'Bringing the Lab to the Field: More than Changing Subjects'

Juan-Camilo Cardenas [1]
jccarden@uniandes.edu.co
Economics Department - CEDE
Universidad de Los Andes - Bogota, COLOMBIA.

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Abstract.

This paper offers a series of reflections and lessons from conducting economic experiments in the field, outside of the campus laboratory, where one finds richer contexts, more variable demographics among the experimental participants, and more complex dynamics and interactions ex-ante and ex-post conducting the experiment. These lessons are based on the author's experience of seven years of conducting experiments in the field, with about three hundred sessions and some 1,800 participants, mostly on common-pool resource and public goods games conducted in rural villages in Colombia, and replications with college students.

Among the main lessons are i) the actual environment and institutions outside of the field lab can help explain experimental behavior and therefore there is need for better understand such contextual factors that the participants usually face. Thus, greater variation in the demographics across subjects within a field site, and replicating experiments across field sites can provide major gains in explaining variation in behavior; ii) replicating experiments with participants in the field and students can enrich the analysis, strengthen the internal validity of the experiments, but also when differences are found, it can provide elements for interpreting results from experiments with students; and iii) re-visiting the same field lab can bring unexplored elements about the long run dynamics in social exchange situations that can rarely be created in short-run experiments. Further, the paper invites experimentalists to improve their observation in the field lab by complementing the experimental data with other tools and dialogues with the experimental participants –called 'subjects' by others- to better interpret results.

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"Instructions can be important because they define context, and context matters because memory is autobiographical".

(Vernon Smith, "Method in experiment: Rhetoric and reality". Experimental Economics, Vol. 5, No. 2, 2002.)

1. Introduction.

People that participate in any economic experiment do not come naked to the lab. We can ask them to leave in the front door as much as possible, have them read unframed instructions that lack or even wash out any context or cue, and yet they will be looking for clues to represent the game they are facing with something they are familiar with, so that they can, by optimizing their strategies in the game, walk out with some cash or other reward in their pockets.

If the participants are familiar with the task or the context in our experiment, if they can use historical information about their previous relations with the rest of players in their own session, or even with the experimenter, they may bring such information and use it strategically for their decisions along with the incentives and strategy set of the experimental design. It is therefore in our best interest to capture and study such information to better understand the behavior of our experiment participants. This can thus help us face the two major challenges of experimentalists, namely, internal and external validities, and therefore contribute to the understanding of the micro economic systems we observe in the outside world.

A natural response to the external validity question (Loewenstein, 1999, Loomes, 1999a, 1999b) has in a great deal been to create experiments richer in context and frame, as well

as conducting experiments with non-student subjects[6]. The recent volume by Carpenter, Harrison and List (2005) collects experimental exercises in diverse areas of economics. This growing experimental work is surveyed –and such strategy is praised- by Harrison and List (2004) who collect and classify a vast array of experiments based on the nature of not only the subject pool but also the nature of the frame or task, the environment in which the players are immersed, the commodity and stakes used in the experiments, and information the participants may bring. Both Harrison (2005) and Ortmann (2005) argue however that conducting experiments in the field, outside of the campus lab, brings a trade-off between the losses in experimental control which is required for internal validity and the gains from capturing more realistic aspects of the world.

Conducting experiments bringing the lab to the field, however, is more than just changing the subjects' pool, the commodity or stakes, or the frame of the game, as I will develop through the paper. I will agree, in fact, with Harrison and List (2004) who argue that creating a very abstract experiment in terms of frame, commodity and tasks could in fact create greater losses in experimental control. But further, I will argue that bringing the lab to the field is more than moving along the efficiency frontier of such trade-off between relevance and control. It is about shifting also the frontier. By bringing the lab to the field we can enrich greatly our understanding of the cognitive process that our participants face in the experiment or outside in their natural world and minimize the costs of control that Ortmann (2005) is concerned about. Further, these goals can be achieved by bringing also to the field other techniques and do something one rarely see in the traditional experimental work, namely, talking to the participants after the experiment is conducted[7].

[6] I recall major methodological discussions when designing my first (dissertation) experiments for the field, in 1997, when serious concern was raised after my choice of i) creating a framed experiment for a common-pool resource game in which the choice variable was to allocate "time into extracting the commons" and obtain a payoff from it and ii) to run such experiment with people who daily do exactly that choice for a living in various rural villages.

[7] At this point the reader may have noticed that I have purposely chosen to name "participants", and not subjects, the individuals we interact with us before, during and after an economic experiment. The methodological proposal includes that a change in attitude by the experimentalists can be beneficial if we consider them as participants in the research and open the possibilities that they contribute to the interpretation of the data we collect from their own behavior, specially if such behavior is similar or related to what they face daily.

In this paper I will attempt to offer some lessons resulting from seven years of running economic experiments in the field and more recently in the campus labs, focusing mostly on the problem of social dilemmas, and particularly on the so called 'tragedy of the commons' in the use of natural resources and the provision of public goods. During these years I have conducted close to 300 experimental sessions (usually ~20 rounds each) with about 1,800 villagers in more than 10 different rural villages of Colombia. The greatest share of these experiments was based on cooperation dilemmas using variations of public goods and common-pool resource games.

Interestingly, however, my interest on using experiments to study economic behavior came from the opposite direction than the current trend of inviting experimentalists to get out of their labs and run experiments in the field (Harrison and List, 2004; Carpenter, Harrison and List, 2005). The so called 'non-conventional' or 'non-standard' subjects that experimentalists refer to, were in fact the people I was more familiar with before getting involved in experimental economics when using other ethnographic and field tools for research on the issues of natural resource management. The natural step to use experiments came from the limitations to understand the behavioral motivations and micro foundations behind the decision-making of the people I had been having dialogues in the field about their use of natural resources.

There are at least three main lessons to be shared in this paper:

a. **Learning from the actual environment, institutions and incentives outside of the lab**.

The actual context, experience and familiarity of the participants with the experimental decision making environment and incentives can help us explain the behavioral variation we usually observe within and across sessions. In fact, field experiments may provide greater variance in terms of the demographics of the population sampled, and therefore help us understand the more complex set of factors affecting individual choices additional to the conventional game theoretical prediction based on a purely selfish payoff maximizers model. I will provide evidence on such claims, where the actual experience,

wealth or occupation of villagers can explain variation in levels of group cooperation because of the easiness to find socially optimum solutions, or because of the social distance among the players. Differently to the students' samples, there are prior historical dynamics, ties, or differences among the participants in one single session, and ex-post possible effects of experimental decisions and outcomes, that can provide a more complex and rich context for the experiment in itself. Now, such richness that the students population lacks, is in fact very much frequent and critical in the actual context of economic decisions being studied, e.g. in the case of rural communities using natural resources and therefore such 'loss' of control becoming 'gain' in richness for understanding the problem. Also, drawing samples across different locations with variations in the connections or similarities between the experimental task and the actual context could also provide the experimenter with greater variance for explaining experimental behavior.

b. Learning from replicating experiments in the Field Lab and the Campus Lab.

Careful replications of the same experiments in the field with students can be greatly beneficial to verify the internal validity and control of our experiments. In our own studies on group dilemmas, data from the field lab are consistent with experiments with students in the campus lab in various dimensions, while also showing shifts in the distributions that can be of value for our understanding of the problem. In general, the group outcomes in both the field labs and the campus labs show similar patterns of socially sub-optimal behavior but without achieving the individualistic Nash equilibrium prediction. Nevertheless, in the baseline case, villagers that are familiar with the common-pool resource dilemma seem to behave closer to the socially optimum solution while students' distributions are closer to the Nash prediction. Also, the distributions of behavioral responses to different treatments involving institutional solutions to the group dilemma show parallel patterns among students and villagers, yet shifts in the distributions are again significant on several cases. For example we have found significant differences between students and villagers when facing the possibility of external but imperfect regulations sanctioning over extraction of the common-pool

(students prefer externally imposed sanctions while villagers prefer more endogenous solutions); meanwhile, face-to-face communication varies much greatly in the field while extremely effective among students (Cardenas, 2005).

c. Learning from re-visiting the field lab.

Coming back to the same field location and re-run the same experiments can be a valuable experiment to observe other dynamics outside of the lab but critical within the societies or groups being studied given the longer terms that people face if compared to the rather short periods (hours or days) that an economic usually involve. We had the opportunity for three different villages to return months, even a year, later and repeat a set of experimental sessions with people drawn from the same village that had and had not participated in the first visit. Surprisingly we found substantially higher fractions of cooperating strategies in the second visit, and not only for the "experienced" participants but among the "fresh" ones. Very strong ex-ante processes of group discussions and agreements, unanticipated by the experimenter, took place previous to the new sessions and such commitments remained strong throughout many sessions. This can contradict or at least enrich the scarce literature on fresh vs. experienced subjects, and the whole concept of "learning" e.g. in the public goods literature. In our case, learning and reflection allowed for improved individual and social outcomes in the experiments, even under the baseline treatments.

2. Bringing the lab to the field and changing subjects.

In many cases our experiments involve complicated tasks, or levels of uncertainty and asymmetries of information regarding outcomes or expected behaviors by others, which will force players to find rules of thumb that help them beyond the elimination of dominated strategies or the backward induction, based on the material payoff maximizing rationale. Emotions will also play a role during the experimental decision process just as they do in uncontrolled economic settings (Elster, 1998; Rabin, 1998), and how those emotions affect choices would be part of a personal history that might not be affected by

an experimental institution or environmental variable. Instead, the experimental design might trigger or inhibit some of these elements and therefore their role needs be studied. McCabe and Smith (2001) explore a cognitive model of exchange that encompasses several factors that humans will not be able to turn off when coming into the lab, but rather will use to educate their decisions, as will be discussed later. The cognitive model of McCabe and Smith includes modules that would apply to the inside and the outside of the experimental laboratory. These include steps for detecting "friends from foes", a module for "mind reading", another for "good-will accounting" and another for "cheater detection". Before choosing to trust or reciprocate, individuals will combine information and these modules to educate their decision. In some cases the experimental design will provide the information, but in many cases much of the information may come from outside the laboratory, and be accumulated through long periods of time before the experiment happens. Thus the initial reference to Smith's remark about instructions, context and autobiographical experience. As will be shown below, these elements also include those instructions and context that the outside of the lab gives to the participants to help the cognitive process.

When we run experiments with people from non-students subject pools, we sometimes recruit them from subsets of people that are somehow familiar with the task and the model or question we are asking as researchers. Workers make part of experiments on gift-exchange relationships (Carpenter, Burks and Verhoogen, 2003), managers make experimental decisions about planning and production (Cooper et.al, 1999); Fehr/Costa Rica CEOs), bike messengers participate in experiments where effort affects wage similar to what they face for their performance based payroll (Fehr and Gotte, 2002), rural villagers are invited to games where they face risky decisions (Binswanger, 1980, 1981), face the incentives to cooperate vs. defect, or the possibility of sharing or trusting at a personal cost, just as they do when a fishing or crop harvest turns out well or not (Barr, 2001; Barr and Kinsey, 2002; Henrich et.al 2001; Ensminger, 2000; Cardenas et.al 2000; 2002; Cardenas, 2002, 2003).

The survey by Harrison and List (2004) reviews a large amount of experiments where different dimensions involve greater relevance from the field, including the subject pool, the nature of the task, the commodity used, the framing of the experiment, among others. Unfortunately for our arguments here, it makes rather little reference to issues of social preferences in the field lab and to the conducting of experiments on social dilemmas associated with the use of natural resources and local public goods within a context of poverty or institutional contexts like those in poor countries. Nevertheless, the experimental evidence surveyed in Cardenas and Carpenter (2004) of more than 50 papers with experiments conducted on developing countries or with development issues in mind shows that experimentalists are increasingly bringing the lab to the field for conducting replications of dictator, ultimatum, trust, cooperation, public goods and risk and uncertainty experiments.

One particular case of interest is that of rural groups, highly dependent on self-governed institutions and local natural resources. Theoretical and empirical support for the so called 'tragedy of the commons', starting with Hardin (1968) proposition, has been for decades debated in the literature and still without conclusive results from Ostrom's seminal work (1990) to the recent volume by the National Research Council (Ostrom et.al. 2002). The observed empirical evidence offers enough variation, from cases of hundreds of yeas of successful management of resources under self-governed institutions to formal institutional solutions that within decades collapsed entire resource stocks. Therefore, an area of promising work should be the use of economic experiments to explore the micro foundations of observed outcomes in the campus lab and the field lab. Interestingly, the seminal work by Ostrom, Gardner and Walker (1994) and the work thereafter by many confirms that aggregate outcomes and individual strategies also vary greatly, from socially oriented to individually oriented strategies and outcomes, and that changes in the institutions, even without material payoff changes, could help correcting the coordination failures. The experimental work with students could not be conclusive about the game-theoretical prediction using the homo-economicus model, and the observed data could not confirm neither reject the tragedy, although it systematically confirmed that, for instance, face-to-face communication was a powerful device to induce

cooperation. But then, if in the field most rural villages facing the possibility of the tragedy when managing their forests, firewood, water, or fisheries, could have a rather low cost environment for face-to-face communication, why in some cases it did not suffice for solving the tragedy? Once again, experiments in the field lab would be an attractive approach to better understand these questions from a microeconomic system perspective, but this time in the field. Maybe individuals bring several other elements to the game –in the lab or in their own natural daily game- that explain behavior and outcomes.

In the next section I will expand in a simple manner Smith's (1982) model of a microeconomic system by identifying examples of elements brought by players from outside the lab which, if accounted for, may enrich the understanding of what happens within the experiment. Then the paper will present some regularities observed in experiments run by the author and others, which support the argument that participants may use information from outside of the lab to guide their decision making and then there will be a much deeper exploration from a large data set of group experiments run in the field with about 1,500 villagers in different rural communities that face the commons dilemmas, with the exact same experimental design. By using additional tools in the field, in which the villagers also participated to discuss the experimental data the institutional setting as well as the environment, and by exploring some household data gathered with conventional survey methods, I will explore the possibility of such information expanding the understanding of experimental data in these settings. Further, the analysis of replications of these experiments with students will also provide some lessons and paradoxes that along the previous sections open new questions and lines of research that will be discussed at the end in the conclusions.

3. The lab and the field as an expanded microeconomic experimental system (EMES).

Smith (1982) offered a basic framework and the sufficient conditions for a microeconomic experiment, composed by the components inside the dotted line in Figure 1, which adapts from Smith's framework to include the factors that come from outside the lab but that are brought to the decision making.. I will label such framework as an Expanded Micro-Economic Experimental System (EMES). The individual decision which we observe as behavior in our experiments is expressed as a message that produces outcomes -also observable- and such behavior is a function of the institution and the environment we design in our experiment. I argue, however, that the (I) Institutions and the (E) Environment variables involve some that are brought by individuals from outside as prior individual experiences, or as norms of behavior that are common in the local context in which the lab is brought to. Still consistent with Smith, the environment, encompasses a set of characteristics associated to each individual making decisions, and as Smith suggests, are private to the player. The environment in the microeconomic system includes a number of agents and their preferences, endowments and resource constraints, and information available to them.

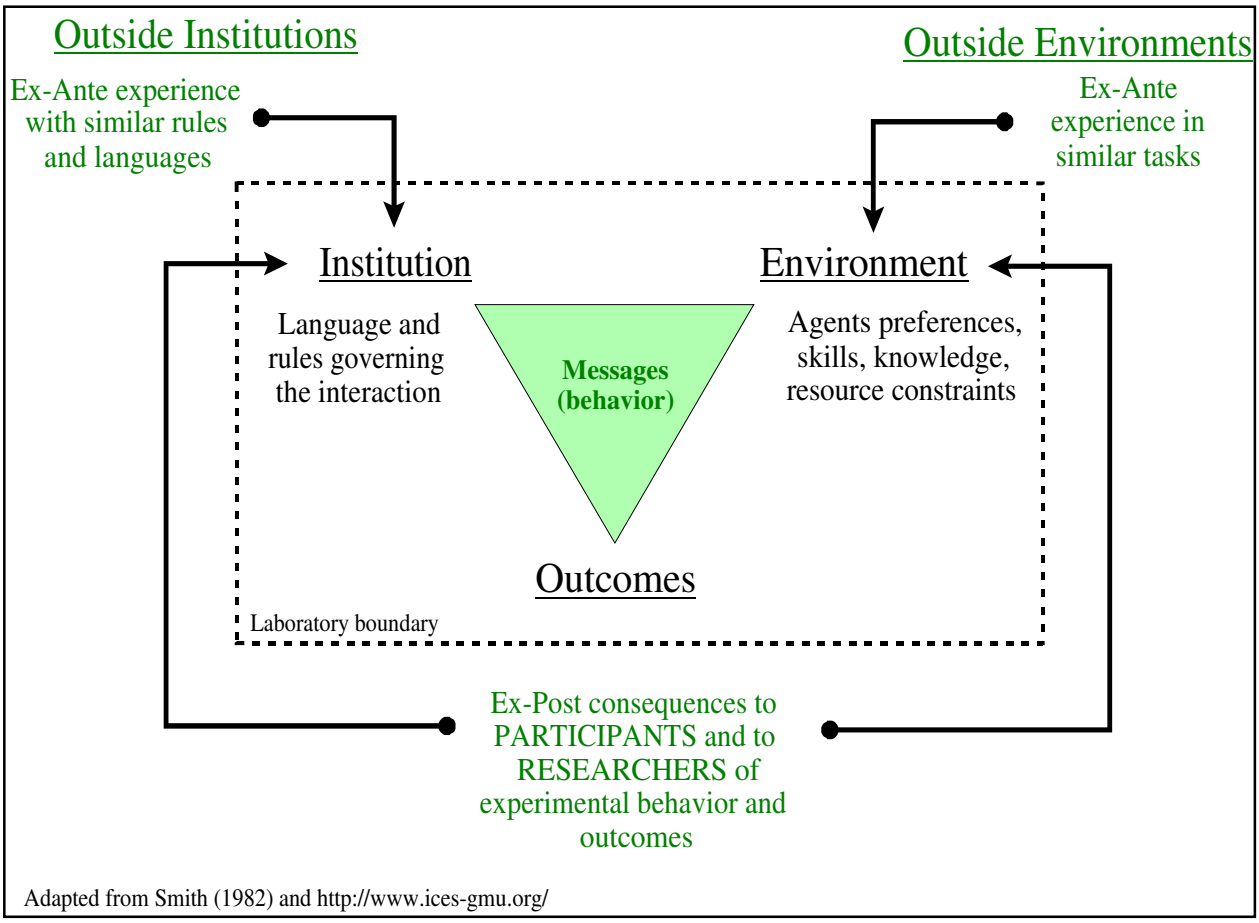

Figure 1 An expanded framework for experimental microeconomic systems (EMES) (adapted from Smith (1982).

By carefully controlling the privacy and confidentiality of decisions, and by avoiding strong framing in the instructions, laboratory experiments have been quite successful in understanding how these institutional and environmental variables introduced in the design, explain regularities in behavior and outcomes, observed throughout many replications of experiments. This control and isolation has served successfully the purpose of consolidating the internal validity of experimental economics. But isolation has also been subject to interesting debates, including that of external validity (Loewenstein, 1999, Loomes, 1999a, 1999b). Such question has been effectively addressed, for instance, by the clarity and replicability of competitive market settings where theory, field observation and experimental data seem to converge. But also, the

design of a competitive market institution involves in itself –in the lab or in theory- that with minimum conditions of information and rationality the socially desirable outcomes emerge naturally and in a decentralized manner with no central planner. The contracts are complete and no coordination failures exist, which is not the case of, for instance, institutions and environments with social dilemmas.

Other experimental settings have shown, however, that behavior can be very sensitive to manipulation of conditions, and divergences with the original theories have created a demand for new alternative models. Ultimatum, Dictator, Trust, Public Goods, Common-Pool Resource games have shown among other i) divergence from canonical models of self utility maximization of material rewards, ii) sensitivity to experimental conditions such as information available, framing of the instructions and composition of the environmental variables, and nonetheless, iii) certain regularities in behavior across settings or even subject pools. The equal split observed in many replications of Ultimatum and Dictator games is an example. However, the larger variation in behavior that the widely study on the 15 small scale societies (Henrich et.al. 2001) found for the dictator and ultimatum games across sites, and which could be correlated with certain characteristics that the ethnographers found varying across the 15 groups, is a clear example of the gains from changing the subject pools.

In many of these games that involve trade-offs between one's payoffs and payoffs of others, we can infer that preferences are interdependent and therefore the externalities within the experiment open the question for other-regarding preferences playing a role in explaining deviations from the canonical model prediction. Reciprocity, fairness and altruism are examples of better predictors of behavior when preferences are interdependent within experimental groups. In fact Smith (1982) discusses this issue within his Precept 4 (Privacy) by exploring the case of interpersonal utilities, but suggests that we provide subjects with less information about outcomes of others to avoid the problem. The natural field, however, cannot avoid always this information problem. In fact many modern institutions and cultural changes offer now more information about the

impact of one's actions on others' well-being. Environmental or consumer groups, research centers, political advocacies and the press are examples.

How these factors affect experimental behavior may be controlled for within the experimental design, but individuals who participate in the experiments surely have had prior experiences in related situations and may have internalized norms of behavior that could become handy when facing the task presented in the lab. Further, participation in the experiment may have ex-post effects that can be part of the information that the individuals use for their decisions. As opposed to college students[8] where anonymity and privacy before, during, and after the experiment are more common, experiments in the field lab involve groups of people that have a better good-will accounting (McCabe and Smith, 2001) of each other as they share the same company, trading floor, warehouse, village, or fishing lake. Therefore, information that comes from the field into the experiment (See Figure 1), and information that leaves the experimental lab back into the field make part of the microeconomic system and, as a working hypothesis, should be accounted for when studying experimental data, specially if the lab goes to the field where the boundaries of the experiment are more permeable, as it is discussed below. Guth, Kliemt and Peleg (1999) say it clearly: *'...in the real world human decision-making is located somewhere between the extremes on which standard models focus. It is influenced by the expected future and by the experienced past'.*

4. Evidence of field determinants of lab behavior.

One of the major advantages of running experiments in locations different from the campus lab, and in settings different from industrialized western settings, is that a greater variability of conditions can help explain the role of institutions in behavior. Some of the reported experimental data, even if gathered from students as the subjects, can provide some light on the kind of information people bring into the lab to help them make their decisions.

[8] Unless there are experiments run within a same class where students know each other and where they may use information afterwards about behavior or outcomes in an experiment.

As Vernon Smith suggests in the quote at the start of the paper, such information is autobiographical, and can come from individual experiences or from the local context of the person and the others within the same experimental session. The personal experience can be with similar tasks or with institutions, rules or languages similar to that replicated in the experiment. Also, the good-will accounting (McCabe and Smith, 2001) players may have about the other players in their experimental session, can come from pre-experimental situations and in many cases seem to be playing a role in their behavior within the experiment, as well as affecting the updating of the same good-will accounting that may happen outside and after the experiment[9].

Henrich et.al (2001) study 15 small-scale societies through a set of experiments and argue that group level information about returns from cooperation in similar tasks, and integration to the market help explain more prosocial behavior by participants in their experiments, measured by mean offers in an Ultimatum game. They argue, however, that individual level data about the players does not help explain variations in behavior. In any case, the local context around the lab setting is playing a role in suggesting norms to the players, and also in giving clues of how to play the game. Ensminger (2000) reports in her public goods experiment in Kenya that once players recognized it as the *harambee*[10] game, a norm of more cooperative behavior emerged within the game.

Cooper et.al (1999) created an experimental design where planners and firms interact in an economic system heavily planned, and they had students as well as Chinese managers and white collar workers participate in the games. They find among others that when the context was explicitly posed as a case of planners partially informed and firms choosing outputs, actual managers from China behaved more strategically than under the unframed experimental design, and argue that their bringing prior experience about planned

[9] Privacy, although guaranteed by the experimenters through consent forms, cannot be sustained long when villagers, neighbors, coworkers, share information about earnings and even decisions. I have observed this phenomenon systematically in many villages when we invite people to discuss the results.

[10] Similar terms exist in the Latin American context (*Minga, Convite, Mandato*) for tasks where voluntary contributions, mostly in labor and kind, produce a public good such a maintaining a road, an irrigation system, building a school, etc.

economies and economic decisions induced a different behavior. However that was not the case for students participating in the experiment.

Another study with differences found between students and non-students is reported in Potters and van Winden (2000) who conducted a signaling experiment to explore the lobbying process with 142 students and 30 professional public affairs and public relations officers from the private and public sectors. The authors' justification for such design is centrally valid here, students do not have experience with lobbying and one could learn from observing professionals in a more controlled setting. In their case, professional lobbyists behaved much closer to the theoretical prediction but also obtaining higher earnings than students.

Studies where certain demographic characteristics of participants provide also support for the expanded microeconomic experimental system. Gender has been part of the explanatory variables to be tested, with ambiguous results though. Eckel and Grossman (1999) provide a survey of the literature studying gender. Croson and Buchan (1999) explore the role of gender in a Trust game and compare results by gender across a sample of subjects from China, Japan, Korea and the United States, and find no significant differences across countries, and slightly higher levels of reciprocity by women.

In the field, Barr and Kinsey (2002) argue that the role women play in social sanctioning is more effective than in the case of males, and such behavior is clearly expressed in their experiments where also women show more cooperative behavior. Ruffle and Sosis (2002) explore cooperation and in-group effects for Israeli cities and Kibbutz, suggesting from his data on one-shot game anonymous cooperation experiments that members of the latter were more likely to cooperate with another anonymous member than with an anonymous person from the city. However, he finds that the longer the person has stayed within a Kibbutz, the less level of cooperation is observed with another fellow member.

Accounting for the particular major of the student participating has also been a focus of attention. Early experiments in the 1980s asked whether economics majors showed

higher levels of free-riding with modest strong results (Gerald Marwell and Ruth E. Ames, 1980; R. Mark Isaac et al., 1985, reported in Ledyard, 1995). More recently, Charles Cadsby and Elizabeth Maynes (1998) reported that nurses showed higher levels of cooperation than economics and business students in a threshold public goods game. These results would also be consistent with the work by Robert H. Frank et al. (1993) on the behavior of economics majors being closer to game theoretical predictions. In another study, Axel conducted an experiment with a unique opportunity historically by observing behavior of university students in a now unified Germany, but taking into account that some of them were raised at one or the other side of the Berlin wall. They found that East German participants behaved less cooperatively than West German ones in both public goods (ten rounds, 5 person) and solidarity (one-shot, 3 person) games, and attribute this to students raised in East Germany being raised at the end of a centrally but inefficient economic system where opportunistic behavior regarding public goods was more frequent.

Peter Kollock (1998) provides data from a set of prisoneŕs dilemma experiments studying how group identity has a direct effect on cooperative behavior. The behavior of college students changed depending on the information they received about the other players (being from the same fraternity, from any other fraternity, from the same campus, from another campus, from the police department). Significant changes in behavior were found consistent with the existence of strong in-group/out-group effects (see John Orbell et al., 1988).

5. **Lessons and paradoxes from cooperation experiments in the field.**

A closer to look to some experimental data from the field and the campus labs will offer more detailed evidence suggesting the existence of such relationships between the basic microsystem and the field context of the participants which form the expanded microeconomic system. In some cases the relationships are clear explanatory variables of

experimental behavior observed, but in others the relationship is more of a puzzle to be explored.

a. Cooperation in the campus and the field labs.

The original work by Ostrom, Gardner and Walker (1994) on Common-Pool Resources opened a major area of experimental research. Replication of similar experiments in the field has confirmed, among other results, the basic finding that under a non cooperative game setting in which players cannot communicate with each other and where decisions remain private and confidential, average decisions do not confirm the prediction of rent dissipation or the so called "tragedy of the commons" (Hardin, 1968), neither they achieve a socially optimal solution. A major part of the literature on CPR and VCM experiments also suggests that if the game is repeated, a significant fraction of players are willing to cooperate in the initial stages, but that such cooperation seems to erode over time as there are no coordination mechanisms, and negative reciprocity induces those same players to start increasing their level of appropriation of the common-pool, or for the case of public goods, they reduce their individual contributions (OGW, 1994; Ledyard, 1995).

Previous experiments in the field conducted by the author also provide support for the arguments discussed before. Group composition and task experience were found to be associated with experimental outcomes in a a set of experiments where groups of eight participants went to a sequence of non-communication and then face-to-face communication rounds in a CPR experiment. In Cardenas (2000) I show that the fraction of players that reported an extractive activity (e.g. fishing, wood logging) as main economic activity was positively correlated (Pearson coefficient = 0.5732, p-value=0,0832) with the gains in group efficiency achieved in the communication stage as compared to the previous stage. Likewise, the fraction of players reporting land as their main income source, was negatively correlated (pearson = -0,7156, p-value=0,0200) with the same group level outcome. The data is shown in the following table from that article, for the ten sessions (groups). The last two columns show respectively the % of the eight

participants that reported extracting a natural resource as his/her main occupation, and the % of players reporting private own land as the main income source, which would measure the inverse of income dependence on a common-pool resource. The first two columns show the social efficiency achieved during the experiments for the last 3 rounds of the stage 1 and the stage 2 where face-to-face communication was allowed.

Table 3. Changes in experimental social efficiency and actual economic context of participants.

Group	Social Efficiency (End of stage I)	Social Efficiency (End of stage II)	Change in Social Efficiency	% of players with extraction of resources as main occupation	% of players with land as main income source
CEW41	62.35%	29.09%	-33.26%	0.00%	87,50%
CEW42	70.85%	77.16%	6.31%	0.00%	75,00%
CES12	49.66%	76.20%	26.53%	0.00%	25,00%
CES11	68.39%	72.48%	4.10%	0.00%	50,00%
CNW42	49.55%	59.52%	9.97%	12.50%	25,00%
CNS12	61.16%	62.50%	1.34%	12.50%	37,50%
Avg 10 groups	57.74%	68.52%	10.78%	22.50%	37,50%
CNW41	37.93%	76.05%	38.11%	37.50%	25,00%
CNS11	53.17%	53.92%	0.75%	37.50%	50,00%
CQW41	81.82%	84.83%	3.01%	50.00%	0,00%
CQS11	42.55%	93.49%	50.94%	75.00%	0,00%
Coefficients of Correlation with % change in Social efficiency:				0,5732	-0,71560
(Pearson Correlation test) p-values:				0,0832	0,02000

Source: Cardenas (2000).

Also, in Cardenas (2002, 2003) an exploration at group and individual levels of how the actual wealth of the participants may explain the willingness to cooperate in the experiment, and how wealth inequality within groups seemed to constrain the possibilities of the group to increase social efficiency through communication. In particular, greater average wealth within the group, and greater inequality in the distribution of wealth within the 8 participants in the game were negatively correlated with the social efficiency achieved by the group in the face-to-face communication rounds in the game.

Notice that in these experiments involving group externalities, individuals face a more difficult task in the sense that there is uncertainty regarding the behavior of others in their group, and a wider set of possible outcomes which depend on a non-linear payoffs function, as opposed to Ultimatum or Dictator games where the range of choices are simpler and there is more information about the distribution of possible outcomes. According to our audio and video data from these experiments, experience in previous similar tasks, seems to guide the behavior and agreements during the communication rounds, but also the prior information they have about themselves and others in the group may enhance or inhibit the willingness to cooperate as it seems to be used to administer the good-will accounting they have about the others and therefore judge their best response in the next round.

b. A larger data set of a non-linear public goods game (field vs students). After the experiments mentioned before, we developed a new experimental design[11] for a group dilemma, where the payoffs structure had some non-linear properties of a common-pool resource game but also with a dominant strategy as in the case of public goods, for analytical simplicity. The design again included two stages of 10 rounds each, and groups of 5 players who had to decide their individual level of extraction of a resource or common-pool (discrete choices were between 1 and 8 units). For this design the social optimum solution occurs when every player chooses 1 unit of extraction and the symmetric Nash equilibrium prediction is when every player chooses her maximum allowed extraction, i.e 8 units, being a dominant strategy for every player to extract 8

units. The data, during the first 10 rounds of the same incentives, experimental institution and environment, shows that in average, the group outcome confirms similar results from the campus lab, although the decay in cooperation (increase in appropriation in our case) is not as severe as in other works. About 200 sessions were conducted, for the first 10 rounds exactly equally in terms of design, incentives, rules, etc. The sample was then

[11] Developed with Ernst Fehr and field work funded by the Preferences Network.

divided in different treatments for the second stage of the game where we introduced different institutions on self-governance and external regulations that are beyond the scope of this paper.

If we focus on the large data set for the first ten rounds, and compare the data between villagers and students behavior, we can derive some interesting results. The following Figure 2 shows data for rounds (1-10) during 187 sessions x 5 players (i.e. 935 people) under same design in stage 1. 145 of the sessions were run in the field with villagers and the remaining 46 sessions with students. Recall that if players follow the prediction of the Nash equilibrium the average extraction should be of 8 units, while the social optimum would be achieved if the total extraction was of 1 unit.

The average extraction (choice variable) and one standard deviation above and below the means are graphed over the ten rounds. Clearly, and statistically different, villagers maintained their extraction below the students and with no sign of trends towards more free-riding over time. Notice, for instance, that the last round effect is clearly marked for the students while inexistent for the villagers.

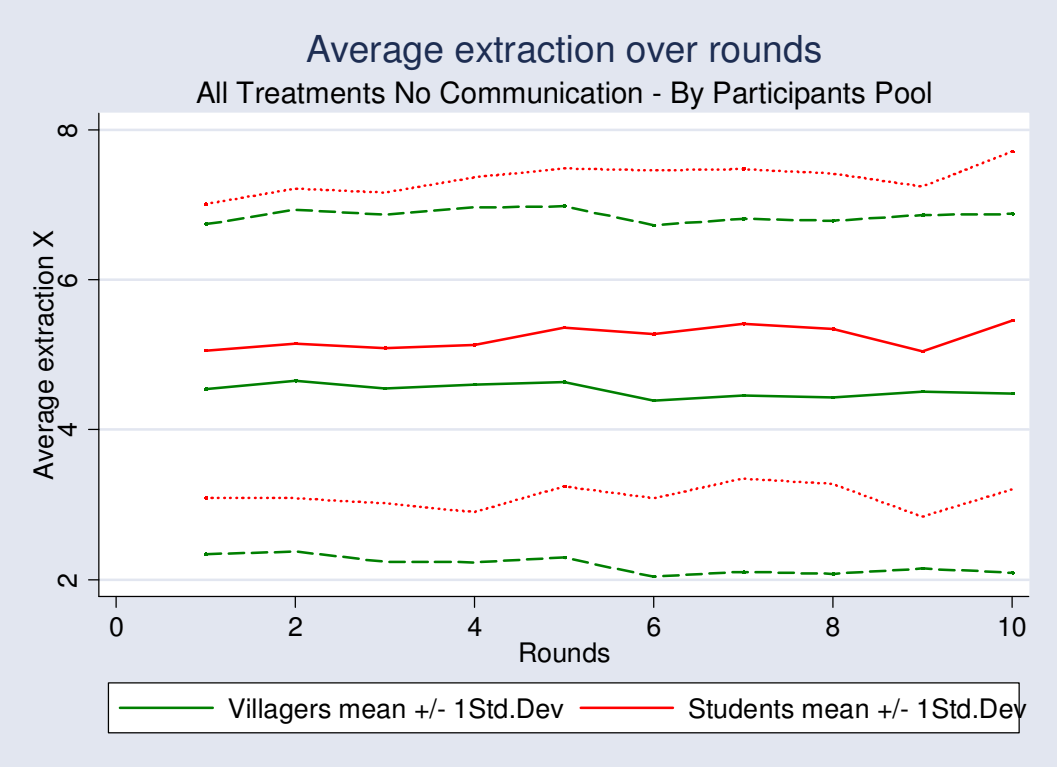

Figure 2. Group extraction during the first 10 rounds (no-communication) for students and for villagers. (Two-sample Wilcoxon rank-sum (Mann-Whitney) test, n=9350 observations, z = 12.698, p-value = 0.0000.)

Further, for 13 of these sessions we conducted a baseline treatment for the next stage, i.e. the entire set of 20 rounds remained under the same treatment conditions. The average behavior is shown in the next Figure 3. The trend and patterns are similar (less smooth as sample is smaller), but also, for the second stage one observes two phenomena previously reported in the literature of public goods. On the one hand, the "repeat" effect in round 11 (Andreoni), much more marked for the case of students, but with very short term effects, and the trend towards more free-riding over rounds for students while flatter for villagers.

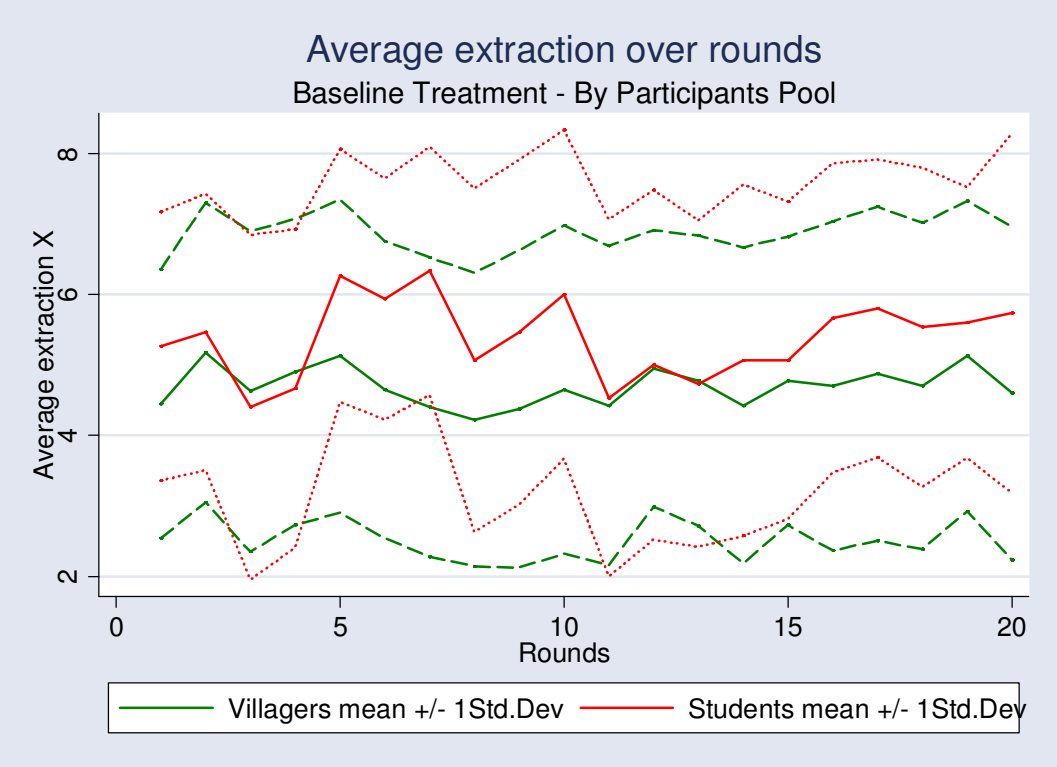

Figure 3. Baseline treatment for 20 rounds (students vs villagers). 8 sessions x 5 players + 3 sessions x 5 players. 20 rounds in each session. Two-sample Wilcoxon rank-sum (Mann-Whitney) test, for the 1100 observations, z = 4.693, p-value = 0.0000.

Although the differences may look small, a look at the individual data and distributions can provide additional lights. As shown in figure 4 with the distribution of individual decisions for the same sample, the students' data suggests a unimodal skewed distribution where most of the decisions approach the Nash equilibrium prediction and fewer decisions are closer to the lower extraction levels. Meanwhile, the data from the field experiments suggests a bimodal distribution where there are two peaks, one closer to the cooperation level and another close to the maximum extraction. This difference yielded a higher level of group and individual earnings for the villagers as free-riding was less frequent in their sessions.

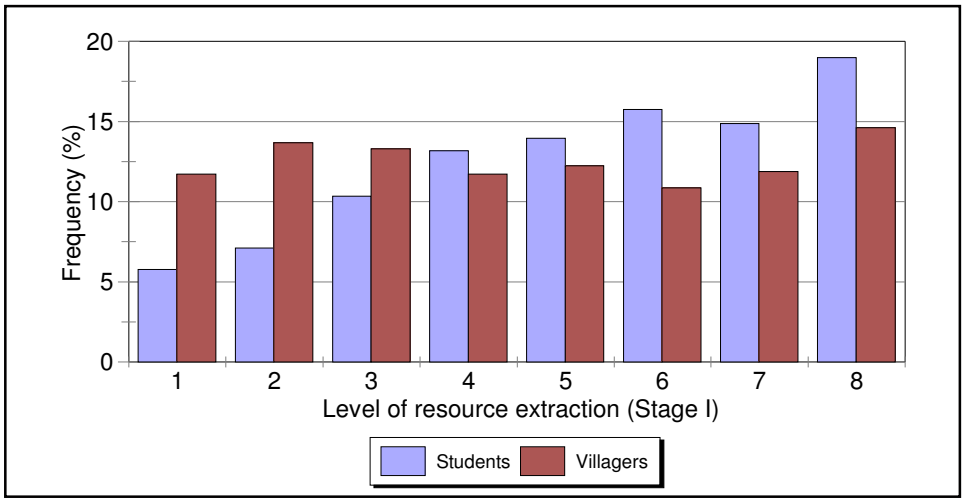

Figure 4. Distribution of decisions across the strategy set (villagers vs students).

A look at the evolution of such distributions over rounds (Figure 5) shows that students seem to behave much closer to previous experimental work in campus labs, with an increasing number of decisions over time towards the highest level of extraction. However the right panel of the figure shows how the data from the villagers is, if we can say, noisier and more difficult to analyze. Although the frequency of decisions that are closer to the maximum extraction in this case seems to be non negligible, the fraction of decisions that are closer to the social optimum levels is much more frequent in the field lab.

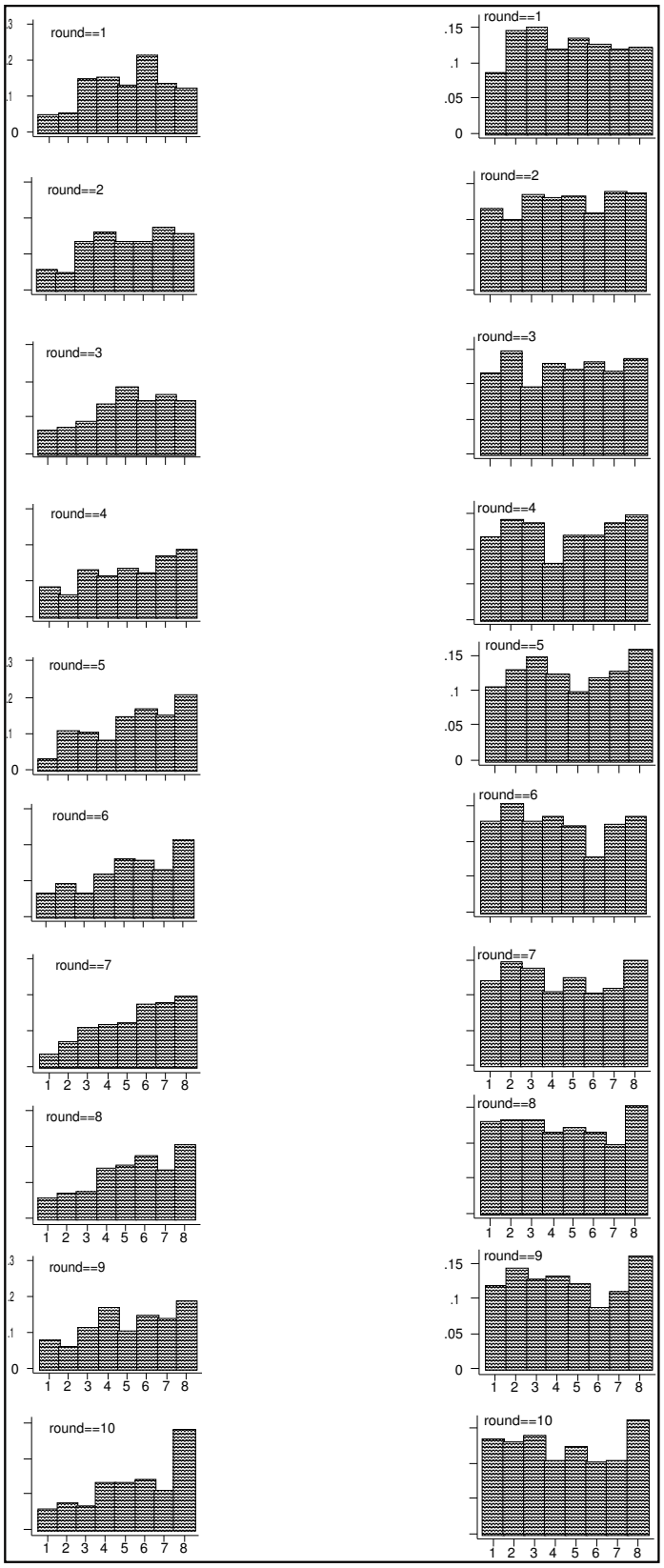

Figure 5. Distribution of choices over time (rounds 1-10) students (left) and villagers (right).

Debriefing of decision making with the villagers suggests that there was a permanent tension between trying to reduce extraction to see earnings increase, and responding with higher extraction levels when they observed that the rest of the group was increasing theirs. However, it is also interesting, looking at the individual data, that there seems to be an upper threshold –well below the Nash equilibrium- of aggregate extraction that induces an immediate reduction by the majority of players without any coordination or communication during this first stage. Notice that increasing individual extraction, at any level of group extraction, is a dominant strategy in this experimental design[12]. It is the case also that a lower threshold also induced most players to increase their extraction when the level of cooperation was sufficiently high as the gains from free-riding seemed higher.

For a subset of sessions where we introduced external regulations during the second stage, and compared different behavioral responses between students and villagers and also allowed them to vote in favor or against the implementation of such regulations, we found again differences across subject pools (See Cardenas 2005 for more details). The villagers were found more opposed to external regulatory interventions than the students and reject such regulations more often than do the students. But they were more inclined to cooperate under a non-regulated setting than students during the second stage.

c. The puzzle of re-visiting the same village: meta-games or social norms learning?

The available funding for this research allowed us to return to some villages we had visited in previous months under another project, three in particular, and replicate the same experiments and explore other treatments. Comparing such new data set with the same design, and for the same 10 initial rounds, shows some striking results that enrich

[12] In this sense there is a difference with the classical common-pool resource design (OGW, 1994; Cardenas et.al, 2000) where interior solutions do not produce a dominant strategy. However, this design shares with the common-pool design the non-linearity of the payoffs surface while the linear public goods involve a constant marginal returns from free-riding, while such rate is decreasing in this and the classical commons case.

our discussion about an expanded microeconomic system in which local dynamics outside of the field lab may play key roles in our analysis. Elsewhere (Cardenas and Carpenter, 2005) we discuss in more detail such findings and their implications regarding the use of experimental methods for interventions, and development in general. Here let me just compare the data from the first and the second visit for these three villages[13], and discuss the implications within the scope of this paper.

The following Figure 7 shows the distribution of decisions for all three villages during the first 10 rounds where no communication was allowed.

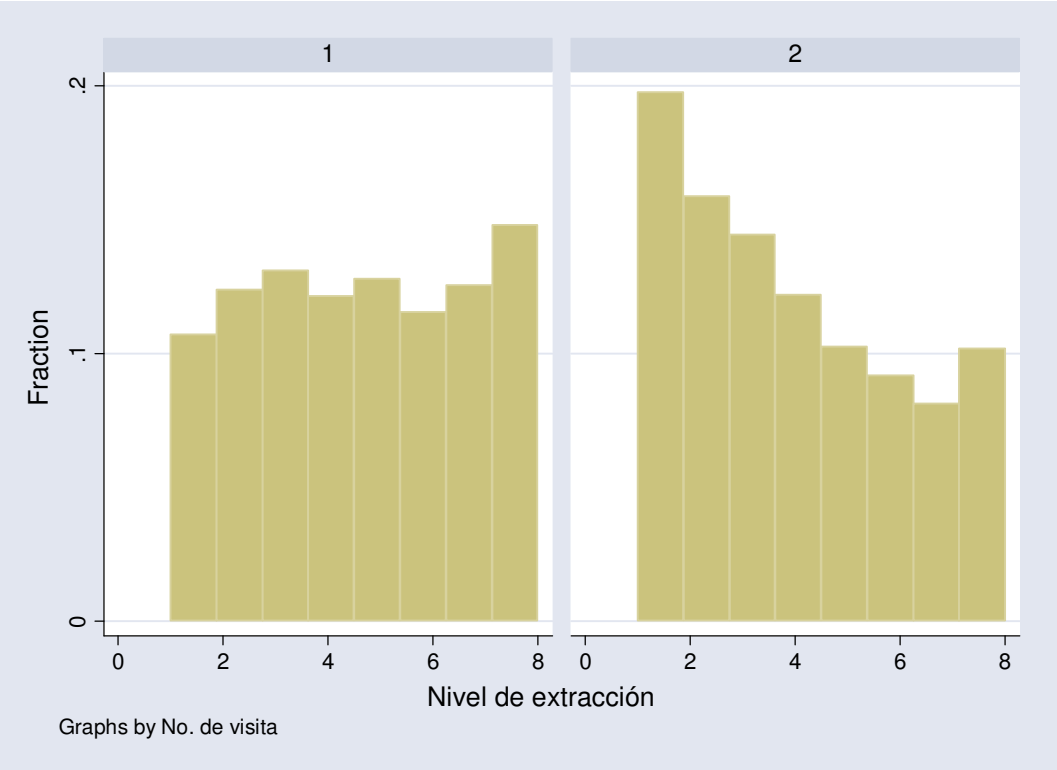

Figure 6. Distribution of decisions (level of extraction), 10 rounds, no-communication, for same 3 villages during first visit (left) and second visit (right).

[13] The comparable sample for these 3 villages included a total of 80 sessions in the first visit (400 participants), and 32 sessions during the second visit (160 participants). The comparison is for the data from the 10 rounds in the first stage.

The left panel shows the data for those three villages during the first visit, and the right panel shows the distribution for the same design in the same villages for the second visit. The second visits occurred respectively 6, 15 and 20 months later for the three villages. The length of time between visits does not seem to explain the differences. The difference in distributions deserves some discussion. Clearly during the second visit there was a norm or rule of thumb for these players. In fact a closer look at the data along rounds, right from the beginning of round 1 this type of distribution appeared, and was sustained along this first stage of the game. It was only in round 10, as usually found in the last round effect, the peak to the right of the graph decreased shifting to a larger fraction of free-riding decisions, looking closet to a uniform distribution.

As we usually do, couple days later we conducted community workshops in these three villages and discussed such radical change in decisions. The consensus was that "they now knew how to play the game", which by the way they knew from the first visit as the debriefings showed how players had understood the structure of the incentives by the end of the experiments. Thus, one could argue that what they knew this second time is that "trust and cooperation could be sustained and would be profitable" and that "cheap talk", outside of the lab, does produce effects before coming into the lab.

A second argument in favor that such norms emerged not only within the rationale of the players (individual learning) but within the village (group learning), emerges from comparing the data for the participants who had been in both visits with those who came to the second visit for their first time. The recruitment for the second visit was made under the same manner, and when asked if people that had been in the first time was allowed, we agreed but also encouraged other people to also come. In Figure 7 there are the two frequency distributions for the two sub-samples, showing that the distribution of strategies were similar regardless of whether they had the individual learning or the group learning.

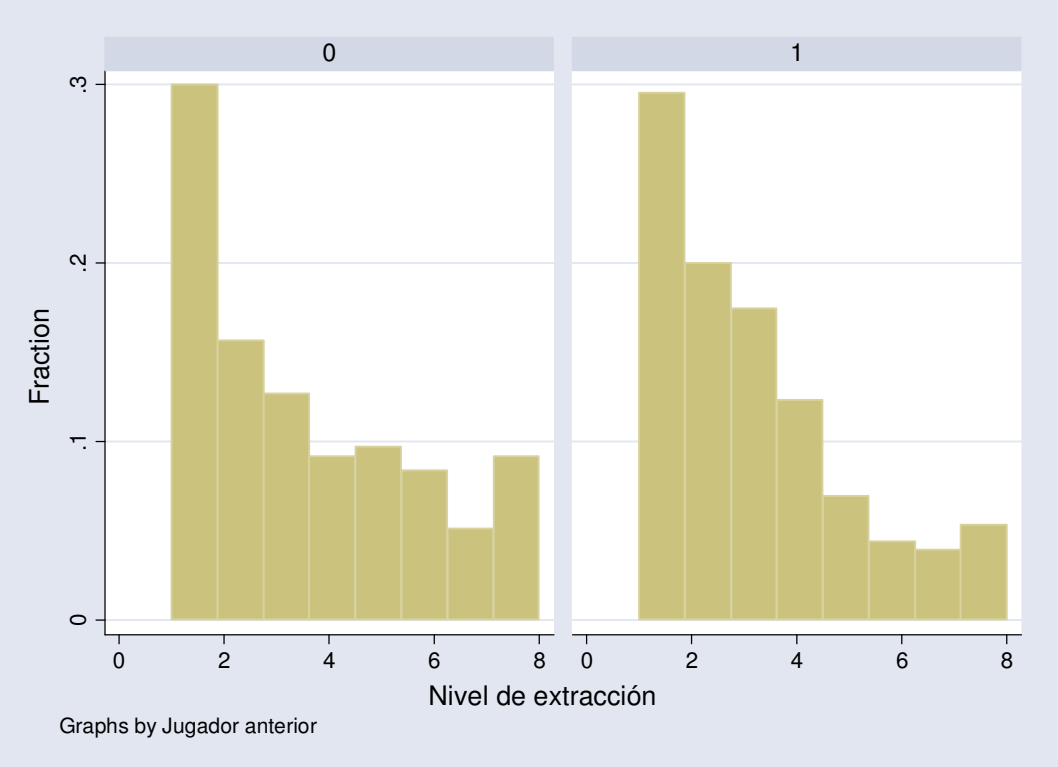

Figure 7. Distribution of decisions (extraction), first 10 rounds no-communication. Left panel: people that did not participate in the first visit, right panel: experienced players.

An alternative explanation, although not mutually exclusive with the previous one, is that of the possibility of a meta-game where the experimenter, by bringing external money, becomes a player in a possibly repeated game. Once the rumor in the village spread about a second round of experiments, people would rapidly distribute the rule of thumb of choosing low levels of extraction to make sure more money from the researcher remained in the village.

Given the experience during the first visit, that despite the researcher maintained decisions private, many people shared information about their decisions and earnings, fear from being discovered choosing fee-riding strategies given the group norm being spread, would impose great costs to such players. Notice the especially high incentives for those "experienced" players once they have heard the spread rule of thumb to choose

low levels of extraction in the second visit. However the data shown in Figure 7 suggest that strategies across experienced and fresh participants in the second visit were distributed very similarly.

I would argue that such explanations do not rule out the possibility of the individual and group learning of cooperative or pro-social norms as part of the expanded microsystem proposed. Basically the pre-commitment before the experiments started, even if only instrumentally for reaping more cash from the experimenter, shows to be effective along with the cost of social punishment outside of the lab -but within the extended microsystem, which illustrate how groups device self-governed mechanisms to produce collective action.

6. **Conclusions and the research ahead.**

"...I was then utterly astonished at Sedgwick not being delighted at so wonderful a fact as a Tropical shell being found near the surface in the middle of England. Nothing before had ever made thoroughly realise, though I had read various scientific books, that science consists in grouping facts so that general laws or conclusions may be drawn from them." **Charles Darwin, Autobiography**, Cambridge, 1828-1831.

Maybe this paper could have been titled "bringing the field to the lab" as I have been inviting experimentalists to learn more about the context in which our participants live to better understand what they do in our campus or field labs.

This paper has emerged from a set of phenomena observed by the author in the last few years of running experiments in the field, and from the increasing literature on experimental work in the field. The intention has been to derive lessons for researchers in both campus and field labs, so that we can understand better what we observe on behavior and outcomes as a result of designing and controlling for institutions and environmental conditions in our experiments. The need to continue strengthening the internal and external validity of experimental economics is the main justification for the effort, and given that there are still variations in the experimental and field data to be explained by our models in many settings of economic and social exchange.

A major proposal along the paper is to expand our basic microeconomic system (Smith, 1982) into a more complete one -which I have labeled Expanded Micro-Economic System- that encompasses information that may flow as a result of participants bringing their own prior experience, rules, norms, prejudices and other information that could be used strategically within the lab, as well as information that may flow from the lab to the

outside field, and which may influence the decision-making as well as a result of players' expectations about the effects of their decisions outside of the lab, which might be significant at least for the case of experiments run in the field. Such expansion of the microsystem can also involve our campus labs, as students also bring elements from outside the lab to help in their rationality and task. Experiments in which there is less risk and uncertainty or less conflict between one's preferences and consequences to others, such as competitive markets e.g. double-auctions, there will probably be less information used by the players to guide their experimental decision-making.

Ortmann's (2005) concerns with field experiments creating a trade-off and an extra cost in losing control for gaining realism can however be qualified. He highlights possible losses of control from translation of protocols, experimenters' effects in the field, and uncontrolled variations from different experimenters across sites, among others. In the experiments conducted and reported above, all sessions in all villages were conducted by the same experimenter or his team of research assistants, all of which had the same affiliation, same mother language and same as instructions and participants'. The exact same scripts from the protocols were read to the participants in the original language they were written, namely Spanish; instructions were read out loud to all participants in the same session and all questions were solved to the entire session group in order to avoid one-on-one possible differential effects on players. These are not costly measures to take in order to maintain the costs in experimental control while increasing the gains in relevance and realism for purposes of external validity.

There are concerns being raised from other methodological approaches involving hypothetical or experimental elicitation methods of individual preferences, mentioned by Harrison and List (2004) but also carefully analyzed in a meta-analysis of the problem of hypothetical bias in stated preference valuation methods using hypothetical and actual values (Murphy et.al, 2004) who suggest that studies based on students may have some biases and shifts in the distributions than with other populations.

The results reported above also show differences between students and villagers that daily face the dilemma of the experiment. The latter seem to behave in a manner that is slightly closer to a more socially desirable behavior, although not yet optimal, while students seem to behave closer to the homo-economicus model of individually oriented strategies. However, most of the experimental literature on common-pool resources is still based on student populations. Thus, possibilities for calibrating results using replications of experiments and sampling across sites with different backgrounds or contexts may seem to be a natural next step in the research agenda.

In Cardenas and Carpenter (2003) we discuss in more detail the few systematic evidence available on studying the question of experienced vs fresh students. This should be also matter of careful research, and in the same line of research suggested here, it would benefit if those students were more actively involved in the discussion of how their evolving rationality and rules of thumb when returning to the lab for one more session.

In summary, the paper offers a set of evidence suggesting that players, students or not-students, bring elements of information to guide their decision, and such information can be about their individual, group or context characteristics. Examples mentioned here include cultural background, group identity, gender, prior experience, wealth or social status, all of which come from the outside of the experiment, and enter to the environment (E) and institutions (I) that our experimental microsystem involves. Further, there might be information (messages) that our experimental microsystem sends to outside of the lab, and that can provide additional information to participants when entering the experiment either as ex-ante information or in future participation in similar or different experiments. Thus, the instructions that individuals receive in the experiment include not only what researchers read to them, but 'instructions' they have read before coming into the lab. How they combine them remains unsolved.

Similar reflections deserve attention with regard to ex-post effects un accounted for in our conventional experimental designs. Privacy and anonymity which we guard with great care in our protocols does not necessarily remain when our participants walk out of

the lab and interact with others in the community. Strategic decisions in the lab may bring other non-monetary payoffs to participants in later situations, such as prestige, social recognition or political capital. Either at individual or group levels, there might be incentives for the participants to create a "warm glow" effect towards others or even the experimenter in case there are possibilities for future experiments being conducted. Once again, these are deviations from the canon in experimental designs, but are very common factors in how the social interactions happen within certain communities throughout the world, e.g. with development or funding agencies, donors, or the local government agents.

At least three major future research questions result from bringing the experimental lab to the field and which might become interesting areas of inquiry in the coming future.

One emerges from the fact that people we invite to participate in our experiments bring into the lab important information that they combine with the experimental institutions (I) and environmental (E) variables we induce in our design. How much of the external I and E they leave out of the field lab, and how much they use into their decision making should be matter of detailed research. We need to continue designing tools to separate and study external and lab factors that explain behavior, particularly if they are confounded in people's decisions in the lab. Framing of experiments can be enhancing or contradicting with what the actual context of the players is. Such was the case with the experiments in the People's Republic of China (Cooper et.al, 1999) where the managers who faced instructions framed as a planned economy for firms decisions, they chose more strategic actions.

A second lesson for those interested in field experimental work emerges from the fact that our participants may well be part of the research analysis as they possess private information researchers do not have about their lab behavior, as well as their field behavior, and that cannot be fully observed in the behavior they show in the

experiment[14]. Even in the case of campus labs, students participating in experiments could become part of the research process, provided that a well controlled design and assuring the privacy of decisions do not induce certain strategic behavior by participants ex-ante, based on their expectations about participating in the discussion and the revealing of certain information that may impose social costs such as we have observed in the field. Such invitation should be made, I would argue, after the experimental sessions were concluded and either at random or as a voluntary activity once the researcher has a fair idea of certain patterns in the data and remaining questions.

One example came from the experience in explaining the game to students and to villagers. While the former often had to raise their hands to ask for "clues" on how to play, asking questions like "but… what are we supposed to do?", villagers often commented me that although the payoffs tables were confusing, they tried to use their personal experience in "not extracting too much" to maintain the resource stock for the next round, but when the resource seemed to be in good shape, slight increases in extraction were often chosen. Notice, however, that the game did not have dynamic stock effects, but they used their prior experience as a clue for solving the group dilemma.

A third line of inquiry is that of meta-games where experimenters become players in the game as their bringing endowments of research cash induces certain strategic behavior that might not happen if such external resources were not brought from outside. The concern on what kind of role experimenters may play in these experiments is still an open question. Although Frank (1998) reports that the experimenter effect in UG might not exist, when he compared cases in which he burned in front of players payoffs not earned to the control case, there is still room for players being influenced by other possibilities for an experimenter effect. For instance, participants may assume that researchers can

[14] Let me give you an example of how we need to establish dialogues between participants and researchers to better understand not only behavior and outcomes but also experimental designs. Abigail Barr (personal communication), in her experiments on risk pooling in Zimbabwe, had to drop the mechanism of flipping a coin to decide which option in a lottery would be awarded to each player, because women do not know how to flip a coin like men do and therefore argued it would not provide a fair toss. Further, Barr also mentioned how her "public shame" experimental design (Barr and Kinsey 2002) emerged as well from a discussion with people in the field after the canonical public goods game.

link behavior data to individuals within a certain group where they play a certain role, or there are possibilities for players assuming that the field experimental data may have a future use for government or donor agencies now that the notion of social capital for development has become central. Further, many of the experimenters working in rural areas have maintained or plan to maintain a long run relationship with the communities which may impose a supra-level set of non-material incentives that must not be at least ignored in our analysis.

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