EconomEtica

Centro interuniversitario per l'etica economica
e la responsabilità sociale di impresa
promosso dalla Fondazione Italiana Accenture

N.30 June 2011

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Working papers

# *Public disclosure of players' conduct and Common Resources Harvesting: Experimental Evidence from a Nairobi Slum**

*June 2011*


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## Abstract

We evaluate the effect of information disclosure on players' behaviour in a multiperiod common pool resource game experiment run in an area of notably scarce social capital such as the Nairobi slum of Kibera. We document divergence of average withdrawal rates across time with an increasingly lower cooperation in the non anonimous setting. We demonstrate that information induced asymmetric conformity contributes to explain what we observe, that is, players who withdraw less than the average of the group in the previous round react more negatively when individual payoffs are disclosed than when they are not, and their reaction is less than compensated by the mean reversion of those who withdrew more. Our results are consistent with the (Ostrom, 2000) hypothesis that, in absence of punishment, disclosure of information about individual (cooperative or non cooperative) behaviour makes common resource management more difficult and tragedy of the commons easier.



**Keywords**: *common pool resource game, conformism, information disclosure field experiments, tragedy of commons.*

***JEL Numbers:*** C93, Q20, H40.



We are extremely grateful to Sergio Beraldo, Tilman Brück, Jeffrey V. Butler, Alessandra Cassar, Luisa Corrado, Benedetto Gui, Luigi Guiso, Alberto Iozzi, Marco Janssen, Tullio Jappelli, Elinor Ostrom, Marco Pagano, Salvatore Piccolo, Fabiano Schivardi, Francesco Silva, Giancarlo Spagnolo, Daniele Terlizzese, Tommaso Valletti, Bruce Wydick, Luca Zarri, Alberto Zazzaro and all other participants to the seminars held at EIEF, CSEF, DIW, to the BELAB Conference and to the PRIN meetings for their useful comments and suggestions. We also thank Alice Cortignani and Alessandro Romeo for the invaluable research support in the field. MIUR (PRIN n. 20085BHY5T) and Regione Lombardia ("Dote ricercatori" FSE, Regione Lombardia) grants are gratefully acknowledged. Remaining errors are solely the responsibility of the authors.

## 1. *Introduction*

People's behavior in social dilemmas has been widely investigated at experimental level with Public Good Games (e.g. Fischbacher, Gachter, and Ernst Fehr, 2001; Croson, Fatas, and Neugebauer, 2005; Fischbacher and Gächter, 2010). A variant of the standard PGG, the Common Pool Resources Game (hereafter also CPRG), is frequently used (Ostrom, Walker and Gardner, 1992; Walker and Gardner, 1992; Heinrich and Smith, 2005; Noaylli et al. 2007; Werthmann, Weingart and Kirk, 2010) in case of field experiments, to analyze the specific case of social dilemmas in presence of common resources. In the CPRG, players have the possibility to withdraw tokens in a pile. The amount they withdraw is immediately a private gain, while units left in the common pile are doubled by experimenters and divided equally among all participants.

In this paper we discuss results from a Common Pool Resources Game implemented in the Nairobi slum of Kibera. The main goal of our analysis is to investigate whether and how disclosure of information on players' behaviour affects their strategies and payoffs.

We carry out our analysis by implementing two different treatments concerning a repeated CPRG in which players play 5 rounds without changing group composition across treatments and without knowing in advance the exact number of rounds they are going to play. In the Restricted Information Treatment (RIT) players are informed about their own payoff only at the end of each round. In the Public Information Treatment (PIT) participants are informed at the end of each round about i) their own payoff and ii) the amount withdrawn by each player in their group and iii) her/his payoff. As we will show in our analysis, information disclosure negatively affects cooperation by generating an increasing divergence in withdrawal rates between the two treatments across rounds. Information induced asymmetric conformity is one of the factors explaining this phenomenon with players with less opportunistic choices than group average in the previous round moving significantly more toward group average than those with more opportunistic choices, but only when information about individual behavior is revealed.

The paper is divided in six sections (introduction and conclusions included). The second section briefly discusses the state of art of the literature related to our contribution and summarizes its original features. The third section provides full details of the experimental design. The fourth and fifth sections illustrate descriptive and econometric findings respectively. The sixth section concludes.

## *2. Related Literature and Main Findings*

Conformity is usually defined by social psychologists as the degree to which persons in a group modify their behavior, views, and attitudes to fit the views of the group (see Moscovici, 1985 and Cialdini and Trost, 1998 among others). The role of conformity in affecting human behavior is widely documented by psychologists also through experimental analysis (see the seminal work of Asch 1952 and the following contributions of Crutchfield, 1955; Turner, 1991 and Haslam et al., 1999). Following Carpenter (2004) the two main rationales explaining conformity are: avoiding sanctions due to deviation from norms, and taking advantage of the information obtained and processed by others (Deutsch and Gerard, 1955). Despite this evidence, conformity is not frequently considered either in economic models which mainly focus on the pursuit of individual material well-being (Carpenter 2004) or in experimental and behavioral economics where the motivations usually considered to account for deviation from the pursuit of the highest personal monetary payoff are, among others, (strategic) trust, fairness/reciprocity (Rabin 1993), altruistic or inequality-averse preferences (Fehr and Schmidt 1999), other-regarding preferences (Cox, 2004), social-welfare preferences (Charness and Rabin, 2002), warm glow (Andreoni, 1989 and 1990).

In spite of this neglect, conformity starts being partially taken into account in recent economic contributions. In a field experiment involving voluntary contributions to a national park in Costa Rica, Alpizar et. al. (2008) show that giving people information on others' contributions affects their behaviour. In a field experiment concerning the donation of money to social causes, Meier

(2005) notices that the information about how many other students had contributed to social causes at the University of Zurich affects contribution decisions. Cason and Mui (1998) study the effect of conformity by implementing a sequential dictator game where in the second stage information on the decision of another dictator is given. They find little evidence of conformity.

The Common Pool Resources Game, by being played in groups instead of pairs, seems to be particularly suitable to study the effect of conformity in affecting players' decisions. Contributions using this kind of games to study conformity are those from Capra and Li (2006), Bardsley and Sausgruber (2005) and Carpenter (2004). Capra and Li (2006) find evidence of willingness to conform in a CPRG treatment in which players make an initial choice which may be revised afterwards. Before revising it, subjects may choose to receive payoff irrelevant information concerning decisions taken by other cohorts that differed in group and gender. In Bardsley and Sausgruber's (2005) design players have information on decisions by their own group and another group. The authors find that conformity explains about 1/3 of the "crowding in" (that is, the tendency of people to contribute more to public goods in experimental contexts, the more the others contribute) in the public good game. Carpenter (2004) implements a PGG characterized by a *control* and a *monitor* treatment. In both treatments subjects play 5 rounds and in each round they are randomly reshuffled into groups of 5. In the control treatment, participants make their choice in the PGG and, before playing the following round, they are informed about individual payoffs plus individual and group contributions in the previous round. The monitor differs from the control treatment only for the information shown to participants after each round. In the control treatment players cannot know whether most subjects are behaving in a specific way while, in the monitor treatment, subjects' information is augmented by the contribution decisions of each single current group member since, according to the author, knowing the distribution of contribution choices allows for conformity to have a stronger role in affecting players' behavior. Carpenter shows that free riding grows faster in the monitor than in the control treatment and interpret this finding as a conformity effect. The rationale is that the monitor treatment characteristics allow confused players to better understand what they should do by looking at (and conforming to) other people's behavior.

The Restricted Information Treatment (RIT) and the Public Information Treatment (PIT) implemented in our experimental design share many characteristics with the control and monitor treatments proposed by Carpenter. As in Carpenter's design, we augment information in the PIT with respect to our "control" Restricted Information Treatment in order to allow conformity to become relevant. In particular, in the RIT we simply give players information on their individual payoffs (thus reducing the possibility to conform with others' behavior since the latter cannot be clearly observed and can only be desumed by one's own payoff), while in the PIT each player announces how much s/he wants to withdraw and payments are visible to everybody (even in this case, however, we give no information about the group average withdrawal rate, thereby creating a more severe test and a relatively less favourable environment for the occurrence of a conformity effect).

However, our experimental setting and the one adopted by Carpenter also differ in many respects.

First of all, we run our experiment in an extremely low income environment in which social capital has been documented to be among the scarcest around the world, even when considering similar socioeconomic environments.[1] We therefore wonder whether and how conformity mechanisms work in such environments vis-à-vis in experiments with university students or other kinds of players in high income countries. Moreover, differently from Carpenter who adopts the "strangers condition" (groups' members are randomly reshuffled after each round), our two treatments are played face to face and group members always remain the same. This variant aims at mimicking more closely the local situation of common pool resource management in which individuals know

[1]Cassar and Wydick (2010) show that the average players' contribution rate to public goods is dramatically lower in the Kibera slum than in other poor areas in Armenia, Philippines, India, and Guatemala. Bohnet and Greig (2008) show in a one shot trust game experiment that Nairobi slum dwellers adhere to norms (*balanced reciprocity*) which generate lower social capital with respect to norms (*conditional reciprocity*) observed in similar environments.

each other but are not always perfectly informed about the free riding/cooperative behavior of their neighbours. However, our econometric approach allows us to specifically focus on the role of conformity behaviour controlling, among others, for round-invariant sociodemographic differences characterizing our two treatments.[2]

In terms of results, differently from Carpenter, we find that not necessarily people tend to imitate free riders. By contrast (and this seems to be closely related to the definition of conformity), subjects tend to conform to the average group's withdrawal rates. More specifically, we document that people who withdrew less than average in a given round, tend to increase their withdrawal rate in the subsequent round, while subjects who withdrew more than the average tend to reduce their withdrawal rate. We also find that conformism is asymmetric: people who withdrew less than average in their group tend to reduce their contribution relatively more with respect to the increase in contribution by people who withdrew more than average. As we will show, this implies divergence between contributions in the PIT and in the RIT.

Controlling for alternative explanations based on conditional or unconditional cooperation[3] and by showing evidence for the importance of conformity, our analysis contributes to highlight a significant role of this kind of motivation in explaining human behavior when the harvesting of a common resource generates a conflict between personal interest and collective goals.

Finally, notice that the PIT in our experiment is equivalent to testing the effects of monitoring in relation to the use of a common resource (people may clearly observe other people's behavior) without an explicit announced sanction against "defectors". As it is well known in this literature the association of monitoring and sanctioning is among those conditions which reduce the probability

[2] Without members' reshuffle across rounds one might expect reputation effects to be stronger and the propensity to free ride lower. This makes our findings on the information induced asymmetric conformism (that is, stronger conformism in the free riding than in the cooperation direction) more counterintuitive. Finally, the reduced heterogeneity in group composition across rounds for the individual player induced by lack of reshuffle will be controlled for by the treatment/control balancing property checks and by the fixed effects in our estimates (see section 5).

[3] For a discussion on conditional/unconditional cooperation in PGG see Fischbacher, Gachter, and Fehr (2001) and Fischbacher and Gächter (2010).

of a tragedy of the commons (Ostrom 2009). Even though Ostrom highlights that many other co-determinants are needed to create conditions for successful community management of common pool resources,[4] we may interpret our paper as a piece of evidence on what happens when monitoring is disconnected from sanctions (and possibility of cheap talks among players). In this case, we show that conformity leads to a non controlled harvesting of social resources, that is, it creates a worse situation than the one where neither monitoring nor sanctions are allowed.[5]

### *3. The experimental design*

Our experiment has been conducted in the Kibera slum of Nairobi, a socioeconomic environment in which inhabitants have proved to be largely uncooperative in case of public good contributions with respect to people living in other poor contexts (see footnote 2). However, it is also true that the practice to contribute to public goods has a specific role in the Swahili culture and in the area where we ran our experiment. In fact, the Common Pool Resources Game that we adopted essentially mimics a well known practice of community provision of local public goods named in Swahili *harambee*. Harambee means "let's pull together" (Miguel and Gugerty, 2004) and denominates the practice of bottom-up collective effort for providing public goods in the area in which we ran our research (Greig and Bohnet, 2009).[6] This practice is at the root of community fundraising for

[4] Such determinants are i) self design of rules governing the resources, with ii) rules being enforced by local users and accountable to them; iii) use of graduated sanctions defining iv) withdrawal rights and v) assigning costs proportionate to benefits; vi) collective action and monitoring problems solved in a reinforcing manner (Agrawal, 1999).

[5] The Ostrom (2000) point is that information disclosure about rules infractions can "generate a downward cascade of cooperation" in a group without sanctioning capacity. An example of it is provided by Kikuchi et al. (1998).

[6] For a similar design see Henrich and Smith (2004) who however, differently from us, have a one shot within experiment.

building and maintaining, for instance, schools, clinics and wells (Miguel and Gugerty 2004; Mwiria 1990).[7]

Given what considered above the aim of our Restricted and Public Information treatments was to analyze the effects of information disclosure in a context in which the provision of public goods (and/or the management of common resources) has a vital role and other people's decisions in terms of contributing or not to the public good may be easily observed (it is simpler to know if other people are contributing in a slum in a *harambee* activity than in a high income country where the contribution to public good is made through taxes).

The sample for our experiment is made of 304 subjects, [8] 76 groups of four people each. Groups sit in a circle around a pile of 600 KSh (€ 6.18 in the month of the experiment). They can withdraw a variable amount between zero and 150 KSh from the pile and keep it. The amount withdrawn is immediately a private gain, while the amount left is doubled and divided equally among group participants. Players make their choice by writing down on a sheet how many KSh they want to withdraw. Then, experimenters write down and communicate individual payoffs to each participant. The game is repeated five times, players know that they will play the game more than once, but they do not know the exact number of rounds in advance in order to reduce the impact of end-game behaviour. Furthermore, they are informed at the beginning of the game that they will be paid just for one randomly-chosen round.

[7] Harambees can be either private or public. Private *harambees* generally raise funds from family and friends for funerals and weddings, college fees and medical bills. Public *harambees* collect financial resources for development projects of common interest such as schools, health centres and water projects (Wilson, 1992).

[8] Participants received a show-up fee (150KSh) and were told that they had the possibility of winning up to 800 KSh, based on their performance in the experimental sessions. They were randomly recruited with a map of the informal buildings in the Kianda area of the slum of Kibera (Nairobi). In situations with two households in the same building, local experimenters tossed a coin and selected one; in case they found three, they randomly extracted one token out of the four representing directions (North, South, West, East). Only individuals aged more than 18 were selected, alternating the gender for each household. After this first selection we made a list of all the individuals identified in the area willing to participate and randomly shortlisted the 404 participants.

Half of participants to the experiment, that is 38 groups, play the Restricted Information Treatment, the remaining half the Public Information Treatment. In the RIT, the experimenter calculates the payoffs and distributes the money in envelopes. In the PIT each player announces how much s/he wants to withdraw and payments are visible to everybody. Moreover, in the PIT the experimenter announces players' payoff at the end of each round as well. During the rounds payoffs are reported on a sheet with the corresponding round number (from 1 to 5). At the end of the rounds each subject randomly extracts a number between 1 and 5 and the number extracted indicates the round for which the player are eventually paid. After the experiment players filled in a socio-demographic survey.

As in many field experiments with low income recipients the potential payoff at stake is very high in relative terms: 600KSh is roughly the average weekly wage in the area.[9]

Finally, consider that our experimental design included not only the two Treatments concerning the CPRG, but also two investment games. Both before and immediately after the CPRG, players took part to two standard investment games. In fact, our research project had two main objectives. The first was to analyze the effect of conformity on the provision of public goods (the topic of this paper) and the second to observe if taking part in decisions concerning the provision of public goods could affect trust and trustworthiness shown by people in an investment game. Since all subjects took part in the investment game, and since payoffs were not revealed before the end of the experiment, we are pretty sure that decisions in the CPRG may be useful to study separately the effect of public information on players' conduct.[10]

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[9] Half of all households in Nairobi slums are classified as "*food insecure with both adult and child hunger*" and 70 percent of inhabitants live below the poverty rate (Faye et al., 2010). A 2007 survey calculates that the cost of basic needs in Nairobi amounts to 100 Kenyan shillings per day per member (Phares-Kirii, 2007).

[10] The inclusion of the CPRG experiment into the "TG-sandwich" experiment we described above implies that we have to control for what happens in the first TG round. We will do it with our fixed effect estimates (see section 5).

## 4. Hypothesis testing and descriptive findings

Based on what considered in the previous sections, we are going to investigate if public disclosure of players' conduct affects subjects' behavior in the CPRG and, in particular, if conformity has a significant role in affecting players' strategies when subjects can observe others' behavior. First of all we will test the following null hypothesis with our experimental data:

$H_0$ $WR_{(PIT)}=WR_{(RIT)}$

that is, information disclosure does not affect significantly average withdrawal rates in the PIT and in the RIT treatments ($WR_{(PIT)}$ and $WR_{(RIT)}$ respectively). Note that under the Ostrom (2000) "downward cascade of cooperation" hypothesis (see footnote 5) we have $WR_{(PIT)}>WR_{(RIT)}$ while, under the assumption that information reinforces reputational concerns vis-à-vis other players, we get $WR_{(PIT)}<WR_{(RIT)}$.

In Tables 1 and 2 we provide respectively the legend and descriptive statistics for the variables used in the empirical analysis which follows. In Table 3 we show results of our randomness check documenting that balancing properties in the RIT and PIT are met for all the considered socio-demographic controls.

Average withdrawal rates are provided in Table 4 and are all significantly different from one that is, from the level predicted by Nash rationality, overall, and in each of the five rounds in both the restricted information and full information setting.

To interpret our results consider that, under both treatments, we are not in a fully anonymous setting but in a more realistic scenario akin to a common pool situation in which players may observe each other. In the RIT they however know only their contribution and their payoff, while, in the PIT, behavior and payoff of each participant to the group are publicly disclosed round per round. Note however that also in the first case (with restricted information) we expect them to formulate a guess on the cooperative/non cooperative attitude of the other group members based on their own payoff since they know (given the rules of the CPRG) that the latter is affected by overall group behaviour.

Table 4 clearly documents that our null hypothesis is rejected since the difference between treatment and control groups is always significant and progressively (even though not monotonically) wider across rounds. Overall, our Public Information Treatment (information on individual players' withdrawal decisions and payoffs) generates a .12 percent additional withdrawal rate (around 74.3 percent against 62.7 percent). However, if we inspect our findings round by round, we find divergence between the PIT and RIT contributions ---the difference is 7 percent in the first round, it widens (even though not monotonically) in the rounds which follow and more than doubles from its initial level, peaking at 16 percent in the fourth round (that is, a 25.8 percent higher withdrawal rate than in the RIT group in that round). Note as well that in the first period the difference is not statistically significant at 5 percent with parametric and non parametric tests, while it is strongly significant in each of the subsequent rounds.

Our divergence result is particularly relevant if we consider that in our experiment group members do not vary across rounds. Even in presence of this feature which should generate reputation concerns and propensity to cooperate, publicly available information on players' behavior tend to increase free riding instead of cooperation.

The evidence shown is confirmed when we look not just at means but we compare withdrawal rate distributions across treatments (Figures 1a-1c). From the inspection of the figures we can clearly identify the much higher (lower) density for low (high) withdrawal rates in the PIT than in the RIT .

**5. Econometric estimates**

In order to understand the reasons for the weak initial significance and the following divergence of the PIT and RIT average withdrawal rates we propose econometric estimates.

In doing so we include as controls not only socio-demographic variables, but also variables aimed at taking into account some of the main rationales advanced in the public good literature to explain players' behavior in repeated PGGs and CPRGs such as conditional cooperation (Fischbacher, Gachter, and Fehr 2001 and Fischbacher and Gächter, 2010), unconditional cooperation (Fischbacher and Gächter, 2010) (or anchoring effect) and conformity (Moscovici, 1985 and Cialdini and Trost, 1998).

Conditional cooperation implies a positive and significant effect of one round lagged group withdrawal rate on individual withdrawal rate (conditional cooperators tend to contribute more to a public good the more other subjects contribute). The concept of conformity (widely discussed in section 2) may be tested by evaluating whether our dependent variable is significantly affected by the lagged deviation of the individual player's behavior from group behavior. The use of this variable implies that the hypothesis of conformity is not rejected if we find a negative and significant sign. Finally, consistently with the conformity concept, our variable is built in such a way that more distance from the group mean implies a larger move toward it.

Finally, the unconditional cooperation (or anchoring effect) suggests that players decide an initial strategy and remain close to it also in the following rounds. We therefore test for the presence of anchoring effects by including the first round withdrawal rate among regressors.

More in detail, we start from a less parametrized moving toward the following fully parametrized model

$$WR_{it}=\alpha_0 + \sum_j \beta_j DROUND_j + \sum_k \gamma_k X_{ki} + \alpha_1 GWR_{i,t-1} + \alpha_2 GWR*PIT_{i,t-1} + \alpha_3 (ME\text{-}GROUP)_{i,t-1} + \alpha_4 (ME\text{-}GROUP)*PIT_{it-1} + \alpha_5 CHEATi_{,t-1} + \alpha_6\, CHEAT*PIT_{i,t-1} + \alpha_7\, UNCONDITIONAL_i + \alpha_8\, MAXGROUP_{i,t-1} + \alpha_9\, PIT + \varepsilon_i$$

where the dependent variable (WR) is the individual withdrawal rate, *DROUND* are round dummies and X-controls include factors such as sociability, trust, risk aversion, betrayal aversion,[11] gender

[11] By collecting experimental measures of betrayal aversion, Bohnet et al. (2008) show that individuals are generally less willing to take risks when the uncertainty is due to another person rather than nature. In order not to complicate further the game and expose participants to an additional experimental activity, we collect survey measures of betrayal aversion by asking questions on negative reciprocity (see the questionnaire in the appendix). Those measures should be proxy for betrayal aversion as argued by Fehr (2010), "[…] *Betrayal aversion means that people dislike non-reciprocated trust […] People with a strong preference for negative reciprocity (i.e., a*

and ethnic fragmentation. Among our main regressors of interest GWR measures group withdrawal rate, *PIT* is a dummy taking value of one for the Public Information Treatment, *ME-GROUP* stands for the difference between individual and group withdrawal rate (or, alternatively, in a different specification, the distance between the individual and the average group withdrawal rate rank), *CHEAT* is a dummy taking value of one if the individual's withdrawal rate is lower than that of the rest of the group, *MAXGROUP* is the highest withdrawal rate in the group in the previous round, *UNCONDITIONAL* is first period player's withdrawal rate.

In terms of hypothesis testing we have conditional cooperation à la Fishbacher if $\alpha_1 > 0$, informed conditional cooperation if $\alpha_2 > 0$, conformism if $\alpha_3 < 0$,[12] information induced conformism if $\alpha_4 < 0$, asymmetric conformism if $\alpha_5 > 0$, information induced asymmetric conformism if $\alpha_6 > 0$[13] and unconditional cooperation if $\alpha_7 > 0$.

Results of our econometric analysis are shown in Table 5. In the first specification (Table 5, column 1) we just introduce round dummies plus controls and our proxy of conditional cooperation (*GWR*). Our controls are the number of players' friends in the round plus a set of individual level (indexes of risk aversion, trust, sociability and betrayal aversion) and group level (ethnic and gender

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*preference for punishing non-reciprocal behavior) are, ceteris paribus, more likely to feel betrayed in case of non-reciprocated trust […]*" (p. 247). In the questionnaire betrayal aversion is calculated by looking at the level of consent to the following two questions: i) *If I suffer a serious wrong, I will take revenge as soon as possible, no matter what the costs; ii) If someone offends me, I will also offend him/her.*

[12] Note that in the RIT, even though there is no disclosure of other group members' behaviour, players may infer something about it by the rules of the game and looking at their own round payoff (ie. if I withdraw 100 and expect that all the other players in the group will do the same I should get (50*4*2)/2 from the pool. If I get less it means that other groupmates withdrew more than me). However one would expect information disclosure in the PIT to make a difference since this calculation requires computational ability and therefore it may be reasonable to infer hat players will have only a guess of it. Furthermore, players in the RIT have no idea about the distribution of choices of other players in the group beyond group means. Even under the extreme hypothesis that they are not able to understand at all the average behavior of their group, the inclusion of this variable is important if we want to measure by difference the information induced conformity effect.

[13] Note that, since the *ME-GROUP* dummy measures two-sided conformism (independently from being above or below group average), the *CHEAT* dummy isolates the asymmetric effect or an additional impact of the fact of being above group average.

fragmentation) variables. Standard errors are clustered at individual level. The PIT dummy is significant and positive. This initial finding documents that the difference between the two treatments is robust to the introduction of controlling regressors in our econometric estimates. Results from this first specification also document the existence of a small but significant effect of conditional cooperation (the coefficient of the lagged group withdrawal rate is positive and significant). The other significant variable is the betrayal aversion dummy. In our second specification (Table 5, column 2) we check whether disclosure of players' payoff and withdrawal decisions affects conditional cooperation (the conditional cooperation variable is interacted with the treatment dummy in the *GWR*PIT* variable) and find that it doesn't. In the third specification we introduce the test of conformity with a variable measuring the difference between one's own and the average group withdrawal rate (*ME-GROUP*) (Table 5, column 3). The impact of the variable is positive and significant rejecting the hypothesis of a common conformism effect in both (PIT and RIT) treatments since the sign of the coefficient implies that higher than average withdrawal rates in the previous round have positive and not negative effects on the following round withdrawal decision. This is consistent with the fact that in our RIT design players do not know about other players' choices and therefore it is not as easy to be conformist in the RIT as in the PIT, even though players can make a guess on it based on their own payoffs. In the fourth specification (Table 5, column 4) we check whether it is our Public Information Treatment to induce conformity and find that the hypothesis is not rejected given that, when introducing the interaction between the conformity variable and the treatment dummy (*ME-GROUP*PIT*), we find a negative and significant sign. In the specification which follows we repeat the exercise by using a rank conformity variable *(RANK(ME-GROUP))*, that is, the difference between one's own contribution rank and the average group rank and find that the information induced conformity effect is confirmed (Table 5, column 5). In the sixth specification we finally want to check whether conformism is asymmetric (Table 5, column 6). We therefore test whether, beyond the standard conformity effect measured in the previous specifications, a dummy for individuals withdrawing less than the group average is significant. We find that the CHEAT variable is not significant in general but significant and positive when interacted with the treatment dummy (*CHEAT*PIT*). We are therefore led to conclude that the hypothesis of asymmetric, information induced conformism is not rejected. The magnitude of the effect is around 8 percent, that is, 2/3 of the first round difference and half of the maximum difference between the PIT and the RIT.

The interpretation of what found so far tells us that when information on players' withdrawal rates and payoffs is publicly available players move toward mean group behavior (thereby denoting conformism) but the effect is much stronger if they are more cooperative than if they are less cooperative than average (thereby documenting that information induced conformism is asymmetric).[14]

To check whether asymmetric, information induced conformity is robust to the hypothesis that players imitate free riders we add in an augmented specification a regressor measuring the highest withdrawal rate in the group in the previous round (*MAXGROUP*). The variable is not significant while our *CHEAT*PIT* regressor remains so (Table 5, column 7). In a final specification we add the anchoring effect to our regressors – WR(1) - and find that it is significant without affecting the result on information induced asymmetric conformity (Table 5, column 8).

By looking at the relevance of other controls under the different specifications we find that betrayal aversion tends to lose significance when we introduce conformity effects. An interpretation may be that information induced conformity effects are strictly related to betrayal aversion. This is perfectly consistent with the betrayal aversion definition given by Fehr (2010) of dislike for being betrayed in case of non reciprocated trust.

[14] Note that the relevance of the conformity result is reinforced by the fact that in our design, differently from that of Carpenter, players do not have direct information on average group behavior.

Note also that the treatment (PIT) dummy remains significant in all estimates documenting that the introduction of the additional (and in particular of conformity) regressors accounts for the widening difference but not for the initial gap.

We repeat for a robustness check our estimates by creating a conformity variable in which we look at the difference between individual and group payoffs (and not individual and group withdrawal rates) and where we check whether inclusion/omission of the relevant individual in group averages affects our findings. Results are unchanged and available upon request.

We repeat our analysis with fixed effects and find that our results are unchanged (Table 6). Even though it obscures the interpretation of the impact of our time invariant regressors, the use of fixed effects may be advised if we believe that clustering standard errors is not enough to take into account that we have repeated observations for the same individual. Furthermore, fixed effects have the additional desirable property of allowing us to control for unobservable time invariant sociodemographic factors. Even more important, fixed effects control for the experience lived by players during the first TG (trustor's contribution, trustee's response and, in general, players' satisfaction about the game) which is also invariant across CPRG rounds.

The conclusion we draw from all our empirical findings is therefore that asymmetric conformism induced by disclosure of information on individual withdrawal rates and payoffs helps to explain the widening difference between withdrawal contributions in the full and restricted information settings. The effect occurs net of conditional and unconditional contribution effects which also are part of the picture. However part of the treatment effect is not explained by this phenomenon. This makes sense both descriptively and statistically given that in the parametric and non parametric tests we find that part of the treatment effect exists since the beginning.

## 6. Conclusions

Previous empirical findings have documented the relative poverty of social capital in areas such as Nairobi slums in which this resource is most needed, among others, for the management of common resources and the production of public goods at community level.

In order to understand more about the mechanisms governing the decisions to contribute to the provision of public goods in such socioeconomic environments we run a multiperiod common pool resource game experiment. To be closer to the everyday reality of common pool resource management in the area we implemented a face to face interaction and did not vary group membership from the first to the last round of the game. Furthermore, to evaluate the effect of disclosure of information about other players cooperative/non cooperative attitudes, we compare findings from a Public Information and a Restricted Information Treatment. Our results show a progressive positive and significant divergence across rounds between average withdrawal rates in the public and the restricted information settings. This implies that, paradoxically, information disclosure (in absence of sanctions and cheap talks) reduces cooperation. The econometric analysis which follows documents the presence of unconditional cooperation and weak conditional reciprocity effects in our experiment, but also shows that information induced asymmetric conformity contributes to explain our main result, that is, with public information, players tend to conform to average group behavior, but more strongly so if in the previous round they happened to be more cooperative than the average of their group. Since the introduction of conformity variables is accompanied by a reduction of the significance of the betrayal aversion indicator we are led to believe that there exists a strict connection between asymmetric information induced conformity and the same betrayal aversion. From the proximity of the two concepts we may infer that part of the less cooperative behavior in presence of information disclosure is due to the dislike of non reciprocated trust which induces cooperators above group average to move with more decision toward the mean than cooperator below average. Two interesting conclusions can be drawn from our experiment. First, conformity is an important driver of players action in poor socioeconomic environments in which monetary incentives of experiments are expected to matter a lot. Second, since conformity is information induced and asymmetric, monitoring and public information without sanctions have the paradoxical effect of reducing and not increasing cooperation thereby making the tragedy of the commons more likely to occur.

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# Table 1. Variable legend

| | | | |
|---|---|---|---|
| *Withdrawalrate (WR)* | = amount withdrew by the participant in the CPRG/maximum the individual can withdraw (150 KSh). | *Trustindex* | Average of the answers to the five questions on trust (see questionnaire) |
| *Age* | Respondent's age | *mfi_now* | = 1 if the respondent is member of a microfinance |
| *Female* | =1 if the respondent is female | *riskaverse* | = 1 if the respondent is risk averse (has chosen lotteries with the payoffs at closer distance - see questionnaire in the appendix) |
| *Married* | =1 if the respondent is married | *betrayalaverse* | = 1 if the respondent is betrayal averse ("strongly agrees" or "agrees" on two statements about revenge - see questionnaire in the appendix) |
| *Widowed* | =1 if the respondent is widowed | *impatient* | = 1 if the respondent is highly impatient (has chosen the lottery with payoffs at higher distance, i.e. need higher payoff in the future to be willing to wait - see questionnaire in the appendix) |
| *Separated* | =1 if the respondent is separted | *Maxgroupwithdrawal* | Withdrawal rate of the more opportunistic player in the group for a given round (i.e. the player with the higher withdrawal rate) |
| *n_house_members* | n. of house components | *ethnicfragmentation* | Ethnic fragmentation index in CPRG groups measuring the likelihood that four randomly drawn members belong to different ethnic groups = 1-Σ(fraction of members belonging to each of the ethnic groups )^2. NB: if =0, fully ethnic-homogeneous group; if =1, fully ethnic-heterogeneous group. |
| *Kikuyo* | =1 if the respondent is from the ethnic group "Kikuyo" | *genderfragmentation* | Gender fragmentation index in CPRG groups measuring the likelihood that four randomly drawn members belong to different gender groups = 1-Σ(fraction of members belonging to each of the two gender groups)^2. NB: if =0, fully gender-homogeneous group; if =1, fully gender-heterogeneous group. |
| *Luo* | =1 if the respondent is from the ethnic group "Luo" | *n_friends* | n. of people known by name in the CPRG. |
| *Lubian* | =1 if the respondent is from the ethnic group "Lubian" | *food_expenditure_day* | daily food expenditure for the respondent's family. |
| *Luhya* | =1 if the respondent is from the ethnic group "Luhya" | *PIT* | = 1 if the respondent participates in the CPRG full information treatment. |
| *muslim* | =1 if the respondent is Muslim. | *ME-GROUP* | Difference between players and group average withdrawal ratio |
| *years_schooling* | Respondent's years of schooling | *(RANK)(ME-GROUP)* | Difference between players and group average rank withdrawal ratio |
| *Unemployed* | = 1 if the respondent is unemployed | *Playermeanwithdrawalrate* | Mean individual's withdrawal rate over all CPRG rounds. |
| *Sociability* | =1 if the respondens says that he meets friends, attends cultural events and goes *to the movies, pop music concerts, dancing, disco, sports events* more than monthly (at least weekly or daily) | *Groupmeanwithdrawalrate (GWR)* | Mean group's withdrawal rate over all CPRG rounds. |

- **Table 2. Descriptive statistics for the variables used in the empirical analysis**

| Variable | Mean | Std. | Min | Max |
|---|---|---|---|---|
| Withdrawalrate (WR) | 0.686 | 0.317 | 0 | 1 |
| Trustindex | 1.894 | 0.481 | 1 | 3.4 |
| Sociability | 0.788 | 0.409 | 0 | 1 |
| Betrayalaverse | 0.189 | 0.391 | 0 | 1 |
| Riskaverse | 0.501 | 0.500 | 0 | 1 |
| Ethnicfragm. | 0.547 | 0.155 | 0 | 0.75 |
| Genderfragm. | 0.404 | 0.113 | 0 | 0.5 |
| Cheated | 0.380 | 0.486 | 0 | 1 |
| Unconditional | 92.482 | 49.975 | 0 | 180 |
| ME-GROUP | 0.722 | 37.190 | -112.5 | 112.5 |
| Age | 28.315 | 8.404 | 18 | 60 |
| Female | 0.542 | 0.498 | 0 | 1 |
| Married | 0.334 | 0.472 | 0 | 1 |
| Separated | 0.052 | 0.221 | 0 | 1 |
| Divorced | 0.011 | 0.103 | 0 | 1 |
| Widowed | 0.046 | 0.209 | 0 | 1 |
| Number of friends | 0.392 | 0.700 | 0 | 3 |
| Cohabitant | 0.006 | 0.077 | 0 | 1 |
| Kikuyo | 0.092 | 0.289 | 0 | 1 |
| Luo | 0.410 | 0.492 | 0 | 1 |
| Lubian | 0.163 | 0.370 | 0 | 1 |
| Luhya | 0.168 | 0.374 | 0 | 1 |
| Christian | 0.737 | 0.440 | 0 | 1 |
| Years _schooling | 11.215 | 2.989 | 0 | 18 |
| N_children | 1.431 | 1.777 | 0 | 10 |
| Food_expenditure | 270.642 | 141.057 | 50 | 1000 |
| Juakali | 0.629 | 0.483 | 0 | 1 |

**Table 3. Balancing properties for socio-demographic variables: PIT vs. RIT**

| | Wilcoxon rank-sum (Mann-Whitney) test | Prob > \|z\| |
|---|---|---|
| Age | -0.267 | 0.789 |
| Female | 1.243 | 0.214 |
| Married | -0.892 | 0.372 |
| Separated | 1.607 | 0.108 |
| Divorced | 0.608 | 0.543 |
| Kikuyo | -1.493 | 0.135 |
| Luo | 1.755 | 0.079 |
| Lubian | -0.331 | 0.741 |
| Luhya | -0.504 | 0.614 |
| Juakali | 0.511 | 0.609 |
| Muslim | 0.565 | 0.572 |
| Years _schooling | 0.552 | 0.581 |
| N_children | 0.446 | 0.656 |
| Food_expenditure_day | 0.587 | 0.557 |
| Unemployed | -2.197 | 0.028 |
| Trustindex | -0.322 | 0.747 |
| Sociability | 0.721 | 0.471 |
| Riskaverse | -0.460 | 0.646 |
| Discount Rate | -0.783 | 0.434 |

**Figures 1a-1c distribution of withdrawal rates across treatments**

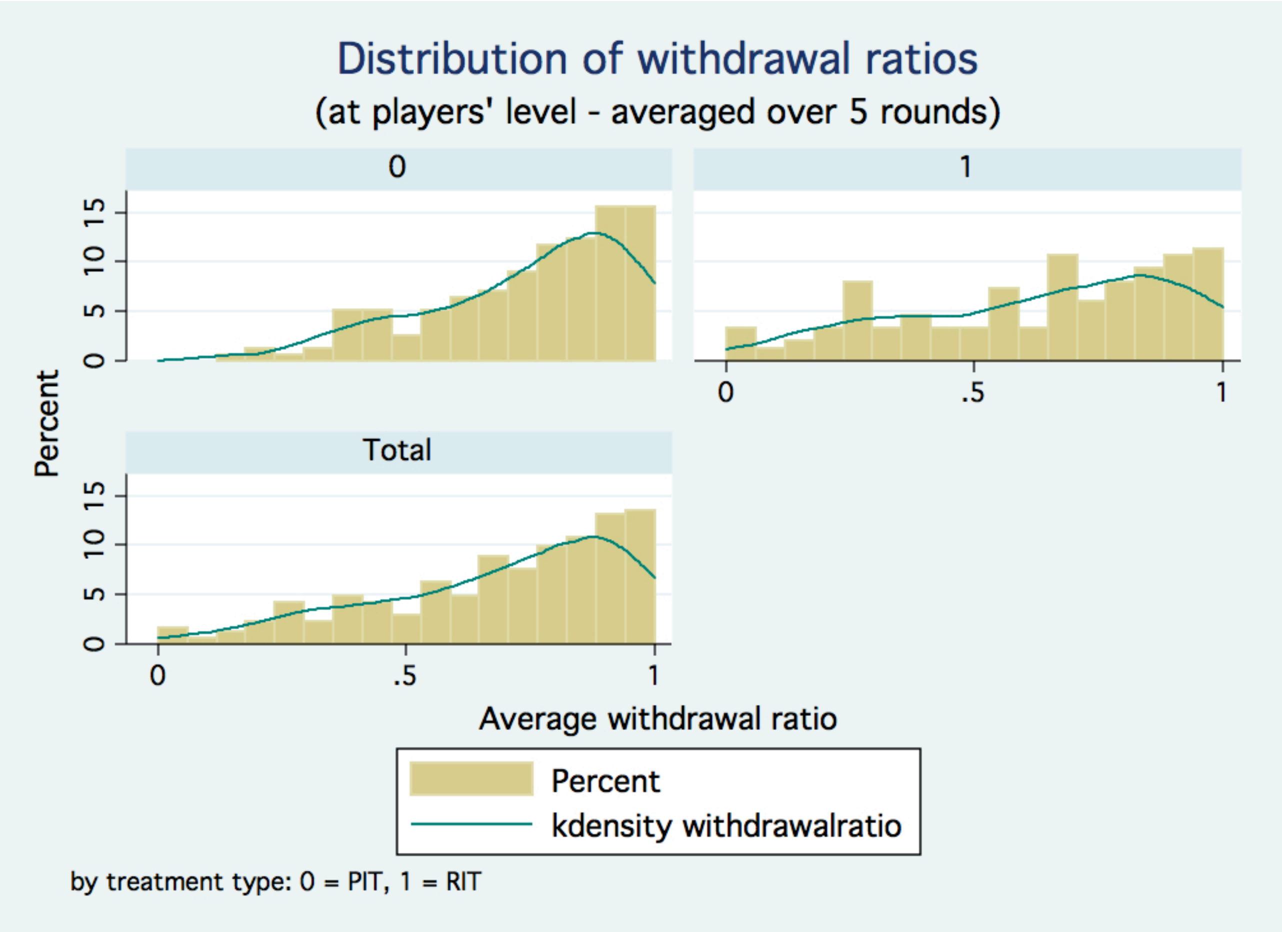

**Table 4 Mean withdrawal rates in the RIT and PIT treatment**

| | Mean withdrawal rate<br>PIT | Mean withdrawal rate<br>RIT | PIT-RIT (t-test) | PIT-RIT (ranksum) |
|---|---|---|---|---|
| All rounds | .627 | .743 | -7.61<br>(0.000) | -6.517<br>(0.000) |
| Round 1 | .617 | .686 | -1.824<br>(0.07) | -1.69<br>(0.09) |
| Round 2 | .630 | .764 | -3.8460<br>(0.0001) | -3.350<br>(0.0008) |
| Round 3 | .623 | .717 | -2.60<br>(0.01) | -2.097<br>(0.03) |
| Round 4 | .626 | .786 | -4.52<br>(0.000) | -3.935<br>(0.0001) |
| Round 5 | .648 | .764 | -3.264<br>(0.001) | -2.604<br>(0.009) |

P-values in round brackets. The null of average withdrawal rates not significantly different from zero is always rejected with p< . 001.

**Table 5 The determinants of players withdrawal rates (standard errors are clustered at individual level)**

| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Trustindex | -0.028 | -0.028 | -0.005 | -0.008 | -0.012 | -0.012 | -0.012 | 0.004 |
| | (0.023) | (0.023) | (0.011) | (0.012) | (0.015) | (0.015) | (0.015) | (0.015) |
| Sociability | 0.020 | 0.021 | 0.007 | 0.004 | 0.010 | 0.009 | 0.009 | -0.000 |
| | (0.030) | (0.030) | (0.013) | (0.013) | (0.017) | (0.017) | (0.017) | (0.016) |
| Betrayalaverse | 0.070** | 0.070** | 0.025 | 0.029* | 0.029 | 0.030* | 0.030 | 0.014 |
| | (0.030) | (0.030) | (0.015) | (0.015) | (0.018) | (0.018) | (0.018) | (0.018) |
| Riskaverse | 0.028 | 0.028 | 0.011 | 0.013 | 0.022 | 0.022 | 0.022 | 0.020 |
| | (0.024) | (0.024) | (0.012) | (0.012) | (0.014) | (0.014) | (0.014) | (0.015) |
| Ethnicfragmentation | 0.049 | 0.053 | 0.051 | 0.053 | 0.047 | 0.052 | 0.053 | 0.063 |
| | (0.083) | (0.083) | (0.040) | (0.042) | (0.051) | (0.051) | (0.051) | (0.056) |
| Genderfragmentation | -0.106 | -0.098 | -0.052 | -0.056 | -0.049 | -0.049 | -0.051 | -0.048 |
| | (0.097) | (0.098) | (0.046) | (0.044) | (0.053) | (0.053) | (0.053) | (0.057) |
| N_friends | -0.026 | -0.026 | -0.012 | -0.012 | -0.014 | -0.014 | -0.014 | -0.012 |
| | (0.017) | (0.017) | (0.008) | (0.008) | (0.010) | (0.010) | (0.010) | (0.010) |
| Dround_2 | 0.052*** | 0.052*** | 0.063*** | 0.062*** | 0.063*** | 0.064*** | 0.064*** | 0.063*** |
| | (0.018) | (0.018) | (0.020) | (0.020) | (0.020) | (0.021) | (0.021) | (0.020) |
| Dround_3 | 0.012 | 0.014 | 0.006 | 0.006 | 0.008 | 0.009 | 0.009 | 0.014 |
| | (0.019) | (0.019) | (0.019) | (0.019) | (0.019) | (0.021) | (0.021) | (0.020) |
| Dround_4 | 0.048** | 0.050** | 0.058*** | 0.055*** | 0.055*** | 0.058** | 0.058** | 0.061*** |
| | (0.020) | (0.020) | (0.020) | (0.020) | (0.021) | (0.023) | (0.023) | (0.022) |
| Dround_5 | 0.044** | 0.046** | 0.036** | 0.037** | 0.036** | 0.036** | 0.036* | 0.042** |
| | (0.019) | (0.019) | (0.016) | (0.016) | (0.017) | (0.018) | (0.018) | (0.018) |
| PIT | 0.078*** | 0.151** | 0.044*** | 0.046*** | 0.216*** | 0.128** | 0.131** | 0.122** |
| | (0.024) | (0.077) | (0.012) | (0.012) | (0.041) | (0.054) | (0.054) | (0.049) |
| $GWR_{t-1}$ | 0.003*** | 0.003*** | 0.004*** | 0.004*** | 0.004*** | 0.004*** | 0.005*** | 0.004*** |
| | (0.0001) | (0.001) | (0.0001) | (0.0001) | (0.0001) | (0.0001) | (0.001) | (0.000) |
| GWR*PIT $_{t-1}$ | | -0.001 | | | | | | |
| | | (0.001) | | | | | | |
| ME-GROUP $_{t-1}$ | | | 0.004*** | 0.004*** | | | | |
| | | | (0.000) | (0.000) | | | | |
| ME-GROUP*PIT $_{t-1}$ | | | | -0.001*** | | | | |
| | | | | (0.000) | | | | |
| (RANK)ME-GROUP$_{t-1}$ | | | | | 0.151*** | 0.139*** | 0.139*** | 0.116*** |
| | | | | | (0.010) | (0.012) | (0.012) | (0.012) |
| (RANK)ME-GROUP*PIT $_{t-1}$ | | | | | -0.068*** | -0.045*** | -0.045*** | -0.036** |
| | | | | | (0.014) | (0.017) | (0.017) | (0.016) |
| CHEAT $_{t-1}$ | | | | | | -0.041 | -0.039 | -0.043 |
| | | | | | | (0.029) | (0.029) | (0.028) |
| CHEAT*PIT $_{t-1}$ | | | | | | 0.082** | 0.081** | 0.074** |
| | | | | | | (0.038) | (0.038) | (0.037) |
| MINGROUP $_{t-1}$ | | | | | | | -0.0001 | |
| | | | | | | | (0.0001) | |
| UNCONDITIONAL $_{t-1}$ | | | | | | | | 0.001*** |
| | | | | | | | | (0.000) |
| Constant | 0.390*** | 0.349*** | 0.169*** | 0.177*** | -0.199*** | -0.156** | -0.170** | -0.169** |
| | (0.092) | (0.105) | (0.048) | (0.048) | (0.065) | (0.069) | (0.074) | (0.068) |
| Wald test | 5018.67 | 4910.25 | 21018.24 | 18456.27 | 13993.25 | 13717.77 | 132363.32 | 14693.45 |
| (p-value) | (0.000) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Observations | 1505 | 1505 | 1505 | 1505 | 1505 | 1505 | 1505 | 1505 |
| Number of players | 301 | 301 | 301 | 301 | 301 | 301 | 301 | 301 |

Robust standard errors in parentheses

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

Variable legend: see Table 1.

**Table 6 The determinants of players withdrawal rates (fixed effects)**

| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Dround_2 | 0.048*** | 0.048*** | 0.049*** | 0.048*** | 0.048*** | 0.029 | 0.022 | 0.029 |
| | (0.018) | (0.018) | (0.018) | (0.018) | (0.018) | (0.019) | (0.017) | (0.019) |
| Dround_3 | 0.020 | 0.019 | 0.020 | 0.020 | 0.019 | -0.003 | -0.019 | -0.003 |
| | (0.018) | (0.018) | (0.018) | (0.018) | (0.018) | (0.020) | (0.016) | (0.020) |
| Dround_4 | 0.055*** | 0.055*** | 0.057*** | 0.056*** | 0.056*** | 0.036* | 0.011 | 0.036* |
| | (0.018) | (0.018) | (0.018) | (0.018) | (0.018) | (0.020) | (0.016) | (0.020) |
| Dround_5 | 0.055*** | 0.054*** | 0.055*** | 0.056*** | 0.056*** | 0.034* | 0.000 | 0.034* |
| | (0.018) | (0.018) | (0.018) | (0.018) | (0.018) | (0.020) | (0.000) | (0.020) |
| $GWR_{t-1}$ | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.001* | 0.001* | 0.001* |
| | (0.0001) | (0.001) | (0.0001) | (0.0001) | (0.0001) | (0.0001) | (0.001) | (0.0001) |
| $GWR*PIT_{t-1}$ | | 0.0001 | | | | | | |
| | | (0.001) | | | | | | |
| $ME\text{-}GROUP_{t-1}$ | | | 0.001** | 0.001*** | | | | |
| | | | (0.000) | (0.000) | | | | |
| $ME\text{-}GROUP*PIT_{t-1}$ | | | | -0.001** | | | | |
| | | | | (0.000) | | | | |
| $(RANK)GWR_{t-1}$ | | | | | 0.037*** | 0.040*** | 0.041*** | 0.040*** |
| | | | | | (0.012) | (0.014) | (0.014) | (0.014) |
| $(RANK)GWR*PIT_{t-1}$ | | | | | -0.038** | -0.022 | -0.022 | -0.022 |
| | | | | | (0.016) | (0.018) | (0.018) | (0.018) |
| $CHEAT_{t-1}$ | | | | | | 0.017 | 0.018 | 0.017 |
| | | | | | | (0.026) | (0.026) | (0.026) |
| $CHEAT*PIT_{t-1}$ | | | | | | 0.066** | 0.064** | 0.066** |
| | | | | | | (0.032) | (0.032) | (0.032) |
| $MINGROUP_{t-1}$ | | | | | | | -0.0001 | |
| | | | | | | | (0.0001) | |
| Constant | 0.608*** | 0.608*** | 0.607*** | 0.611*** | 0.569*** | 0.510*** | 0.479*** | 0.510*** |
| | (0.036) | (0.036) | (0.036) | (0.036) | (0.041) | (0.047) | (0.052) | (0.047) |
| Observations | 1505 | 1505 | 1505 | 1505 | 1505 | 1505 | 1505 | 1505 |
| R-squared | 0.015 | 0.015 | 0.019 | 0.023 | 0.022 | 0.031 | 0.032 | 0.031 |
| Number of players | 301 | 301 | 301 | 301 | 301 | 301 | 301 | 301 |

Standard errors in parentheses

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

Variable legend: see Table 1.