especially? – with local organization, though, there may be negative reactions to the increased monitoring and sanctioning of behavior required to increase PES impact. Mexico's forest agency (CONAFOR) has had limited average impacts per PES contract in its direct state payments but also, since 2008, a novel policy to help create new local PES. The *Fondos Concurrentes* (Matching Funds) program solicits applications – initiated by varied partners – that must include agreement between upstream and downstream groups. We consider the creation of local PES programs, involving coordination by those groups to establish a new institution, and effects of permitting sanctions on upstream behaviors. We use PES framing (services go downstream, payment up) of the contributions in a new assurance game that, in real time, links the groups – each of which confronts free riding. After our field pilot, we recruited 240 downstream and 240 upstream *Fondos* participants from Xalapa (Veracruz State), Merida (Yucatan State) or Cancun (Quintana Roo State). Initial trust-game behaviors align with participant perceptions and predict baseline giving in assurance (which is significant, despite a zero equilibrium, perhaps due to our sample). For upstream providers, i.e., those who get sanctioned, the threat and the use of sanctions increase contributions. Any 'motivation crowding' is not dominant during these sanctions. Downstream users contribute less when offered the option to sanction – as if that option signals an uncooperative upstream – then contributions rise in line with complementarity.

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* co-lead authors

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1. Introduction

Payments for ecosystem services (PES) give incentives to actors to alter their behaviors in ways that increase ecoservices. PES are voluntary transactions between services providers and users, transfers from the users to the providers conditioned on measures of ecoservices themselves, or actions thought to provide them. Being voluntary, they should arise only if all involved benefit.

The organization of such institutions certainly could be purely local, perhaps seen as ‘Coasian’: if it is clear to all that upstream landowners have a right to put cows anywhere on their land, e.g., but that affects water quality, downstream may offer payments to keep cows away from streams. If the water quality benefits are greater than the costs of the restrictions, a price might be agreed.

Coase (1960) allows that this is less likely if the transactions costs of such negotiations are high. Finding the relevant upstream actors has real costs for downstream, as does building a sufficient joint understanding to define a coherent contract, not to mention monitoring any such agreement. Thus, heading upstream to create a new agreement is a venture involving significant uncertainty concerning downstream outcomes. Should upstream not wish to contract, one's effort will be lost.

Additional challenges to organization are present due to the public good character of ecoservices: downstream actors gain from impacts of colleagues' contributions, and may themselves slack off; and upstream efforts are substitutable, within any aggregate measure, by the efforts of neighbors. The resulting incentives to free ride could motivate efforts to monitor and motivate behaviors but less-than-transparent links to ecoservices from actions, or ecosystem states (Porras et al. 2008), can add to the costs of connecting behaviors to actual ecoservices changes (Brauman et al. 2007). Faced with all this, local actors may well be daunted. States may want to act in their capacities.¹

To date, in fact, most such ecopayments have been made by government. Within the largest PES programs – for instance in China, Costa Rica and Mexico – states pay the landowners directly. That reinterprets ‘voluntary’ but the principles remain: agencies should pay upstream actors if downstream users gain more in service than is paid; and provider cost should be below the price. Government may naturally step in as ‘the user’ when services beneficiaries are many and diffuse, when they have technical capacity to measure, and when they already interact with the upstream.

Nonetheless, there may be good reasons to increase the share of PES implemented purely locally. Lowering federal expenditures can lower taxes, regional subsidies, and volatility of PES budgets. Local organization can improve monitoring of rural areas where federal presence may be limited and can improve the understanding of local gains and losses involved in any changes in behavior, potentially improving the upstream ‘buy in’ for undertaking costly actions to help downstream. Consistent with such motivations, and alongside its program of state payments started in 2003², Mexico's forest agency (CONAFOR) in 2008 started a program to facilitate local mechanisms.

¹ In China, that may include compelling (even if compensating) actions but here we focus upon voluntary situations.

² Multiple studies of this national program provide useful insights into its origins, functions, outcomes, and impacts (see, for instance, Munoz-Pina et al. 2008, Corbera et al. 2010, Shapiro 2010, Alix-Garcia et al. 2015 among others).

This *Fondos Concurrentes* or Matching Funds program solicited applications for new local PES by offering to cover half the costs of linking upstream service providers with users downstream. Any application has to include a suite of required elements, the most fundamental among them being of course some integration of upstream and downstream actors within which at a minimum the downstream agrees to pay the upstream, conditional upon an agreed suite of relevant actions. Integration or linking of upstream with down often is initiated and sustained by intermediaries, whose motivations range widely from rural welfare upstream to species' existence value globally. This paper models challenges involved in creating new PES institutions in which groups interact, as do individuals in each group, and asks if their function improves with sanctions on upstream.

Why sanctions? CONAFOR officials do not flag non-compliance as a major challenge for their significant program of direct state payments, which routinely monitors a standard set of items.³ In Costa Rica, owners comply with voluntary PES contracts (see, e.g., Robalino and Pfaff 2013), and thus would not seem to require further monitoring and sanctioning to fulfill those promises.

Yet we believe that is because the existing PES contracts have not changed behavior very much.⁴ Consider a "first come, first served" model of PES enrollment. The landowners who after costly forest clearing would earn no money in agriculture anyway, due to steep slopes or poor soil, e.g., should be relatively eager to sign contracts that will pay them if their forested land stays forested. Should they represent a large share of PES enrollment, then we would not expect behavior shifts or increased services – but at least agencies would not need to focus on monitoring or sanctions.⁵

However, what if alongside any other program goals an agency wanted to increase PES impacts? Even if poverty or politics foci justified standard direct PES payments with little service impact⁶, perhaps the higher cost of a *Fondos Concurrentes* program demands a larger gain in ecoservices. Further, perhaps the higher local involvement within such a program offers hope for its supply? Local presence is costly to organize but it may lower costs of creating incentives for real change. Putting it another way, maybe a local program allows PES to better confront threat of forest loss, and thereby prevent more forest loss, even if that could require a greater enforcement presence. Further, it might better implement targeting of ecoservices impacts – e.g., land at streams' edges.

Current large voluntary PES programs, however, do not obviously offer the opportunity to study whether greater monitoring and sanctioning could achieve more targeting of threat and influence and more ecoservice impact. However, in order to ask whether potential policy shifts might work we could enroll members of relevant populations in Mexico in hypothetical settings of this type. This paper reports on a field experiment of that type to study 'new Matching Funds institutions'.

³ Sanctions are not common in the national program but have occurred in monarch areas (Honey-Roses et al. 2011).

⁴ Adding to prior Mexico cites, on limited impact in Costa Rica see Arriagada et al. 2012, Robalino and Pfaff 2013.

⁵ "Sanctions" could be cancellation of PES contracts or instead, e.g., fines to spur increased attention to compliance.

⁶ We note that, among true statements, how one states programs' outcomes can communicate very different pictures. Imagine that 100 landowners sign up for PES, of whom only 2 would have deforested their lands without the policy. When the policy dissuades 1 of them from clearing, do we say deforestation was lowered by 1% or reduced by half? Comparing program costs and benefits highlights the 1% perspective and an attendant focus on deforestation threats.

To model *Fondos* within such an experiment we suggest an assurance game between two groups: one upstream, framed as services providers, on the phone with one downstream, framed as users. In assurance games, one's own gain from contributing more is negative when others give little but it rises with others' contributions (usually to become positive, although here at most zero). Critically, then, for assurance there can be both high and low symmetric contributions equilibria whose realization will depend upon each group's expectation of whether the other will cooperate. Coordination is even trickier because the individuals within each group face incentive to free ride by allowing others in their groups contribute while they gain from the other group's contribution. Thus, for instance, how one expects other groups to handle free riding affects the critical beliefs.

We believe that the assurance game captures one critical feature for the creation of institutions.⁷ For hydrological PES, it is intuitive and important that the payoffs from attempting to organize at one end of the watershed will depend upon one's beliefs about what will happen at the other end. The other end needs to be sufficiently internally coordinated to make one's efforts worthwhile.⁸

Yet marshalling actors at either end is costly and at neither end is final coordination guaranteed. Each individual may understand the complementarity of upstream and downstream contributions yet face private incentive to let the others at one's end bear the cost of making the contributions.⁹ For example, imagine that many others from downstream attend public meetings for a new PES. Further, next those same others from downstream contribute sufficient funds to pay upstream. The marginal downstream user then fares better by not contributing to the institution or within it. The same holds upstream. That can generate cooperative collapses at either end of a watershed which, given complementarity of upstream and down, in turn could eliminate all contributions. All of these incentives promote the obvious, and stable, equilibrium of zero contributions by all.

Yet actors may have broader goals. Further, those may very well differ across *Fondos* locations. Thus, we might well expect that outcomes will vary by site – even for the same strategic setting. After consulting with *Fondos* staff about all their sites, and visiting 12 *Fondos* sites in mid-2013, to carry out our framed field experiment after a field pilot we chose 3 to revisit in summer 2014: Xalapa within Veracruz State; Merida in Yucatan State; and Cancun within Quintana Roo State.

After a field pilot of our experiment – done in Coatepec¹⁰, which is also within Veracruz State – we recruited 240 downstream and 240 upstream *Fondos* participants in the three other locations. To start, we examined initial behaviors in a trust game – run before the assurance game – which we framed, and implemented, as with an unknown individual at the other end of your watershed.

⁷ For Mexico, one must emphasize that upstream itself features interesting collective landowning institutions, *ejidos*. Here, in focusing on the upstream-downstream interaction, we are consciously neglecting the function of the *ejidos*. However, our next set of experiments will permit more interesting upstream-upstream interactions given sanctions.

⁸ On the potential narrow rationality of cooperation given others' cooperation, see Stag Hunt game (Skyrms 2004).

⁹ As stressed in Ostrom (1990), institution building is a 2nd-order collective action dilemma in the sense that while the institution is for solving an incentive problem there are also incentive problems in donations to the institution.

¹⁰ We would be remiss not to mention the significant adjustments brought about by our learning in this field pilot. We simplified the game and, given high baseline cooperation, we made it harder by lowering own giving payoff.

Within the trust game, participants indicated both how much they would transfer to that person out of their endowment, in the 1st stage, as well as how much they would expect in the 2nd stage. There was significant variation, across sites and individuals, for both of these two trust responses (which are less correlated upstream, consistent with varied exposures to up-down interactions¹¹).

Perhaps usefully for CONAFOR's review of future applications for new local PES mechanisms, we found associations between such responses and the perceptions expressed by our participants. Downstream water users in Yucatan, e.g., felt that those 'in the jungle' upstream were responsible for lower water quality in the city, and those users also gave the least in the 1st-stage trust game. In contrast, users in Quintana Roo felt that upstream would comply with forest conservation, should they commit to do so for payments – and those users expected more in trust's 2nd stage (including after removing expectations' correlation with giving using expected-to-giving ratios). There is also individual variation, with education raising giving and interesting effects of gender, specifically higher 1st-stage giving by female users downstream but men upstream giving more. Especially in Quintana Roo, upstream we had longstanding male *ejidatorios*, familiar with PES.

Again linking across settings, the trust behaviors had predictive power for baselines in assurance. Here the most robust relationship is between the return that is expected in trust's 2nd stage and one's contribution in the baseline assurance round played by everyone (without any treatments). That link is particularly strong for the downstream users, almost twice as strong as for upstream. Given that zero is the highest own marginal product of a contribution in assurance (Section 3), the baseline contributions seemed relatively high (all the numerical detail is below in Section 5). We speculatively correlate this with prior exposures to and predilections toward local PES ideas, as our sites already participate in *Fondos*, but it may be explained by play starting cooperatively. Even if our sample were prone to cooperative contributions, though, for assessing the treatments we subtract baseline individual contributions and find there is still room for positive impacts.¹²

We find that both the threat and the use of sanctions upon upstream raise giving by upstream. Thus, any 'motivation crowding' of upstream's cooperative incentives was not a dominant effect. We find that, when sanctions on upstream are available, the downstream users initially give less. Our best explanation is that users infer from options to sanction that upstream will not cooperate. However, in line with complementarity of up- and down-stream, the giving still rises over time.

Below, the rest of the paper is as follows. Section 2 provides some background on CONAFOR. Section 3 then describes our model of the interactions of contributions in creating a local PES, which is formalized most specifically in the exact details of the assurance game that we played. Section 4 gives information about our empirical setting, participants and game implementation. Section 5 then lays out our results in more details. Finally, Section 6 offers additional discussion.

¹¹ Another lack of correlation, which is methodologically interesting, is between these two responses in Trust games and direct answers to questions about trust on a survey after the game. We do not know why this would be the case.

¹² We also compare sanctions of behaviors upstream to groups with just information on upstream. That is vulnerable to differences across the groups, as our randomization has less power given small groups, but avoids ordering issues.

2. Mexican PES Programs: two major initiatives of the federal forest agency (CONAFOR)

2.1 National Program's Direct State-Landowner Payments (discuss more the literature on PSAH)

Mexico's largest national-level program of ecoservices payments, the Payments for Hydrological Services (*Pago por Servicios Ambientales Hidrológicos (PSAH)*), started in 2003 in response to water scarcities and deforestation. CONAFOR, the federal forest agency in charge of the PSAH, signs agreements with landowners. The landowners agree to maintain forest cover or implement practices to conserve natural land ecosystems. CONAFOR agrees to pay a fixed compensation per hectare for a period of five years (CONAFOR 2011). One's price per hectare is determined by an estimation of the opportunity costs of leaving one's land in forest. Which lands are eligible depends on the value of hydrological services and other policy criteria (Muñoz-Piña et al 2008) and as noted above an increasing set of authors have commented on the forest impacts of PSAH.

PSAH has been funded through an earmark from federal fiscal revenues derived from water fees, in an effort to create links between those who can benefit from services provided and those who can benefit from providing them (Muñoz-Piña et al 2008). Representing many services users, the federal government has remained the exclusive buyer of environmental services in the *PSAH* (Shapiro 2010). Yet as Wunder et al. (2008) have noted: "Costa Rica's PSA and Mexico's PSAH are attempting to develop additional financing sources from individual ES users to complement their public financing, and are trying to move away from their current uniform approach to payments to a much more differentiated and targeted approach in which the amount of payment and the specific land uses being paid are much more closely targeted to local conditions." That potential trend is precisely our focus, in particular given local-mechanism initiatives in Mexico.

2.2 Starting A Companion Program For Local Mechanisms (discuss institution & behavior lits)

To move in those directions, the Mexican program of local mechanisms for providing services, implemented as Matching Funds, began in 2008. It aims to provide incentives for organizational partnership and social arrangements to link the users with the providers of hydrological services. Local PES, our focus, are defined as "institutional arrangements to transfer resources from users of ecosystem services to the owners of the forestlands where the services are generated, with the aim of promoting the adoption of best management practices and the conservation of land that will maintain and/or improve the provision of these services" (CONAFOR 2011).

To facilitate such new local PES mechanisms, to finance the payments to providers CONAFOR currently will partner with a local or regional organization who, in a fashion, represent the users of the environmental services. That includes water utilities, municipal and state governments, and civil society. CONAFOR provides 50 per cent of the financing necessary to establish the program over 5-15 years (CONAFOR 2012). One distinction from the national program is that some of the monitoring is the responsibility of the local partner institutions, not of CONAFOR. Another feature is roles for intermediary or facilitating actors (agencies and other organizations). As documented by Porras et al. (2008), they often are necessary within a local PES mechanism.

A critical fact is that over 70% of Mexican forest is common property. In that setting, payments go to the governing bodies of the *nucleos agrarios* or communal lands, who decide how to use *PSAH* (Shapiro 2010). Some communities invest *PSAH* in public goods, others divide equally the payment among their members, while others have a mixed strategy (Muñoz-Piña et al. 2008). Since this feature should not be particular to the national program, it should apply to local too.

Also common to some extent across the types of PES programs is that compliance often will be verified through satellite images. The significant percentage of common lands in the *PSAH*, though, implies also a role for collective-action institutions at the community level. For any such program, they will affect rules definition, monitoring and enforcement (see, e.g., Ostrom 1990).

An important part of understanding such a program in the Mexican context is poverty alleviation (Shapiro 2010, McAfee and Shapiro 2010). This can affect where the national or local funds are allocated directly (or prioritized in terms of evaluation of applications received from contractees) as well as which of the many possible forest-oriented goals are emphasized within enforcement. Of course, this element also interacts strongly with the point above about the function of program on common-property lands. The role of local social agreements will be relevant also for poverty.

To date, local mechanisms or Matching Funds are small compared to the national program. While under the national program there have been more than 2 million hectares contracted, only 300,191 hectares have been contracted under the local mechanism program. That has involved 83 local partners: 44 civil organizations; 17 state governments; 14 local governments, 6 water utilities; and 2 private companies (CONAFOR 2012). This list illustrates that, even within the effort to build new local PES mechanisms, public actors still are playing a large role in demand.

3. Upstream-Downstream Assurance Game: building a new local mechanism

3.1 Overview

Our assurance game for building a new local institution, by bringing together multiple groups, is a new design. Inspired by the *PSA-ML*, it is an adaptation of the *Stag Hunt* (Skyrms 2004) game. ‘Stag Hunt’ refers to the idea that, in a hunt, hunters can either work together and catch big prey that has a greater value per person or work alone and catch small prey with less value per person. As long as each believes that a sufficient number of others will cooperate to catch the big prey (stag), so that the group can succeed in catching it, then it is rational for each to cooperate in that. But if one expects that an insufficient number of others will cooperate in that, then the individual strategy will be to defect from the collective action and work individually in catching small prey.

To be explicit, if an insufficient number of others will cooperate in the stag hunt the individual will waste their effort for nothing. Thus, both cooperation and defection can be rationale and the viability of cooperation depends on mutual beliefs or probabilities or trust (see Skyrms 2004). Thus, the Assurance or Stag Hunt game has multiple symmetric Nash equilibria – all cooperate and all defect – plus sometimes intermediate outcomes where only some people are cooperating. Its general implication is that for some tasks’ payoff structures, groups with more cooperation

generate more incentive to cooperate and vice versa. Expectations based on the past are critical and behaviors can be self-reinforcing (Mayer 2014). According to Skyrms (2004), although many modern thinkers have focused on the prisoners' dilemma to model collective challenges, this emphasis is misplaced and many social interactions might be modeled as a Stag Hunt game. As a change in the beliefs, norms and expectations can induce cooperation in a Stag Hunt game, tools other than a change in the monetary incentives may help to reach a cooperative solution.

The coordination required to build a new local mechanism (as in the PSA-ML) can resemble a Stag Hunt, as can the function of such a new institution. The key point for building institutions is that all the effort of getting your end of a watershed organized is pointless, in terms of the value from an upstream-downstream institution, if the other end of a watershed is not able to function. Building institutions takes time, meetings, consensus building, process development and then all of that again whenever new situations arise that were not anticipated when the institution started.

Such complementarity in payoffs can also describe the function of an institution. If downstream works hard to collect contributions to pay for services in the next year but upstream has fallen apart and no longer is getting behavioral shifts implemented, payoffs for downstream are zero. Likewise, if upstream undertakes costly actions to cause services to flow down but downstream has fallen apart politically, so monies are unavailable, then the payoffs for upstream are zero. In fact, in both cases net payoffs are negative, as benefits are zero while the costs of contributions, or land-use shifts, certainly are not. Generally, if the other side of the deal does not do its part, then the marginal payoff from putting in more of one's own effort will be negative, i.e., a loss.

3.2 Stag Hunt Between Groups (allowing free-riding challenges at each end of the watershed)

In PSA-ML, i.e., creating a new institution, it is large groups of providers and users who interact. That yields potential for institution creation to be harder than just upstream-downstream beliefs. For an individual, what she contributes dictates her cost. However, it is the aggregate amount her group contributes that dictates the other side's gains and via complementary may lead to her gain. Thus, a novel element of our Group-Group Stag Hunt is within-group incentives for free riding.

Spelling that out, even if one perfectly understands the complementarity of the groups, as long as the other folks within one's end of the watershed contribute enough one could free-ride and gain. As the watershed's other end still might be willing to keep contributing, one may as well save. However, if one's colleagues see this as unfair, or risking collapse of a positive equilibrium, then free riding can yield failure to achieve within-group or, then, upstream-downstream coordination.

Specifically, each provider decides how much effort to contribute to creating the new local PES. Likewise, each user in the group of users decides how much effort to contribute to the local PES. For 'institution creation', all actors' efforts are inputs into creating a new, local PES organization. For 'in a PES', contributions by providers are represented by trees, while users' are seen as coins. Each participant in each group can decide between four levels of effort: 0 units or 1, 2 or 3 units.

Unlike in a public good game, nobody gets any benefits from their own group's contributions. Instead, one's earnings rise with the other group's contributions and fall with one's contributions. Cooperation (high contributions to the collective action) can be a rational strategy for anybody if they believe there will be sufficient aggregate contributions by the members of the other group. While we are unable to predict 'default' contributions levels using other regarding preferences, it is always the case that the more contributions by the other group, the better for one to contribute.

The figures below show the payoffs we used, given one's own and the other end's contributions. The latter is shown in ranges, in order to reduce the number of combinations one must consider. The sum of individual contributions by the other group ranges from 0 to 15 (5 people doing 0-3), while one's contribution ranges from 0 to 3, and there are 16 cells distinguished by their payoffs. Appendix 1 depicts how we implemented this graphically for experimental sessions in the field. There is an equilibrium with all zeros, as well as a weak cooperative equilibrium with all threes.

Payoffs In Users-Producer Assurance Game

		My contribution as provider (user)			
		0	1	2	3
Contribution of the group of users (providers)	0-2	9	6	3	0
	3-7	10	8	6	4
	8-12	11	10	9	8
	13-15	12	12	12	12

		PROVIDER			
		0	1	2	3
AVERAGE USER	0	(9, 9)	(10, 6)	(11, 3)	(12, 0)
	1	(6, 10)	(8, 8)	(10, 6)	(12, 4)
	2	(3, 11)	(6, 10)	(9, 9)	(12, 8)
	3	(0, 12)	(4, 12)	(8, 12)	(12, 12)

3.3 Treatments (upstream behaviors information vs. various sanctions based on that information)

Given our perception of relatively low use of sanctions and relatively low impact, we wanted to explore the potential for some institutional interventions that might increase the contributions. Roughly, if programs are going to need to confront higher opportunity costs to increase impacts, for instance by increasing measurement of actually additional outcomes and cancelling contracts, sanctions of various types may be signals of dissatisfaction before more drastic actions are taken.

Experiments can be useful for exploration such potential elements of PES not yet much utilized. Had they been highly used to date, there might be better ways to comment upon their impacts. But when they have not yet been used, such framed field experiments we believe can help frame or structure two types of discussions about such policy elements: first, what exactly interventions might be – a discussion and set of choices that are forced upon us in doing experimental design; and second, what some of the relevant population thinks about this kind of potential intervention. The latter learning is as likely in post-experiment focus groups and interviews as in experiments. We see that form of learning as a strong complement to the specific behaviors within our games.

Perceiving that a reason intermediaries are so important in the creation of local PES applications is limited information flow between upstream and downstream, and knowing that information is a prerequisite for sanctions, we start by just providing information about the upstream behavior. Then, on the basis of that information, i.e., on top of providing that same information in each of the following, we add one of three types of potential sanctions as an option for the participants. That yields four treatments, three of which we compare to information alone for sanction effects:

- *Information On Upstream Behavior Alone (this is also required within all the sanctions):* after everybody has made a contribution decision, the facilitators anonymously list the actions of all the providers for all participants to see, users and providers (anonymity is achieved via random assignments of animal picture cards, so one can verify one's choice)
- *Provider-Provider Nonmonetary Sanction:* adding to the above, after seeing the list of upstream choices, for a cost of MXN\$10 providers can send a red card, as a disapproval; the facilitators display the red cards received by each participant upon the behaviors list, keeping all decisions anonymous, as in the previous treatment, as well as the card senders
- *User-Provider Nonmonetary Sanction:* adding to the above, after seeing the list of the upstream choices, for a cost of MXN\$10 any user can send a red card, as a disapproval; the facilitators display the red cards received by each participant upon the behaviors list, keeping all decisions anonymous, as in the previous treatment, as well as the card senders
- *User-Provider Monetary Sanction:* adding to the above, after seeing the list of the upstream choices, for a cost of MXN\$10 any user can monetarily sanction any provider (as many providers as one likes though at most one sanction per provider from any user); each sanction received by a provider has a cost to them of MXN\$30 and all is anonymous

4. Context & Implementation

4.1 Sites & Participants

Any local PES setting will have its own particular characteristics, so the details of the institutions that work best can vary. That said, for the most part the ecoservices providers are ejidatarios or small land-owners who live upstream on rivers or in sites of aquifers recharge, while services users are in towns downstream. How users link to users in local PES mechanisms varies a lot. While some may make voluntary donations on their water bills, others pay through water bills but do not make active donation decisions, while others are not aware their utilities are paying.

Participants within three local PES mechanisms participated in our framed field experiments, one in the state of Veracruz led by the NGO SENDAS, one in the state of Quintana Roo led by the NGO Amigos de SianKa'an and one in the state of Yucatan led by the NGO Niños y Crias. One of the main reasons for choosing these cases is that both the users and the providers function in a collective fashion. Thus, there is not a single large actor like a downstream utility manager or upstream large landowner making all the decisions. We wanted to consider first cases where the coordination of providers and users was required for making the local PES mechanism work. The providers who participated are inhabitants of ejidos that have land registered in the program and that provide water to the cities where users live: Xalapa (Veracruz), Cancun (Quintana Roo) and Merida (Yucatan). The main characteristics of participants are summarized in Appendix 2.

4.2 Recruitment & Implementation

We recruited 480 people – 240 users and 240 providers - in these locations. Sessions were run with groups of 10 users and 10 providers who played simultaneously but in different locations – always in the places where they live. Users were in the cities while providers were upstream in the case of Veracruz and in the jungle in the case of the Yucatan peninsula. Recruitment was in each case done through the local NGO implementing the *PSA-ML*. They invited providers from the ejidos (collective lands) where they are currently implementing local PES – or starting one – and, for the users, inhabitants of the cities receiving the services provided by those same ejidos.

We placed facilitators with the users and with the providers. The facilitation was run by people from Duke University and those NGOs. As providers and users were in their distinct locations, the interaction between the users and providers was done by the facilitators, using cell phones. One experimenter led all the sessions with providers and another led all the sessions with users.

Before running the assurance game, we anonymously matched one provider and one user to run the Trust game (Berg et al. 1995), framed around water and payments (see Cardenas et al. 2015). Decisions were communicated by phone, again with anonymity using identification numbers (from 1 to 10, assigned before any games). Results of these initial Trust games, done before any Assurance games, are compared with qualitative site observations and the results for Assurance. We emphasize that Assurance decisions were taken without participants knowing Trust results.

Finally, for the Assurance game, we split the providers as well as the users in two groups of five. Each group was anonymously matched with one of the groups at the other end of the watershed, and participants in each group make their individual contribution decisions. To split and match the groups, we use the color of the participants' identification number card, so providers with the green cards formed one group and providers with the yellow identification cards formed another. The green group of providers was matched with the green group of users and same for yellow.

Again, for the Assurance game we started with a baseline without any information or sanctions. Then for all other rounds there is always information on upstream and sometime also sanctions. Finally, we never tell them baseline results. Thus, we can study their expectations of sanctions.

5. Results

Figures 1 and 2 depict all of our outcomes. We discuss regression analyses of these data below.

5.1 Trust Game Responses (giving, expected return, ratio) & Participants' Expressed Perceptions

Perhaps usefully for CONAFOR's consideration of the future applications for new local PES, we found associations between Trust responses and varied perceptions expressed by our participants. For instance, downstream water users in the Yucatan, who expressed that those 'in the jungle' upstream are responsible for the reduction in water quality for the city, had lowest Trust giving. That is seen in Table 1A, which examines differences across regions and upstream/downstream in tokens entrusted to an unknown person at the other end of the watershed, Trust's first decision. We note also higher downstream 1st-stage giving by women, while upstream the men gave more. Especially in Quintana Roo, those included men familiar with PES, as longstanding *ejidatorios*.

Quintana Roo's downstream or users expressed that upstream complies with forest conservation, once they have committed to it for payment, and those users expected more from Trust's 2nd stage. That is seen from Table 1B, which examines differences among downstream actors, across sites, in the tokens expected back from the unknown individual upstream, i.e., Trust's second decision. Table 1B actually finds this regional variation in expectations even controlling for giving levels, as its dependent variable is the ratio over giving of the expected return, which rises with giving.

5.2 Assurance Game Baseline Giving & Participants' Prior Trust Game Responses

Further linking types of behavior, Trust behaviors had predictive power for Assurance baselines, i.e., for giving in the Assurance game in the initial round – before anybody knows of treatments. Specifically, the more one gave or entrusted in the first Trust decision, the more one contributed in the baseline of the Assurance or institution-creation game. People simply differ from the start. This is seen in Table 2A, controlling for the differences by regions, locations, and characteristics.

Such links are robust to using instead the return that one expected from Trust's second decision. In Table 2B, controlling again for regions, locations in watershed and individual characteristics, Trust expectations are linked to Assurance giving (though the expectation/giving ratio was not). We note that this is especially strong for downstream – almost twice as strong as for upstream.

5.3 Sanctions (threats and uses) & Upstream Contributions

Tables 3 show that the threat and the use of sanctions upon upstream raise giving by upstream. 'Threat' means the announcement that for Round 1 in the Assurance game, unlike in the baseline, some actor will have the option to impose a sanction upon any individual upstream participant (based on knowledge of upstream contributions since, from Round 1, everyone sees them listed).

Tables 3A consider contributions in Round 1 minus baseline before any sanctions have occurred. These results robustly support that threat of monetary sanctions raised giving for low baselines. The two tables under 3A, however, break down the data rather differently to tell different stories. The initial regression assumes that difference in baseline giving are fixed differences across people, with no implication for changes later, e.g., for the Round 1 minus baseline change. Under that view, a threat of either of the types of sanction by downstream raises giving upstream.

The second 3A regression, though, allows that perhaps the initial choice affects the later changes. Contributing maximally in the baseline means, e.g., one could not possibly raise contributions. Experimentation with more extreme giving levels in the baseline, high or low, also could explain lower changes in contributions after higher baseline giving. One way or another, it would seem that baseline changes could affect not only future changes but also even affect treatments' effects. Allowing for such possibilities, in the second regression, higher baseline giving is associated with lower changes afterward. However, a threat of monetary sanctions still raises lower giving.

Table 3B then considers the effect of the actual use of sanctions based on past upstream choices. As sanctions do not occur until after Round 1, it considers the two changes following Round 1, i.e., the change in contributions from Round 1 to Round 2 and change from Round 2 to Round 3. For this evolution of contributions over time, interestingly the sanction treatments themselves do not have significant impacts. That could make sense, though, since now sanctions have occurred. The mere possibility of a sanction may not mean much when a sanction was not actually applied.

On the other hand, when a sanction was applied, it very clearly appears to increase contributions. Table 3B has a very significant and meaningful increase in upstream contributions by those who were previously sanctioned – controlling for the treatments, the regions, and the characteristics. Thus unlike in some other literature in which actors respond negatively to enforcement by others, here at least while the sanctions are in effect any 'motivation crowding' is not a dominant result.

We also control for contributions by others in one's own upstream group, and in fact that giving has a positive effect on one's own giving upstream. This looks like trust that counters free riding. When a participant upstream can see that her colleagues are giving (again their giving is listed) this can spur confidence that, in making contributions, she will not be abandoned by the others.¹³

¹³ Along these lines, the sanction and colleague-giving results could be interpreted purely as responses to colleagues. In Table 3B, being sanctioned and colleague giving both raise contributions. Yet, then, higher own contributions and lower giving by colleagues imply the opposite. We find a negative effect of "your giving minus colleagues" and that it is highly correlated with the variables included here – and thus its inclusion can crowd them out in the regression.

5.4 Sanctions (options and uses) & Downstream Contributions

As when considering upstream's contributions, we start by examining expectations of sanctions. Downstream users are not sanctioned so, unlike the upstream providers, they do not face threats. Yet expectations enter, as optimal contributions depend on the contributions expected upstream. A possibility of sanctions on upstream actors could affect those expectations in either direction. On the one hand, downstream could anticipate that upstream would react to the sanctions threat. If anticipating Table 3A, downstream will expect a rise in at least lower initial giving upstream.

Bowles (2008), however, has hypothesized that a participant could 'interpret the treatment itself'. Telling downstream users that they could use a sanction on upstream could slander the upstream or, more generally, cause downstream to believe that upstream is not likely to play cooperatively (or setting out "a constitution for knaves" (find the cite) could generate more 'knaveish' behavior). Table 4A supports the latter hypothesis with downstream sanction options lowering giving¹⁴ and, interestingly, no significant effect on downstream giving of allowing upstream to self-sanction.¹⁵

A feature of that latter hypothesis is that it concerned expectations, distinct from actual behavior. Put another way, even if the sanction setting initially led downstream to expect little of upstream, still if upstream played cooperatively early on the beliefs on the part of downstream could shift. Downstream actors might well update their expectations of future upstream behaviors, based on upstream's actual past behavior, as opposed to inferring from the treatment alone as for Round 1.

Table 4B suggests that sort of process is happening as we move from Round 1 into later rounds, meaning we move from operating solely on expectations of treatment effects into real reactions. Both treatments with downstream sanctions on upstream are significant, as they are in Table 4A. However, for both downstream sanction treatments, the signs are now reversed from Table 4A. We believe that is what one would expect if positive play upstream overcomes pure expectations: instead of treatment effects, these positive coefficients are really the erasure of Table 4A effects, i.e., a normalization of expectations about upstream as actual play overwhelms pure speculation.

Given that effect of setting (then erasure of that effect), Table 4B also considers actual sanctions. As downstream users are not sanctioned, here we consider associations with sending a sanction. Controlling for treatments, regions and characteristics, sending one lowers the change in giving. Thus, while a trend might be positive early play by upstream and normalization of expectations, when downstream is compelled to sanction this seems to lower expectations and thus also giving (even though in principle sending sanctions could yield beliefs that upstream will jump upward). Finally, unlike in Table 3B, the others' giving at one's end of the watershed lowers one's giving.

¹⁴ Another possible explanation for such a result could be that downstream would anticipate 'motivation crowding', i.e., that upstream would react negatively to the threat of external sanction and lower contributions, making it less worthwhile for downstream to contribute. However, since that was not in fact how upstream reacted in Table 3A, reacting to threats, or Table 3B, reacting to actual sanctions, it seems hard to assert such expectations downstream.

¹⁵ Given the significant effect of baseline contributions in Table 3A and here, we control for such potential effects. However, testing for interaction effect on treatments of baseline contributions, as in Table 3A, found nothing here.

6. Discussion

Stepping back to consider policy implications, we believe our findings are supportive of what we have heard from CONAFOR itself about the importance of the social capital at a prospective site. The initial contribution differences we observe are correlated with trust-game responses that, in turn, are correlated with participants' statements in surveys and focus groups about their settings. They are also somewhat persistent. In a setting of multiple equilibria, that can be determinative.

We can imagine beliefs spillovers across regions as well, in that if one local mechanism gets up and going it can influence the beliefs relevant for the challenging starting phase of others nearby. This could help to explain early weight on sites that had already had some upstream-downstream interactions, and related upstream organization, before the *Fondos* program came into existence. Consistent with Ostrom's (1990) point that starting easier could be a way to crack hard problems, *Fondos* may well have wanted to establish feasibility to improve beliefs before harder cases. The latter could include efforts to move PES into regions of higher pressure in order to raise impacts.

Our results also support a potentially positive role that could be played by more use of sanctions. We believe that currently sanctions are not common. That may link to a lack of additionality, as one would not expect to have to sanction folks to comply with contracts to simply carry out what they would have done anyway in the absence of PES. However, should PES move to stricter insistence on measured services outcomes for making conditional payments, which could involve restrictions on lands with higher opportunity costs, sanctions may play a key signaling role. In a world with significant transactions costs – i.e., all the upstream-downstream coordination costs – before simply cancelling payments for lack of service generation upstream one can send a signal.

However in the large voluntary PES programs that currently exist, say in Costa Rica and Mexico, there is little opportunity to study whether contracts on higher-pressure lands are possible, and whether increased monitoring and sanctioning – local or federal – would help them to function. Thus, we wanted to consider sanctioning regimes with relevant populations in Mexico, even if in our experiment of course everything is hypothetical and cannot be guaranteed to predict realities. We believe that, despite this, our field work offers some support for the potential from sanctions.

Adding to the experiment itself, qualitative field information is supportive of the thought that in cases where higher pressure and thus potential impact requires higher monitoring due to larger risks of non-compliance, external intervention is needed and even welcome to help coordination. For instance, in cases we visited in Veracruz and Yucatan, the intervention of a NGO that to an extent represents downstream interests has been crucial for the coordination among upstreamers. NGOs have among their duties the monitoring of upstream compliance with the PES contracts but this occurs in different ways, interacting with different levels of participation by other actors. In a case in the Yucatan, the NGOs and CONAFOR monitor and make decisions about sanctions but in a case in Veracruz the external and local are more integrated. There is a committee where upstream and downstream actors, as well as authorities, get together and make decisions about the watershed including the local PES program, verification and compliance with the contracts.

References

- Alix-Garcia, J., K. Sims & P. Yanez-Pagans (forthcoming). "Only One Tree From Each Seed?".
- Baland J.M. and J.P Plateu (1996) *Halting Degradation of Natural Resources. Is there a role for rural communities?* Food and Agriculture Organization of the United Nations (FAO).
- Brauman, K.A., C.G Daily, T.K. Duarte and H.A. Mooney (2007) The nature and value of ecosystem services: an overview highlighting hydrological services, *Annual Review of Environment and Resources*, 32: 67-98
- Cardenas, J.C. and J. Carpenter (2008) Behavioral development economics: lessons from field labs in the developing world. *Journal of Development Studies*, 44(3): 337-364.
- Cardenas, J.C., L.A. Rodriguez and N. Johnson (2011) Collective action for watershed management: field experiments in Colombia and Kenya, *Environmental and Development Economics*, Cambridge University Press, 16(3): 275-303.
- Cardenas, J.C., L.A. Rodriguez, and N. Johnson (2014) Vertical Collective Action: Addressing Vertical Asymmetries in Watershed Management. Working paper
- CONAFOR (2012) Mecanismos Locales en México, presentación Sergio Graff, Coordinador General de Producción y Productividad de CONAFOR, 2° Encuentro Nacional de Mecanismos Locales PSA.
- Corbera, E., Estrada, M. & Brown, K. (2010). Reducing greenhouse gas emissions from deforestation and forest degradation in developing countries: revisiting the assumptions. *Climatic Change*, 100, 355–388.
- Harrison, G. W., and J, List (2004) Field Experiments, *J. of Economic Literature* 52: 1009-1055.
- Honey-Rosés, J., K. Baylis and M.I. Ramirez (2011). "Do Our Conservation Programs Work? A Spatially Explicit Estimator of Avoided Deforestation". *Cons. Biology* 25(5): 1032–1043.
- Janssen, M.A., J.M. Andereis and J.C. Cardenas (2011) Head-ender as stationary bandits in asymmetric commons: Comparing irrigation experiments in the laboratory and in the field, *Ecological Economics*, 70: 1590-1598.
- Mayer, F (2014) *Narrative Politics: Stories and Collective Action*, New York: NY, Oxford University Press.
- McAfee, K. and E. Shapiro (2010) Payments for Ecosystem Services in Mexico: Nature, Neoliberalism, Social Movements and the State, *Annals of the Association of American Geographers*, 100(3): 1-21.
- McKean, M.A (1992) Success on the Commons: A Comparative Examination of Institutions for Common Property Resource Management, *Journal of Theoretical Politics* 4, 247-281.
- Muñoz-Piña, C., A. Guevara, J.M. Torres and J. Braña (2008) Paying for the hydrological services of Mexico's forests: Analysis, negotiation and results, *Ecological Economics*, 65(4): 735-736

- Ostrom, E (1990) *Governing the Commons. The Evolution of Institutions of Collective Action*, Cambridge University Press
- Ostrom, E. (1998) A behavioral approach to the rational choice theory of collective action. *American Political Science Review*, 92: 1-22.
- Pfaff, A., M.A. Velez, R., Taddei and K. Broad (2013) Unequal information, unequal allocation: Bargaining field experiments in NE Brazil. *Environmental Science and Policy* 26: 90-101
- Pfaff, A. & M.A. Velez (2012) Efficiency and equity in negotiated resource transfers: Contributions and limitations of trust with limited contracts, *Ecological Economics* 74: 55-63
- Porrás, I., M. Grieg-Gran and N. Neves (2008) All that glitters: A review of payments for watershed services in developing countries. *Natural Resource Issues* No. 11. International Institute for Environment and Development. London, UK.
- Shapiro, E (2010) *To revalue the rural? Transformation of the Mexican federal payments for ecosystem services programs from neoliberal notion to development dogma*, Doctoral Dissertation, University of California, Berkeley.
- Skyrms, B (2004) *The Stag Hunt and the Evolution of Social Structure*. Cambridge; New York, Cambridge University Press.
- Wunder, S. (2007) The efficiency of payments for environmental services in tropical conservation. *Conservation Biology* 21:48–58.

Figure 1 Assurance Contributions across Rounds: averages by treatment

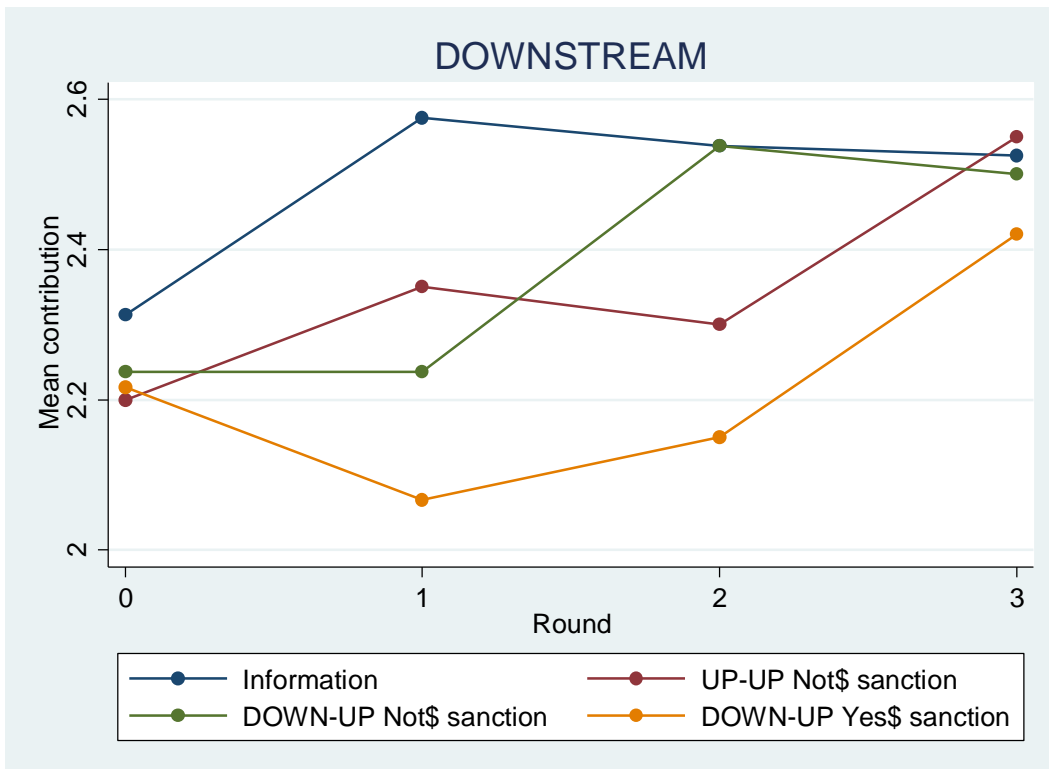
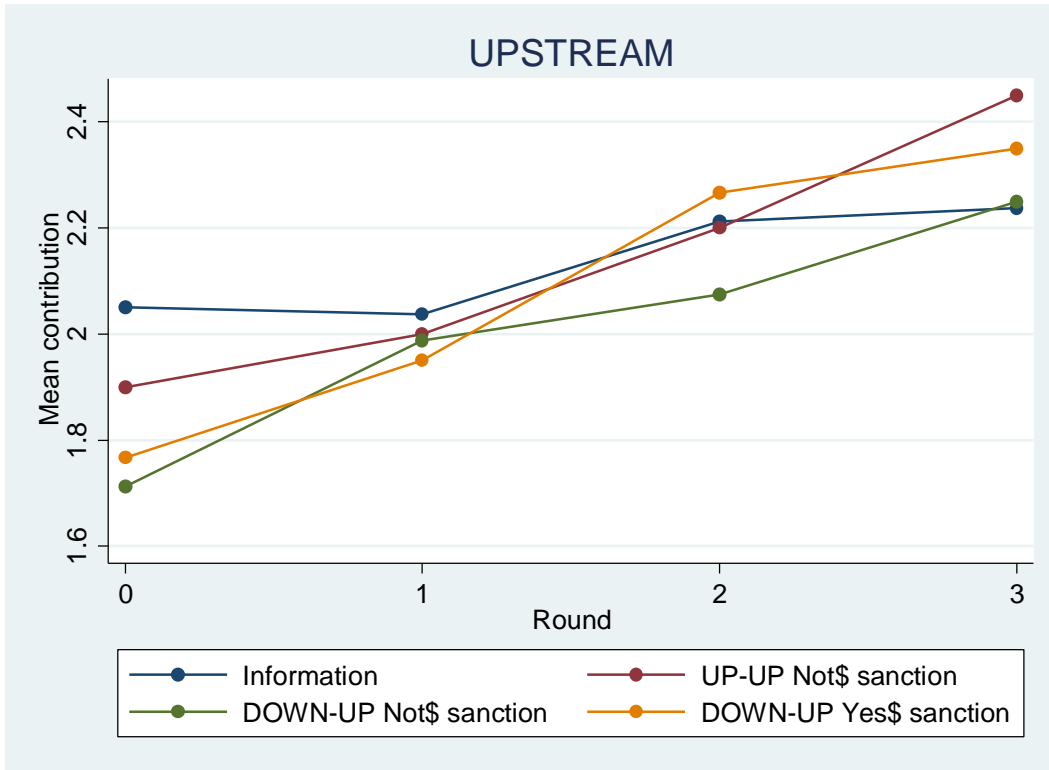
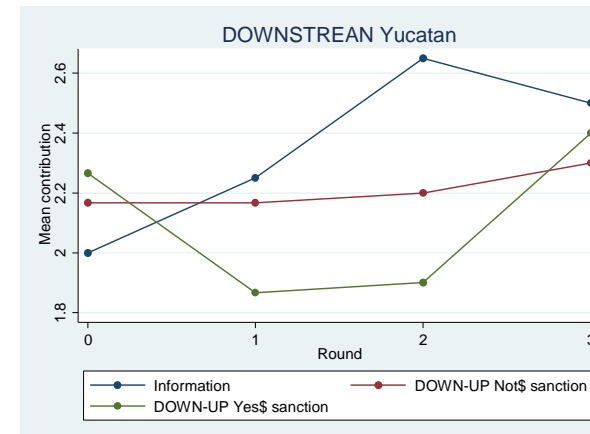
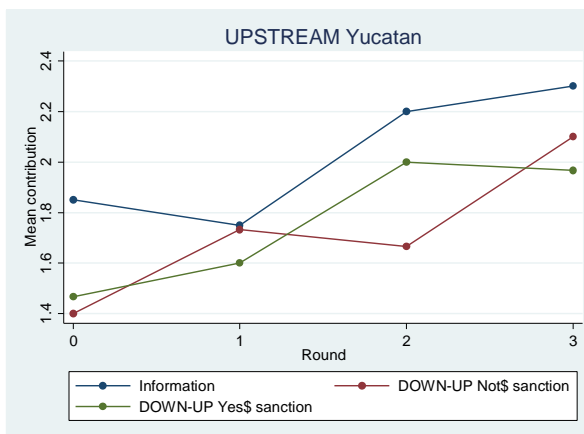
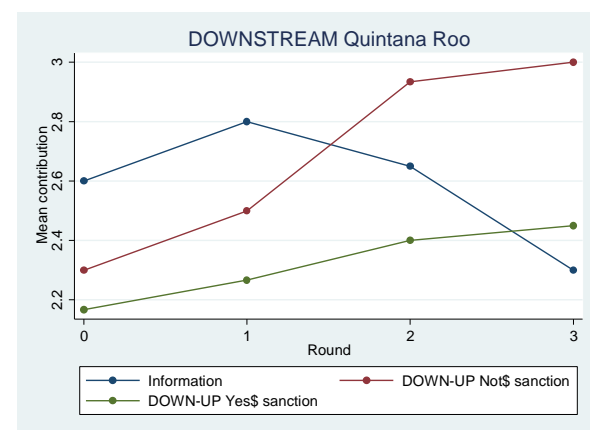
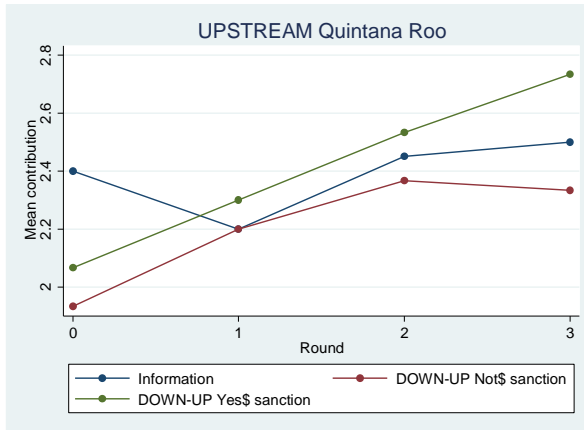
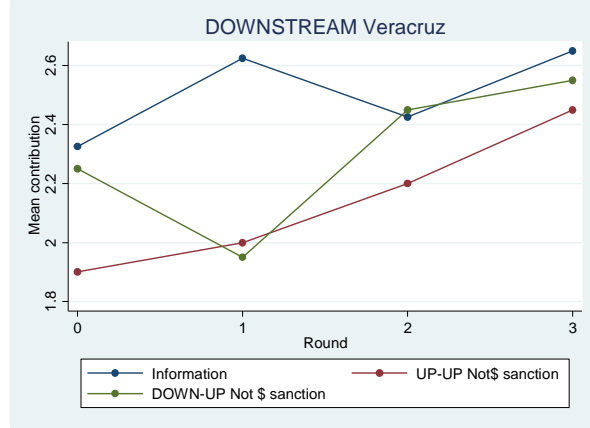
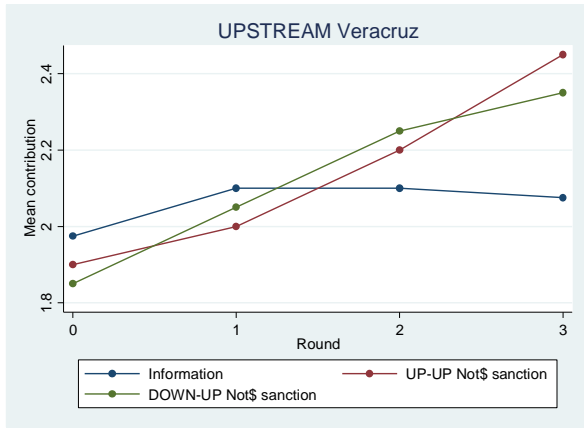


Figure 2 Assurance Contributions across Rounds: averages by treatment and site



Tables 1

Variation in Trust Game Responses across Region, Location, Individual Characteristics

Table 1A: Variation in Trust Giving (by Region, Location and Individual Characteristics)

Linear regression (Yucatan Downstream omitted)					Number of obs = 458	
trust	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Yucatan Up	1.417026	.3824948	3.70	0.000	.6653191	2.168733
Q.Roo Up	1.303662	.3703479	3.52	0.000	.5758275	2.031497
Vera. Up	1.254305	.4113715	3.05	0.002	.4458477	2.062763
Q.Roo Down	.5224865	.2894315	1.81	0.072	-.0463255	1.0912
Vera. Down	.7178394	.2949125	2.43	0.015	.1382557	1.297423
age	.0092001	.0077622	1.19	0.237	-.0060548	.0244549
gender	.4012908	.2467039	1.63	0.105	-.0835497	.8861313
gender*Up	-.7376328	.3607277	-2.04	0.041	-1.446561	-.0287042
education	.067545	.0259374	2.60	0.010	.0165709	.1185191
constant	2.8813	.5544858	5.20	0.000	1.791584	3.971016

Table 1B: Downstream Variation in 'Trust Ratio' [= Expected Return / Giving] (by Region)

Linear regression (Veracruz omitted)					Number of obs = 235	
hope	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Quintana Roo	.2948131	.1467701	2.01	0.046	.0056207	.5840055
Yucatan	.1944229	.1528149	1.27	0.205	-.1066801	.495526
age	.0105638	.0054162	1.95	0.052	-.0001083	.0212358
gender	.0029734	.1206037	0.02	0.980	-.2346613	.240608
education	-.0144273	.0172253	-0.84	0.403	-.0483675	.019513
constant	1.459773	.3384529	4.31	0.000	.7928936	2.126653

Tables 2

Correlations of Trust Game Responses with Assurance Baseline Contributions

Table 2A: Trust Giving Predicts Assurance Baseline (| for regions, locations, characteristics)

Linear regression (Yucatan upstream omitted)				Number of obs = 458		
contribution	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
TRUST GIVE	.058825	.0185351	3.17	0.002	.0223985	.0952516
Vera. Up	.2597197	.1212517	2.14	0.033	.0214268	.4980125
Q.Roo Up	.4069576	.1331291	3.06	0.002	.1453225	.6685926
Vera. Down	.8154806	.1331193	6.13	0.000	.5538647	1.077097
Q.Roo Down	.8828021	.1338705	6.59	0.000	.6197099	1.145894
Yucatan Down	.7650473	.1386706	5.52	0.000	.4925217	1.037573
age	.0048969	.0028848	1.70	0.090	-.0007726	.0105663
gender	.0503594	.0725468	0.69	0.488	-.0922149	.1929336
education	-.0187705	.0100114	-1.87	0.061	-.0384456	.0009046
constant	1.228936	.1888163	6.51	0.000	.85786	1.600011

Table 2B: Expected Return Predicts Assurance Baseline (| regions, locations, characteristics)

Linear regression (Yucatan upstream omitted)						
contribution	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
TRUST EXPECT	.0208397	.0062944	3.31	0.001	.0084682	.0332113
Vera. Up	.2021716	.1243566	1.63	0.105	-.0422509	.446594
Q.Roo Up	.4662856	.1398897	3.33	0.001	.1913329	.7412383
Vera. Down	.831124	.1325874	6.27	0.000	.570524	1.091724
Q.Roo Down	.8494307	.133195	6.38	0.000	.5876364	1.111225
Yucatan Down	.7299685	.1366887	5.34	0.000	.4613074	.9986296
age	.003961	.002981	1.33	0.185	-.0018981	.0098202
gender	.0921066	.0737821	1.25	0.213	-.0529118	.237125
education	-.0179286	.0100784	-1.78	0.076	-.0377377	.0018804
constant	1.351438	.178867	7.56	0.000	.9998756	1.703

Tables 3

Upstream Assurance Contributions given the Threat & Use of Sanctions by Downstream

Tables 3A: The Threat of Future Downstream Sanctions (LHS = Round1 - Round0 baseline)

Linear regression (Upstream)		LHS = contributions rise			# of obs = 222	
R1-Baseline	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
Up-Up Not\$	.0719867	.1940277	0.37	0.711	-.3104738	.4544471
Down-Up Not\$	.307548	.1442718	2.13	0.034	.0231646	.5919313
Down-Up Yes\$	.2841286	.1741014	1.63	0.104	-.0590538	.627311
age	.0042102	.0042459	0.99	0.323	-.0041592	.0125796
gender	-.1131858	.1280209	-0.88	0.378	-.3655359	.1391643
education	-.0005754	.0158829	-0.04	0.971	-.0318832	.0307323
Quintana Roo	-.0799854	.1471469	-0.54	0.587	-.370036	.2100652
Veracruz	.1016021	.1517641	0.67	0.504	-.1975497	.4007539
constant	-.1506819	.256381	-0.59	0.557	-.6560508	.354687

Linear regression (Upstream)		LHS = contributions rise			# of obs = 232	
R1-Baseline	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
Baseline Contr.	-.3656514	.1095055	-3.34	0.001	-.5815283	-.1497745
Up-Up Not\$	.0942486	.3636457	0.26	0.796	-.6226351	.8111323
Down-Up Not\$	.2245869	.3112071	0.72	0.471	-.3889204	.8380942
Down-Up Yes\$	.6666551	.2925395	2.28	0.024	.0899488	1.243361
Bl*Up-Up Not\$	-.0681463	.1720311	-0.40	0.692	-.4072849	.2709922
Bl*Down-Up Not\$	-.0119349	.1385936	-0.09	0.931	-.2851554	.2612857
Bl*Down-Up Yes\$	-.2893198	.1429033	-2.02	0.044	-.5710364	-.0076032
age	.0067271	.0036869	1.82	0.069	-.0005412	.0139954
gender	-.133421	.1205525	-1.11	0.270	-.3710757	.1042336
education	-.0077931	.0140198	-0.56	0.579	-.0354314	.0198452
Quintana Roo	.1043205	.1266055	0.82	0.411	-.145267	.353908
Veracruz	.1810532	.1425186	1.27	0.205	-.0999905	.4620114
constant	.4604196	.3226078	1.43	0.155	-.1755629	1.096402

Table 3B: The Use of Downstream Sanctions (LHS = Round2 - Round1 & Round3 - Round2)

Linear regression (Upstream)		LHS = Contributions rise			# of obs = 444	
R2-R1 & R3-R2	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
Up-Up Not\$	.1425072	.1592177	0.90	0.371	-.1704285	.4554429
Down-Up Not\$	-.1492205	.1044275	-1.43	0.154	-.3544684	.0560274
Down-Up Yes\$	-.1071264	.1199958	-0.89	0.372	-.3429731	.1287203
GOT SANCTION	.6177465	.1260188	4.90	0.000	.3700619	.8654312
Others' contr (not me)	.0560466	.0227859	2.46	0.014	.0112618	.1008314
age	.0001415	.0034121	0.04	0.967	-.0065648	.0068478
gender	.1054178	.0872895	1.21	0.228	-.0661461	.2769817
education	.000677	.0141455	0.05	0.962	-.0271254	.0284794
Quintana Roo	-.0931804	.113345	-0.82	0.411	-.3159553	.1295945
Veracruz	-.2547852	.1174671	-2.17	0.031	-.4856618	-.0239086
constant	-.2783602	.277258	-1.00	0.316	-.8232992	.2665787

Tables 4

Downstream Assurance Contributions given an Option & Use of Sanctions by Downstream

Table 4A: The Option of Future Downstream Sanctions (LHS = Round1 - Round0 baseline)

Linear regression (Downstream)		LHS = contributions rise			# of obs = 235	
R1-Baseline	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
Baseline Contr.	-.608933	.0688706	-8.84	0.000	-.7446469	-.4732191
Up-Up Not\$	-.1086924	.152073	-0.71	0.476	-.4083619	.1909772
Down-Up Not\$	-.329527	.1013009	-3.25	0.001	-.5291468	-.1299072
Down-Up Yes\$	-.504395	.1199453	-4.21	0.000	-.7407549	-.2680351
age	.0015997	.00348	0.46	0.646	-.0052578	.0084572
gender	.0205251	.0840896	0.24	0.807	-.1451788	.1862291
education	.0055506	.0110981	0.50	0.617	-.016319	.0274202
Quintana Roo	.3693604	.1007058	3.67	0.000	.1709132	.5678075
Veracruz	.0522791	.1178542	0.44	0.658	-.17996	.2845182
constant	1.401292	.2849717	4.92	0.000	.8397376	1.962847

Table 4B: The Downstream Use of Sanctions (LHS = Round2 - Round1 & Round3 - Round2)

Linear regression (Downstream)		LHS = contributions rise			# of obs = 443	
R2-R1 & R3-R2	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
Up-Up Not\$	.0409392	.1580391	0.26	0.796	-.269682	.3515605
Down-Up Not\$	.2661886	.1046931	2.54	0.011	.0604173	.4719599
Down-Up Yes\$	.223951	.1340569	1.67	0.096	-.0395339	.4874359
Sent A Sanction	-.2377017	.1016879	-2.34	0.020	-.4375663	-.0378371
Others' Contr.	-.0401884	.0234318	-1.72	0.087	-.0862428	.0058661
age	-.0065821	.0038149	-1.73	0.085	-.0140802	.000916
gender	-.1362932	.0796651	-1.71	0.088	-.2928727	.0202863
education	-.0029774	.0119125	-0.25	0.803	-.026391	.0204361
Quintana Roo	.0018344	.102867	0.02	0.986	-.2003478	.2040165
Veracruz	.0986757	.108716	0.91	0.365	-.1150024	.3123538
constant	.6896151	.3609532	1.91	0.057	-.0198277	1.399058

APPENDIX 1 – Supporting material used in the experimental sessions


























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Figure A1 – Payoffs table - PROVIDERS


























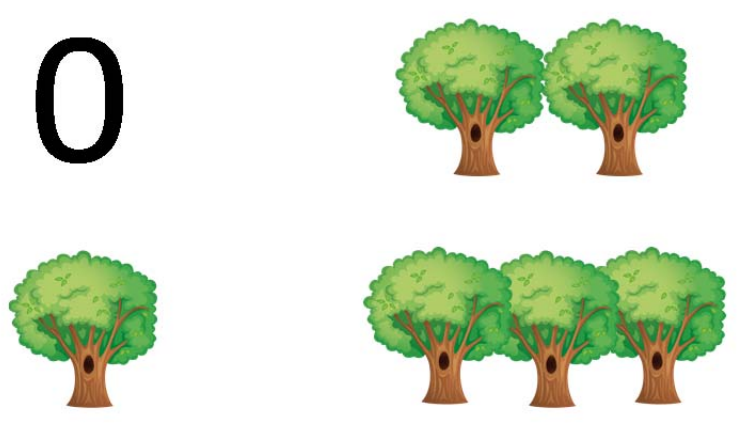
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Figure A2 – Payoffs table - USERS

No participante: _____ Color grupo: _____
Ejercicio: _____ Decisión: _____

0



The illustration shows a total of five green trees with brown trunks. Two trees are arranged in a horizontal row at the top right. One tree is positioned below the top-left tree. Three trees are arranged in a horizontal row at the bottom right.

Figure A3 – Decision form PROVIDERS

No participante: _____ Color grupo: _____
Ejercicio: _____ Decisión: _____

0



The illustration shows a total of five gold coins with silver borders. Two coins are arranged in a horizontal row at the top right. One coin is positioned below the top-left coin. Three coins are arranged in a horizontal row at the bottom right.

Figure A4 – Decision form USERS

APPENDIX 2 – Descriptive statistics of participants by case

PROVIDERS	Veracruz	Quintana Roo	Yucatan
Sociodemographic characteristic			
Gender (% women)	57.5%	23.2%	68.3%
Age	38.3	49.3	32.5
Years of education	5.2	6.3	7.8
Household size	5.4	5.2	5.1
Time living in the community (years)	28.4	42.7	27.8
Weekly income (US\$)	\$43.4	\$43.4	\$46.7
Weekly expenses (US\$)	\$32.4	\$39.8	\$37.6
Land property			
Farmer	62.3%	81.6%	30.4%
Land use for cropping	3.2	6.8	16.6
Ejidatario or ejidatario's wife	53.2%	78.4%	30.0%
Avecindado o comunero	45.5%	15.2%	53.7%
Small landholder	1.3%	0%	16.2%
Trust and social capital			
Participation in a community group	60%	52.9%	41.3%
How many hours a month?	17.5	8.3	9.2
Participation of community members (out of 10)	5.2	4.7	5.8
Who you can trust in your community?			
<i>You can trust most people</i>	25.0%	31.0%	15.0%
<i>You can trust most people but you have to be careful with some</i>	50.0%	43.7%	37.5%
<i>You have to be careful with most people</i>	21.3%	17.2%	42.5%
Who you can trust in the city?			
<i>You can trust most people</i>	6.3%	17.2%	2.5%
<i>You can trust most people but you have to be careful with some</i>	28.8%	46.0%	31.3%
<i>You have to be careful with most people</i>	56.3%	26.4%	62.5%
Local PES Progrma			
Does your community participante in the PES program?	76.3%	56.3%	53.8%
Days a month devoted to the forest maintenance			
<i>0 days</i>	13.8%	9.2%	40.0%
<i>1-2 days</i>	51.3%	46.0%	18.8%
<i>3-5 days</i>	23.8%	17.2%	23.8%
<i>More than 5 days</i>	7.5%	17.2%	11.3%

USERS	Veracruz	Quintana Roo	Yucatan
Sociodemographic characteristic			
Gender (% women)	55.0%	61.2%	55.0%
Age	35.1	33.3	31.9
Years of education	13.3	13.7	14.8
Household size	4.1	3.4	3.7
Time living in the community (years)	20.3	14.2	22.8
Weekly income (US\$)	\$182.6	\$347.2	\$217.0
Weekly expenses (US\$)	\$115.9	\$186.0	\$129.9
Trust and social capital			
Participation in a community group		42.5%	35.0%
How many hours a month?		35.5	15.4
Who you can trust in your community?			
<i>You can trust most people</i>	10.0%	11.3%	10.0%
<i>You can trust most people but you have to be careful with some</i>	61.3%	67.5%	76.3%
<i>You have to be careful with most people</i>	20.0%	17.5%	13.8%
Who you can trust upstream / in the jungle?			
<i>You can trust most people</i>	8.8%	8.8%	3.8%
<i>You can trust most people but you have to be careful with some</i>	57.5%	68.8%	62.5%
<i>You have to be careful with most people</i>	28.8%	18.8%	30.0%
Perceptions about water scarcity			
Water scarcity in your community	50.0%	15.0%	16.3%
<i>Not severe</i>	35.0%		
<i>Moderately severe</i>	23.8%		
<i>Very severe</i>	5.0%		
At least one day without water per month	63.8%		
PES program			
Do you make a payment in your water bill for forest protection?			
<i>Yes</i>	5.0%	0.0%	
<i>No</i>	37.5%	42.3%	
<i>Does not know</i>	57.5%	57.5%	
How much would you be willing to pay per month? (US\$)		\$9.3	\$2.5
How much would you be willing to pay per year? (US\$)	\$22.0	\$111.3	\$35.5