## Contribution of individual social preferences on the propensity to cooperate:
## Lessons from an experimental study

### By Aboudou OUATTARA [†]

**Abstract.** Axelrod (1992) highlighted the important role of cooperation in actors' strategy and performance in the social interactions. This importance is confirmed by Thépot (1998). The understanding of individual propensity to cooperate is an important field to better know their strategies and the performance of the economic systems' in which they evolve. In this sense, game theory indicates that individual's propensity to cooperate depends on his anticipation of decision that will be made by other participants and his expected gain. The challenge of this assumption based on experimental study generated other motivations to individual decision. An individual can be motivated by altruism, reciprocity, inequity aversion, …these motivations, other than self-pecuniary interest, form the social preferences theory which opened the way to other reading of individual propensity to cooperate within organizations. A better understanding of the influence of these social preferences on the decisions to cooperate (or not) within organizations have motivated this research. It relies on data collected through an experimental study which allowed the identification of the motivations (altruism, desire of reciprocity, inequity aversion,…) which best characterize individual social preferences and to study its influence on the contributions made in public good game. It concludes that the presence of rational selfish persons only motivated by pecuniary gain is the cause of cooperation's declining within organizations and that individuals motivated by an inequity aversion have some resilience when they experiment a lack of cooperation from other organizations members. It therefore establishes that an individual social preference influence his propensity to cooperate within organization. As well, in addition to other determinants found in the literature, the conclusions of this research underline the role of social preferences in the functioning and the dynamics of organizations.

**Keywords.** Social preferences, Cooperation, Experimental study.

**JEL.** C72, C81.

## 1. Introduction

The dominant paradigms in economic and management were based on the postulate of the homo-economicus, derivative from neoclassical theory that assume that individual decisions are dictated by a look for a self-pecuniary interest. In this framework, economic situations are the result of interactions between individuals whose decision are made to satisfy their own interests (Giraud, 2000; Miller, 2003; Gibbons, 1992).

The game theory served as a framework for the analysis of the interactions between participants. It allowed us to understand, among other things, the conditions that favor or not cooperation between economic agents. Let's recalled that the dictionary Larousse define the cooperation as a method of action by which individuals or families with common interests constitute a business where each member's rights are equal and where the profit is distributed only between the

[†] Centre Africain d'Etudes Supérieures en Gestion (CESAG), Dakar, Senegal.
☎. +221 33 839 75 75
✉. aboudou.ouattara@cesag.edu.sn

partners in proportion of their participation in the activity [Retrieved from]. It is essential to organizations' well-functioning. It is right that the conditions of its emergence and maintenance generate research in management.

Indeed, economists and mathematicians have long been interested in the optimal decision that should be made by each participant in strategic interactions through the game theory. In this paradigm, an individual's propensity to cooperate depends on its expected gain which is a function of his decision and those of other participants.

The empirical validation of the foundations and conclusions of this theory by the Experimental Economics established that individual's decisions could be motivated by altruism, desire of reciprocity, inequity aversion, or reciprocity, … these motivations, different from the strict self-interest search constitute the concept of social preferences. It is defined as the motivations that govern individual decision in social interactions. This paradigm opened the way for the development of other key reading of individual's propensity to cooperate in organizations.

Based on the development of the research on the field, we can note the need for the refinement of our understanding of the distribution of social preferences in a given population and their influence on the propensity to cooperate. The latter is defined as an individual's inclination to focus in his decisions on options that are likely to make a gain for the whole community; even if it appears, at first intention, less beneficial for his self-well-being.

It is to contribute to a better understanding of the influence of social preferences on cooperation within organizations that this empirical research has been conducted. It focuses on answering the following question: What is the influence of social preferences on the propensity to cooperate within organizations? The understanding of the influence of social preferences on the emergence of cooperation in organizations is crucial to enrich the understanding of preferred options in individual decision making and its influence on organizations dynamics. This research provides a better understanding of the influence of social preferences on the propensity to cooperate within organizations, based on an experimental study conducted in the African context.

It makes a triple contribution: theoretical, managerial, and methodological. On the theoretical level, the questioning of the validity of individual decision making theories in social interactions should allowed the assessment of the completeness of available paradigms. It will therefore open the reflection on the construction of an unified and efficient framework to understand individual preferences in social interactions.

On the managerial level, the identification of the link between social preferences and the propensity to cooperate opens the way for the identification of the actions that can be carried out to generate cooperation in organization. On the methodological level, the use of experimental study allows us to propose an approach for the identification of social preferences underlying individual preferences. In addition, the use of specific analysis tools should contribute to the establishment of a specific approach allowing an efficient framework to test the validity of the theories mobilized.

To achieve this, we base the analysis on the data collected by Ouattara (2015) through an experimental study conducted during the months of February and March 2013. It involved a sample of 130 students of CESAG Business School's master programs. We consider data on four (4) treatments composed of a dictator, an ultimatum, a trust and a public good game.

It comes from the analysis that individual social preference influences the propensity to cooperate. Indeed, individuals characterized by different social preferences have different behaviors in public good game. The presence of selfish rational individuals is the cause of the cooperation's decline within organizations and that inequity averse individuals are resilient to the lack of cooperation from other organizations members.

The following of the document is divided into three sections. It begins with a literature review on the foundations and tools for social preferences and the propensity to cooperate analysis. The methodology is presented in the second section. Followed by the presentation of the experimental study and the data mobilized in this research. The third section is devoted to the presentation of the results of the research.

## 2. Social preferences and cooperation, foundations and analysis tools

Right now, there are many researches on the propensity to cooperate and the motivations of decision-making mechanisms in social interactions. Various proposals have been made on the reasons why some individuals are prone to cooperate and others not. The first section presents the foundations and analysis tools of the propensity to cooperate.

### 2.1. Individuals propensity to cooperate

One of the conclusion of the game theory is that sometimes organization members have an interest in cooperation to enable them to lead to a situation that is far preferable to that in which the decisions based on a selfish individual reasoning would have led the organization. Considering individual's propensity to cooperate is then decisive in individual and collective decisions making because it is likely to govern the evolution of the organization.

In addition, it is interesting to look for a suitable means that could be mobilized to achieve a greater cooperation between a given organization's members. It can be, among other things, by the introduction of reputation (Andreoni & Miller, 1993), the use of communication between participants or the introduction of punishment of the stowaway by other participants (Gachter *et al.,* 2010).

Experimental economics used, among others, public good game (Andreoni, 1988; Fehr & Schmidt, 1999) with different variants to respond to the question of the identification of social stimuli or economic challenges that can be used to obtain a greater cooperation from organization's members. Fischbacher & Gaechter (2008) propose a classification of individuals in four categories:
1. free riders (FR): Those who don't cooperate within organizations and look for their selfish interest regardless of the contributions of other members;
2. conditional contributors (CC): Those whose contribution depend on that of others; they increase their contribution when the other members increase theirs;
3. triangular contributors (CT): Those whose contribution increases with that of the other participants when the latter is low and reduce their contribution when those of the other exceeds a certain threshold;
4. unclassifiables (I): those whose contributions doesn't obey to a given rules.

Parallel to this categorization, social preference theories have been proposed to identify the motivations that govern individual's decision and the motivation to behave as a free rider, a conditional contributor, a triangular contributor, etc. Neoclassical theory that postulates that individual decision making is solely based on their selfish monetary gain justify only free riding behavior. Social preference theory intends to propose a framework that justify the other observed behaviors.

### 2.2. Social preference theories, proposals and interpretations

In neoclassical theory, social preferences' analysis is articulated around game theory which helped to structure the knowledge on the possible strategies and the determinants of the preferred options in social interactions. It led some recommendations about the strategies that each participant can implement in such interactions to pull the best situation for them and for the group. As well, the equilibrium that can emerge from individual decision can be a Nash, perfect Nash in sub-game, perfect Bayesian Nash depending on the conditions of interactions;

specially in relation to the information available for the actors and the structure of decisions they can make (Giraud, 2000; Miller, 2003; Gibbons, 1992).

The recommendations of this paradigm are normative insofar that they are dictated as the strategy that a rational selfish individual who interact with other participants who act in the same way can implement. It was necessary to confront these prescriptions with individual's behaviors in real situations.

Experimental Economics served as a privileged framework for the validation of assumptions and conclusions of the game theory. It is based on a wide variety of experimental studies that simulate various possible environment and help to depict the motivation of individual's decision made in social interactions.

As well, ultimatum game (Greenberg, 1978; Slonim & Roth, 1998; Fehr & Schmidt, 1999; Chang & Maheswaran, 2011), dictator game (Kahneman *et al.,* 1986; Engel, 2010) and investment or trust game (Berg *et al.,* 1995; Meidinger *et al.,* 2001) have been used to study altruism, reciprocity and trust. Prisoner's Dilemma (Giraud, 2000; Dreber *et al.,* 2014) and public good game (Marwell & Ames, 1981; Fehr & Schmidt, 1999; Gachter *et al.,* 2010) were used to study an individual's propensity to cooperate. In a complementary way, the battle of sexes (Osborne, 2000) and deer hunt allowed to study the propensity to coordinate. The negotiation ability is studied through a beauty game.

In addition, the relationships between these behaviors have been subject to recent researches. For example, Dreber *et al.* (2014) have studied the link between the propensity to give in the dictator game and cooperation in a repeated prisoner's dilemma game. They show that people who cooperate more in the prisoner dilemma game are not necessarily those who give the most in the dictator game. This result shows that individual's social preferences have some specificities that should be understood; more specifically in the African context.

The authors conclude that some individuals are not only interested in their monetary gain. They discover that altruism can be one of the motivation underlying these observed behaviors. The lack of convergence of self-declared sharing in the dictator game and cooperation in the repeated Prisoner's Dilemma game informs on the specificities of individual behavior as a function of the decision framework. The empirical studies based on these different games conclude that it is necessary to broaden the framework to understand individual's strategies in social interactions. They allowed, among other things, to realize that participants in these games do not always make their decision on the basis of their selfish well-being and don't think only of their monetary gain. They look at other considerations such as altruism, desire of reciprocity, inequity aversion, look for equity, reciprocity, … These proposals represent the social preference theory built on the contributions of Rabin (1993), Levine (1998), Fehr & Schmidt (1999), Bolton & Ockenfels (2000) and Dufwenberg & Kirchsteiger (2004).

### 2.2.1. Rabin's intentional fairness model (1993)

Rabin (1993) postulates that an individual adopts an equity behavior which stimulate him to be benevolent toward people who are kind with him and make its blow to those who are malicious even if with the price of renouncing to his own monetary gain or saving.

This framework is applied to propose some explanation of the difference in individual propensity to cooperate in the prisoner dilemma or to coordinate in the battle of sexes. It concludes that the prevalence of cooperation in these games is the result of the anticipation of other members' cooperation and his intention to be fair with them.

Note that the framework is hardly generalizable to game with several players. Indeed, author discuss the decision of an individual who is member of an organization within which some members have been malware with him and other benevolent. The optimal decision did not seem obvious to derive in these conditions. These limits have stimulated the proposal of sequentially reciprocity theory by Dufwenberg & Kirchsteiger (2004) which generalizes Rabin's framework including several participants and a dynamic cases. But the

implementation of the conclusion in empirical studies is not straightforward. Levine (1998) proposes another explanation to individual social interactions' behavior.

### 2.2.2. Levine's altruism and spitefulness model

Levine (1998) proposed a model in which everyone involved in a social interaction makes his decision by optimizing a psychological utility function. This function is a combination of the wellbeing associated to his own monetary gain and those of the other participants associated with their earnings. It assigns a weight to his monetary gain and a weight to those of the others.

The author relies on this framework to elucidate the results obtained in the public good game. He predicts two situations. The individuals who cooperate because they have a high altruism's coefficient and people who do not cooperate because their coefficient of altruism is low. As well, an individual's propensity to cooperate is determined by his altruism's level. It should, however, be pointed out that Levine (1998)'s altruism and spitefulness' model predicted two extreme cases: individuals who contribute with their entire Token and those who do not contribute in the public good game. However, experimental studies' results don't exhibit this bimodal situation.

### 2.2.3. Inequity aversion theory

Fehr & Schmidt (1999) developed a model of inequity aversion to explain the stylized facts observed in cooperation or competition's game. The model retains the assumption that individuals are rational. But they add that participant are driven by a self-center's aversion to inequity. In other words, they consider that everyone is disposed to sacrifice a part of his individual wellbeing (associated to his monetary gain) to get closer to the most equitable situation. Individuals according to their behavior can be stored in two major categories: pure selfish (only motivated by his monetary gain) and inequity averse (who is interested in the reward or punishment of its counterparts on the basis of their strategies). Based on this model, the authors propose a reading of the stylized facts of public good game. They establish that inequity averse individual are likely to have a higher propensity to cooperate than that of rational selfish individuals. However, in a group, the presence of rational selfish individuals can induce a non-cooperative behavior among individuals highly inequity averse. However, as the authors point out, the application of the inequity aversion theory face some difficulties to explain the stylized facts relating to altruism's propensity.

### 2.2.4. Equity, reciprocity and competition theory (ERC)

In the same sense like Fehr & Schmidt (1999), Bolton & Ockenfels (2000) proposed a theory that also aims at explaining the stylized facts of games in which the Equity, Reciprocity and Cooperation are the main participants decisions' motivations. The difference with Fehr & Schmidt (1999)'s model is that it is a model that can be applied to incomplete information games.

The model is based on the postulate that individual decisions in a social interaction are motivated by self-monetary gain's and the relative gain's level compared to those of other participants. Thus, the conclusion is that the stylized facts observed in games are the result of the interaction between self-interest and equity looking.

Authors apply this framework to explain the behavior observed in various social interactions. They provide some explanations to some facts that appear has a puzzle by another author. Overall, these four proposals related to individual preferences supplement the neoclassical theory to provide a better understanding of individual decision making. Despite their significant contributions to the understanding of individual propensity to cooperate within organizations, there are little researches that mobilizes the overall frameworks to explain behaviors observed in experiments. Indeed, each author limits his analysis to a given framework in providing an explanation to the stylized facts. Fischbacher & Gaechter (2008) proposed an explanation of the difference of propensity to cooperate observed in experimental studies. They established, among others, that

contribution's decline in public good game is not due to behavior's changes. It is due to the conditional nature of people contributions and the beliefs' changing during the session.

It seems interesting to study the influence of possible motivation of individual's behaviors in social interactions on cooperation. In that perspective, it is useful to study the heterogeneity of these individual motivations in a given population. Indeed, as established in the literature review each proposed model seems insufficient to explain the observed behavior in reality and in the experiments conducted by the authors cited. That is the goal of this research which mobilized data on experiments to study the influence of social preferences on the propensity to cooperate.

## 3. Research methodology

The study of the influence of the social preference on an individual's propensity to cooperate faced a triple challenge. Firstly, it raises the problem of tools that can be used to measure efficiently the two key concepts : social preference and an individual's propensity to cooperate. Thereafter, it is imperative to establish a formal link between the measures and decision making's parameters. The last point focus on the analytical tools suitable to study the influence of the social preference on the propensity to cooperate.

This section presents the approach used. It covers the strategy used to collect the data, to identify individual social preferences and to estimate decision's parameters.

### 3.1. Social preference identification and propensity to cooperate's measure, an experimental study

The data used in this research are from Ouattara (2015). They are part of data collected from an experimental study. It covers a sample of 130 students from CESAG Business School based in Dakar (Senegal). We used data related to four (4) treatments: dictators game, ultimatum game, Trust game and public good game.

The analysis establishes that the sample is composed of 81 men and 49 women; they are between the ages of 21 and 41 years and they come from eleven african countries.

The choice of the studied population has been dictated by the desire to test the validity of the conclusions established in other economic spaces in an African context and by the accessibility of students for experimental studies implementation. They constitute a working group from which we can obtain results that are generalizable to the whole population where they have been drawn.

### 3.1.1. Measurement of the propensity to cooperate: a public good game

Individual propensity to cooperate is studied through a public good game (Marwell & Ames, 1981; Fehr & Schmidt, 1999; Gachter *et al.,* 2010). Each participant is informed that he is part of a team composed of four other anonymous participants and that he is endowed with ten tokens. It must make the decision of the number of tokens that he would like to put in the common pool. The remaining is kept for him. Each token retained earns 0.15 €. While each token placed in the kitty provide an amount of 0.075 € to each member of its group (including himself). Thus, if for a given group, all members put their entire token (cooperation), each one will win 3.00 €. Has the opposite, if no one put any token in the common pot (absence of cooperation), each person receives the amount of 1.5 €. In addition, if all participants except one (alone) decide to put their entire token in the common pool then those who put their tokens will receive 2.25 € and the one who didn't put anything will get 3.75 €. In this situation, the participant who didn't cooperate is a free rider and he receive an higher amount than the others. Between these two extreme cases, there is a range of situations from full cooperation to free riding.

Each participant's decision depends both on its anticipation of what other group members will do and his propensity to cooperate. A participant with a strong propensity to cooperate will be inclined to put his entire tokens in the common pool, hoping that the other will do the same. A non-cooperative participant will retain all his tokens for himself and will expect that his teammate will put at least a part of their token in the common pool. As well, an individual's propensity to cooperate is measured by the quantity of token that he puts in the common pool.

The experiment is repeated ten times to study the evolution of the propensity to cooperate. The repetition allows the study of the influence of the lack of cooperation of his teammate in a given period on his contribution in the following periods. Each participant is informed of his total gain once all participants have made their decision.

This treatment is part of a global experiment whose description is available in Ouattara (2015). At the end of the study, each participant receives in cash the cumulative gain. This strategy is used to ensure that each participant make its decisions in a real situation and not in a hypothetical way.

*3.1.2. Identification of social preferences: a combination of dictator, ultimatum and trust games*

To identify the motivations that govern an individual's decisions in social interactions, a combination of three experiments is used: dictator, ultimatum and trust games.

*3.1.2.1. Treatment 02: dictator game*

Experiment 02 is consisted in submitting each participant at a dictator game (Kahneman *et al.,* 1986; Engel, 2010). Each participant is informed that at the end of experiment, he gains 15.27 € and that another anonym participant receives nothing. It is then proposed to share his gain with this participant. The amount that he wishes to transfer to this participant is left to its discretion and will be withdraw on his gain. If he doesn't share is amount there would not have any punishment or additional compensation. He is free to decide the amount he will like to send to his binomial.

The interviewee is not forced to share. He doesn't obtain any remuneration or sanction if he shares or refuses to share. As well his decision is essentially dictated by its degree of altruism. As well, if he pays a non-null amount to his pair, he will not get a zero gain. In so doing he shares its monetary gain with his pair. He will not be encouraged to act in this way if he doesn't attach any well-being to his pairs well-being.

The part of his gain that he shares with his binomial measure his social preference. A selfish rational person will not be motivated to transfer an amount to his binomial. At the opposite, an individual sensitized to the well-being of others will tend to share a substantial part of his gain with his binomial. A formal relationship between the level of sharing and an individual social preferences level will be established in the following.

*3.1.2.2. Treatment 03: identification of acceptance's thresholds in ultimatum game*

Treatment 03 is designed to identify a participant acceptance's thresholds in an ultimatum game (Greenberg, 1978; Slonim & Roth, 1998; Fehr & Schmidt, 1999; Chang & Maheswaran, 2011). The scenario of the experiment is worded as following.

You are matched with another participant with whom you will interact anonymously to share a given amount. You will interact sequentially. Participant 01 is informed that he is the first decision maker. A given amount M is offered to them. He is asked to make a proposal of the sharing that he would like to make between him and his binomial. The proposal will be sent to his binomial who has the last decision: refuse or accept. If he is agreed with the sharing made, each person receives the amount as proposed by the first participant. If he disagrees, each participant receives nothing: 0 €. Before proceeding the game, data on the intentional acceptance's threshold have been collected. Each participant has been

invited to put themselves in the second player's position. He is asked to provide information on his decision to accept or refuse his pairs' proposal for different levels of the participant 01's sharing proposal.

This step allows to estimate each participant's acceptance's threshold in ultimatum game. This threshold is used to identify the motivation that governs an individual decision making in social interactions.

### 3.1.2.3. Treatment 04: intentional reciprocal gifts in trust game

In Treatment 04, it is proposed to participants a trust game designed by Berg *et al.* (1995) (Meidinger *et al.,* 2001). This game consists in matching anonymously each participant who receives an initial endowment of 1.52 € at the beginning of the experiment. Participant 01 is informed that he is paired anonymously with another participant and is invited to choose the amount (on his 1.52 €) that he would like to transfer to the Participant 02. He is informed that the amount send is multiplied by three and transfert to the recipient. Once informed of the total amount he received, participant 02 must decide the part of the amount received that he would like to give back to participant 01. Participant 02 is not obliged to make a reciprocal gift. Nothing will arrive if he decides to send nothing to participant 01.

Before proceeding the game, information on participant 02's intentional reciprocal gift are collected. Doing this, each participant is asked to put himself in the position of participant 02. For different amount received, he is asked to declare the amount that he would give back as reciprocal gift. Ten different amount as gift are proposed.

The amount of the reciprocal gift is used to identify the motivations that underlie participant's decision making process in social interactions.

The whole experiments have been implemented under the platform Z-tree (Zurich Toolbox for Readymade Economic Experiments) developed by Urs Fischbacher (2007). The use of these experiments allows us to have information on sharing level in dictator game, acceptance's threshold in ultimatum game, intentional reciprocal gifts in the trust game for ten amount received and the contribution in the public good game.

Sum up, the combination of the four treatments allows to characterize individuals according to their social preferences (altruism, the desire of reciprocity, the inequity aversion, reciprocity, …) and their propensity to cooperate. To achieve this, it is necessary to determine an analytical function that links participant's decision to their motivations and decision making parameters in social interaction.

### 3.2. Identification of social preferences and estimation of individual parameters

Based on this dataset, we proposed a process to identify of social preferences that govern the decisions made by each participant in the experiments. To achieve this, it is essential to establish formal relations between indicators and the key variables of the theoretical models. The resolution of the program of each decision maker establishes that indicators are related to the characteristics of individual social preferences according to table 01 below.

Recall that the relations have been established by maximizing the utility function associated to each motivation. The proofs can be found in Ouattara (2015).

These relations allow to build an identification strategy for the characteristics of social preferences.

Social preferences' identification and parameters estimation are made by step. Firstly, we defined social preference's classes: Rational egoist (class 01), altruist and spiteful (class 02), inequity averse (class 03) and look for Equity, Reciprocity and Cooperation (class 04).

**Table 1.** *Summary of attended decision in experiments depending on social preferences*

| Theoretical Framework | Individual utility function | Sharing (dictator game) | Threshold of acceptance (Ultimatum game) | Reciprocal gift intentional (Trust game) |
|---|---|---|---|---|
| Selfish rational | $U[Y_i]=Y_i$ | $Pd_i = 0$ | $Su_i = \varepsilon$ | $RCo_i (x) = 0$ For any x |
| Altruism and spitefulness | $U(Y_i)=u(Y_i)+\dfrac{a_i+\lambda_i a_j}{1+\lambda_i}u(Y_j)$ | $Pd_i = \dfrac{1}{1+a_i}$ | $Su_i = \dfrac{1}{a_i}-1$ | $RCo_i(x) = = \dfrac{1}{3x}-\dfrac{3+a_i}{3(1-a_i)}$ |
| Inequity averse | $U[Y_i] = Y_i - \alpha_i \max_t Y_j - Y_i ;0) - \beta_i \max_t(Y_i - Y_j ;0)$ | $Pd_i = 0.50$ | $Su_i = \dfrac{\alpha_i}{1+2\alpha_i}$ | $RCo_i (x) = 2/3$ |
| Equity, reciprocity, Cooperation (ERC) | $U(Y_i)=\begin{cases} 0.5 & si \ Y_i+Y_j=0 \\ \dfrac{Y_i}{Y_i+Y_j} & si \ Y_i+Y_j>0 \end{cases}$ | $Pd_i = \dfrac{1}{2}-\dfrac{m_i}{b_i}D$ | $Su_i = \dfrac{1}{2}-\dfrac{m_i}{b_i}D$ | $RCo_i(x) = \dfrac{2}{3}\left[1-2\dfrac{m_j}{b_j}\dfrac{(1+x)^2}{x}D\right]$ |

**Notes:** $Y_i$: individual i's gain, $Y_j$: individual j's gain, $Pd_i$: Sharing in the dictator game, $Su_i$: acceptance's threshold in ultimatum game; Rcoi (x): intentional reciprocal gift of individual i in case of the gift of an amount x; $a_i$: altruism coefficient; $\alpha_i$: negative inequity aversion coefficient; $m_i$: monetary preference coefficient; $b_i$: inequity aversion coefficient

For each class, the link between the indicators and the parameters is based on Table 01. On this basis, we build a score of belonging to a given class; computed as following:

$$Score_k\left(Pd_i, Su_i, RCo_i(x)\right)=\frac{1}{L+2}\left[\left(Pd_i-\overline{Pd}_k\right)^2+\left(Su_i-\overline{Su}_k\right)^2+\sum_{i=1}^{L}w_l\left(Rco(x)-\overline{Rco(x)}_k\right)^2\right] \qquad (1)$$

In this expression, the highlighted iterms designate the values that a person should provide if his preferences are consistent with the predictions of the model defining the class k. For a given class, a person whose score is equal to 0 has his answers that lies within the expected values for the class. The score is higher than 0 if the value provided by the participant is away from those expected. Thus, for each participant, four scores associated to each class are computed. Based on these scores, an individual is assigned to the class k for which it has the lowest value.

Sum up, this approach provides an assignment of each participant to one social preference class.

### 3.3. Methodology of the study of the influence of social preferences on the propensity to cooperate

An econometric modeling is used to study the influence of social preferences on the propensity to cooperate. The latter is measured by the number of tokens puts in the common pool by the participant. We estimated a count model linking the number of tokens deposited in the common pool to the class of social preference. Individual variables such as the contribution to the previous period are considered as explanatory variable to control their effects on the propensity to cooperate. Formally, the analysis is based on the estimation of the following relationship:

$$Contr_{i,j} = f\left(\Pr efSoc_i, X_i, j\right)$$

The functional form is chosen among the possible count models that are poison models, negative binomial, zero-inflated poison and zero-inflated negative binomial. The estimation and validation of the model are implemented in accordance with the approach provided by Miller (2007). The modules developed under Stata by Long & Freese (2014) are used as tools.

Sum up, this section presents the methodology. It presents the data collection tools and social preference and the propensity to cooperate measurement. It ended

by the description of the approach used to estimate the relationship between the two key concepts. After these presentation, the results drawn can be discussed.

## 4. Research results

The objective of this section is to present the results of the research. It begins by the presentation of the characteristics of the participants' propensity to cooperate. The characteristics of social preferences are discussed thereafter. It ends by the analysis of the influence of individual social's preferences on the propensity to cooperate.

### 4.1. Participants' propensity to cooperate

Let's recall that an individual's propensity to cooperate is measured by the number of tokens on its endowment of ten tokens that he decides to put in the common pool at each step of the public good game.

Table 2 below presents descriptive statistics of contributions in the public good game. It is arisen from these results that in average participants contributed with around three token (mean = 3.40) at the first period of the game. Thus, on average, each participant contributes in the common pool with the third of his endowment. This contribution decreases drastically at the second period by one third (mean = 2.35) in average and remains approximately stable for the following step of the game. A mean comparison test shows that the contribution's decreasing is statistically significant (Pvalue= 0.006).

**Table 2.** *Evolution of the contribution in the public good game*

| Period | N * | Median | Average | Std. Deviation | Minimum | Maximum |
|--------|-----|--------|---------|----------------|---------|---------|
| 1 | 130 | 2.00 | 3.40 | 3.31 | 0 | 10 |
| 2 | 130 | 1.00 | 2.35 | 2.82 | 0 | 10 |
| 3 | 130 | 1.00 | 2.26 | 2.97 | 0 | 10 |
| 4 | 129 | 1.00 | 2.13 | 2.86 | 0 | 10 |
| 5 | 121 | 1.00 | 2.50 | 3.38 | 0 | 10 |
| 6 | 116 | 0.50 | 2.16 | 3.08 | 0 | 10 |
| 7 | 111 | 1.00 | 1.63 | 2.48 | 0 | 10 |
| 8 | 100 | 1.00 | 2.17 | 3.07 | 0 | 10 |
| 9 | 79 | 1.00 | 2.09 | 3.01 | 0 | 10 |
| 10 | 45 | 1.00 | 2.53 | 3.61 | 0 | 10 |
| Total | 1091 | 1.00 | 2.33 | 3.06 | 0 | 10 |

**Notes:** We present in this table the characteristics of the distribution of contributions in public good games. * Note that the differences in sample size comes from the fact that the size of some cohorts of participants is not a multiple of 4. In these cohorts, some individuals have not been assigned to groups for some periods. In addition, participants of the latest cohort participate only in five periods game instead of the ten described in the methodology.

The cooperation level observed is higher than the results found in the literature which records a contribution of the quarter of the endowment (Fehr & Schmidt, 1999). The contribution's reduction over the periods has been widely documented in the literature, and the issue of some researches is to provide an explanation of the causes of this decline.

The literature harbors a controversy. Indeed, some assigns this decreasing to a modification of participants' propensity to cooperate during the experiment. Fischbacher & Gaechter (2008) showed that this decline is not necessarily due to a change in the propensity to cooperate but is due to the existence of free rider among participants. When a participant with high propensity to cooperate meet a free rider at a given period of the game, he modifies his behavior by reducing his contribution in the common pool. They conclude that the existence of free rider in real live is not necessarily attributable to the human nature but to the modification of cooperation based on the experience of no-collaboration with free riders in the past. The existence of one free rider in a group can reduce the cooperation of the whole group. Thus, the contribution's decline can be associated with participant's disappointment at an early stage of the game. It can also be associated to the desire of betraying other participants by showing a high propensity to cooperation in the

first stage of the game and free ride at the subsequent stages when the others are confident in the group's cooperation.

An analysis of the relationship between the contributions' level at a given period and that of their group members in the previous period allow to discriminate between these two explanations found in the literature. The result of the analysis is shown by the scatter plot in Figure 1.
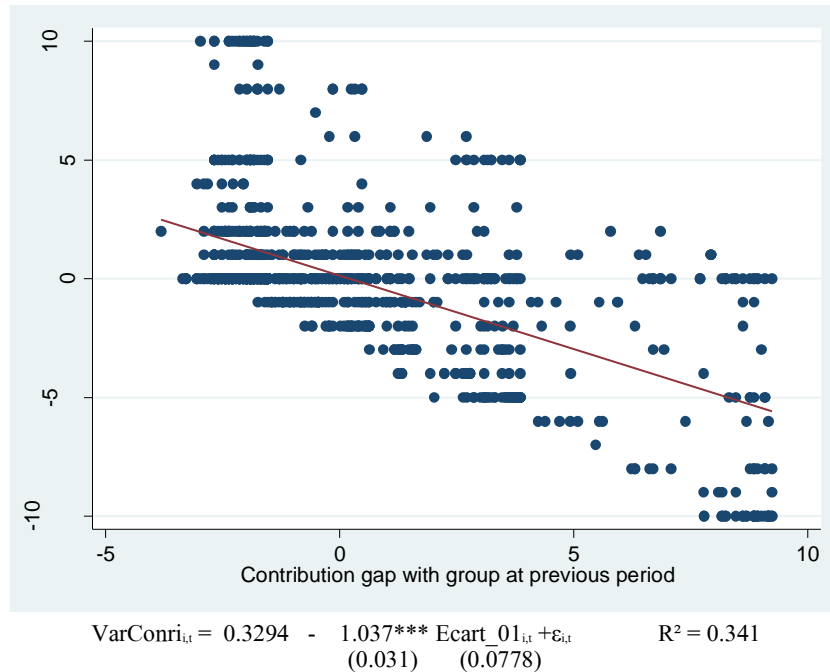


$$VarConri_{i,t} = 0.3294 \quad - \quad 1.037^{***} \; Ecart\_01_{i,t} + \varepsilon_{i,t} \qquad R^2 = 0.341$$
$$(0.031) \qquad (0.0778)$$

**Figure 1.** *Scatter plot of contributions changes vs. previous period's differential contributions*

The scatter plot highlights a decreasing relationship between participants' contribution variation at each period and the gap between his contributions' level and his group members' average contribution at the previous period. The linear regression between the two variables shows that the influence is statistically significant at Pvalue of 5% and that 104% of the gap of contributions is reflected by the participant in his contribution at the next period.

We can conclude that the declining in contributions is, for a large part, due to participants' disappointment when he encounters at a given period people who contribute less. This relation explains one third of the contribution's heterogeneity between individual and game's period.

We can also observe that the contribution's distribution is very heterogeneous as we can observe in the distribution's standard deviation, minimum and maximum's values. Indeed, table 2 show that there is some participant who contributes by zero at each period of the game (minimum = 0) and others who continue to contribute with their entire endowment at the last period of the game (maximum = 10). This heterogeneity is translated by a coefficient of variation which is greater than 1. The contribution's heterogeneity between participant translate that of the propensity to cooperate' characteristics between them.

But before going there, it seems interesting to study the distribution of the population according to their social preferences.

### 4.2. Social preferences' characteristics

In this section, we present the distribution of sharing in dictator game, acceptance's threshold in ultimatum game and intentional reciprocal gifts in trust game. The results are recorded in table 3 below.

### 4.2.1. Sharing in dictator game

In dictator game, approximately 12% of population doesn't intend to offer any part of their endowment. Persons who declare their intention to transfer an amount to their binomial send, on average, 25 per cent of their endowment (Table 3).

Table 3. *Characteristics of sharing in dictator game, acceptance's threshold and intentional reciprocal gift*

| | | Obs. | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|
| share levels in the dictator game | | | | | | |
| With null sharing | | 130 | 22.1 | 19 | 0 | 100 |
| With sharing | | 114 | 25.2 | 18.3 | 0.01 | 100 |
| Acceptance's threshold in ultimatum game | | | | | | |
| Threshold | | 130 | 35.8 | 17.4 | 0 | 70 |
| Intentional reciprocal gift in trust game | | | | | | |
| | 10 | 130 | 52.7 | 26.7 | 0 | 100 |
| | 20 | 130 | 46.9 | 21.8 | 0 | 100 |
| | 30 | 130 | 45.3 | 20.3 | 0 | 100 |
| Fraction of | 40 | 130 | 44.8 | 19.5 | 0 | 100 |
| endowment | 50 | 130 | 44.7 | 19 | 0 | 100 |
| given by the | 60 | 130 | 43.5 | 18.2 | 0 | 100 |
| binomial (%) | 70 | 130 | 41.7 | 18.3 | 0 | 100 |
| | 80 | 130 | 40.5 | 17 | 0 | 100 |
| | 90 | 130 | 40.1 | 16.7 | 0 | 100 |
| | 100 | 130 | 40.9 | 18.1 | 0 | 100 |

By comparing the average sharing with the value expected for each social preference classes, we can derive that there is more participant whose decision in the dictator game is guided by the look of Equity, Reciprocity and Cooperation (ERC). In addition, the analysis of the histogram of sharing in Figure 2 highlights a bimodal distribution in the population. We can conclude that the population is composed of two sub-populations. One composed of people who envision to pay the entire amount of their endowment to their binomial. Another for those who pay less than half of their endowment.

We can realize that the population is relatively heterogeneous according to the sharing in the dictator game. Indeed, the observed sharing level cover the entire support of the distribution. Values lies between 0 and 100%.

### 4.2.2. Acceptance's threshold in ultimatum game

The results indicate that the acceptance's threshold is on average 36%. This value is out of the inequity aversion theory's prediction zone but lies on forecasting zone of two other theories. The histogram of the acceptance's thresholds shows a bimodal distribution concentrated around 10% and 50% (Figure 2).
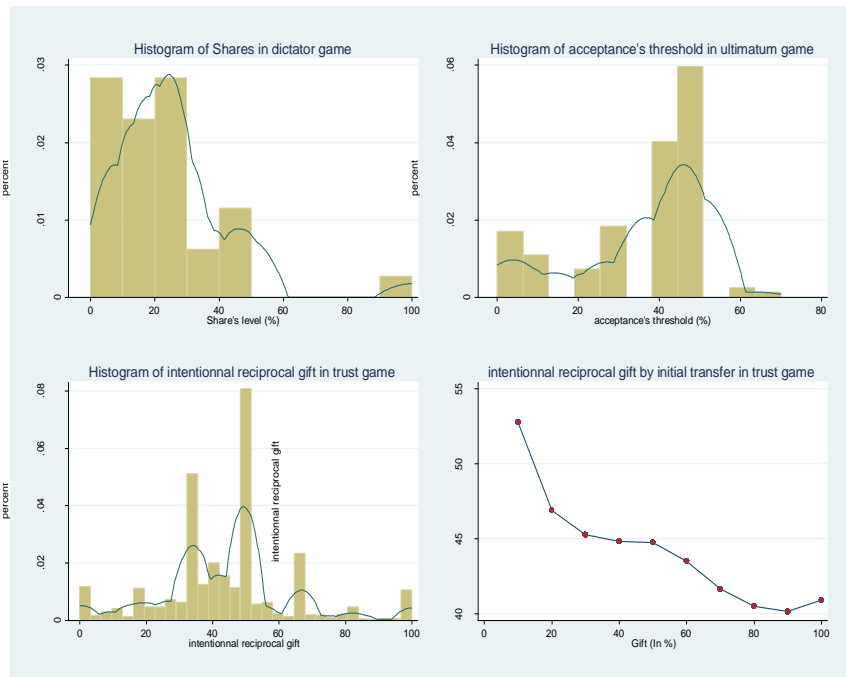
**Figure 2.** *Distribution of sharing, acceptance's threshold and intentional reciprocal gifts*

Thus, the distribution of acceptance's threshold highlights a heterogeneity. One important observation is that the average acceptance's threshold doesn't reveal a clear predominance of altruism and spitefulness theory and the Equity, Reciprocity and Cooperation theory. Indeed, these two theories provide a similar forecast about the acceptance's threshold's range.

*4.2.3. Intentional reciprocal gift in trust game*

The last component of the analysis of social preferences' indicators is about the intentional reciprocal gift in the trust game.

As we can observe in figure 2, the intentional reciprocal gift's coefficient is linked to the hypothetical gift by a hyperbolic curve. A log-log adjustment on data provide an empirical relation $Y = 66.95\exp(-0.11*X)$. This equation means that each supplement percent of endowment offers leads a decreased of 11% of the intentional reciprocal gift's coefficient. For a gift of 10% of his binomial's endowment, participant promised in average a reciprocal gift of 52% of the amount get from this transfer. The intentional reciprocal gift's coefficient decreased with the part of his binomial's endowment that he offers. The reciprocal gift represents 40% of the amount received when his binomial transfers all his endowment. As shown in table 01, this hyperbolic configuration is consistent with the prediction of altruism and spitefulness theory and the Equity, Reciprocity and Cooperation theory (ERC).

As for the other indicator, the population is characterized by heterogeneity in relation to the intentional reciprocal gifts since the observed values cover all the support of the indicator's distribution. The population could be divided into sub-categories as suggested in the form of the histogram.

*4.2.4. Distribution of individuals based on their decision schema*

The social preferences identification's process provides two classes characterized respectively by the selfish rationality and the inequity averse. participants are unevenly distributed between the two categories. The first comprises 19% of the sample with 25 individuals against 104 in the second class.

Individuals classified in the category of selfish rational promised to donate less in the dictator game, have a relatively low acceptance's threshold and have an intentional reciprocal gift on average lower than those of the second class. The

multivariate comparison tests confirm the significance of the observed differences (P-value=0.000).

These classes are used to study the influence of social preferences on the propensity to cooperate.

### 4.3. Influence of social preferences on the contribution in the public good game

According to the methodology for the estimation of this type of model, we estimated four models: *poison model, zero inflated poison model (ZIP), negative binomial model and zero inflated negative binomial model (ZINB)* (Long & Freese, 2014). The comparison of the explanatory powers of these models allows to identify the more suitable to the dataset.

The variable of interest is divided into four components. Indeed, we considered the contribution at the first period (contribution 01), the contribution's increase from one period to another (VariContriplus), a contribution's decrease from one period to another (VariContriplus) and the variable that provides information on the constant of the contribution in reference to previous period contribution (VariContrizero). The consideration of these variables is motivated by a desire to have a deepest knowledge on the influence of social preference on the propensity to cooperate. Indeed, the first period contribution's level reflects the individual preferences while individual contribution at the other periods can be influenced by his history, the experience. For the other periods, the influence of the social preference on the contribution's modification inform on its influence on the propensity to keep cooperation behaviors. It is this logic that governed the building of the variables of interest.

The results of the estimation of the poison model are recorded in the Table 4.

It comes from this table that inequity averse individuals contribute on average approximately 25% more than those driven by selfishness at the first period of the public good game. Note that the difference is not statistically significant. The influence which is statistically significant is the influence of social preference on the contribution's reduction because of a disappointment in the previous period. In model 03, the social preference's measure has a negative sign which is statistically significant at the threshold of 1%. We can conclude that the social preference reduces the individual's propensity to reduce their contribution.

Model 04 establishes that social preference positively influences the probability of maintaining the same contribution's level from one period to another. This influence is statistically significant. In addition, this model provides some information on the influence of social preference on contribution's adjustment due to contributions' gap at the previous period. The positive sign of the coefficient tells us that inequity averse individuals are prone to keep the same contribution's level at the next period when they find a difference between their contributions and the average contributions of their group members. That is, when they realized that at a given period, their contribution is higher than the average contribution of their group members, they are prone to keep the same contribution's level at the next period.

**Table 4.** *Results of the estimation of the influence of social preference on the propensity to cooperate*

| VARIABLE | Contribution 01 | VariContriplus | VariContrimoins | VariContrizero |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Averse to inequity | 0.254 | -0.293 | 0.114 | |
| | (-0.193) | (-0.205) | (-0.147) | |
| gap_01 | | -0.118 *** | 0.254 *** | |
| | | (-0.0389) | (-0.0186) | |
| Constant | 1,314 *** | 0.908 *** | -0.393 *** | |
| | (-0.177) | (-0.22) | (-0.149) | |
| Inflate | | | | |
| Averse to inequity | 0.175 | -0.357 | -4,376 ** | -0.296 * |
| | (-0.614) | (-0.26) | (-2,108) | (-0.178) |
| gap_01 | | 0.160 *** | -16.50 *** | -0.389 *** |
| | | (-0.045) | (-5,747) | (-0.0751) |
| Averse to inequity: gap_01 | | | | 0.209 *** |
| | | | | -0.0799 |
| Constant | -1,229 ** | 0.520 * | -19.81 *** | 0.0234 |
| | (-0.571) | (-0.295) | (-7,443) | (-0.161) |
| lnalpha | -1,438 *** | 0.285 | 0.0197 | |
| | (-0.363) | (-0.318) | (-0.129) | |
| observations | 129 | 952 | 952 | 952 |
| p | | 0.116 | 0 | |
| N_zero | | 696 | 672 | |

**Notes:** Standard errors in parentheses. *** P <0.01, ** p <0.05, * p <0.1. In this table, we present the result of the estimation of the count model between the contribution in public good game and the social preferences classes, contribution levels at the previous steps (gap_01: the difference between the participant's contribution and that of the mean contribution of his group members at the previous period). The depend variables are contribution at the first period (Contribution 01), the increase of contribution (varicontriplus), the decrease of contribution (varicontrimoins), the constante of contribution (varicontrizero) comparing to his contribution at the last period. Variable "gap _01 'represents the difference between the participant's contribution and the average contribution of his group members the previous period.

Thus, we can conclude that the social preference, including the inequity aversion, tends to protect individuals from the temptation to reduce their degree of cooperation when they meet free riders. Their cooperation's behavior is more resilient than selfish individuals. This last result has not been documented in previous research. Thus, we can conclude that the social preference does not have a significant impact on the propensity to cooperate but rather confers a greater resilience in front of cooperation's failure within an organization. This last result close the presentation of the results.

## 5. Discussion and conclusion

This paper aims at contributing on the identification of factors that influence the propensity to cooperate within organizations with an application in the African context. We emphasis the influence of social preferences on the propensity to cooperate. It emerged from the literature review that individual social preferences can be characterized by selfish rational, altruism and spitefulness, an inequity aversion, look for Equity, Reciprocity and Cooperation which are the theoretical frameworks developed to explain individual decisions made in social interactions.

The identification of individual social preference is based on their intentional sharing in dictator game, their acceptance's threshold in the trust game and their intentional reciprocal gift in trust game. We classify participants in two categories. Rational selfish individuals represent around 20% of the studied population. The other individuals are characterized by an inequity aversion.

These classes are used to explain the differences in contributions in public good game, a measure of the propensity to cooperate. We establish that social preferences affect the propensity to cooperate even when we control the contributions' adjustments in relation with experience in the game. The influence of inequity aversion lies in the resilience toward greater cooperation that it confers. Individuals characterized by this preference are less inclined to reduce their contribution when they meet free riders, individuals who think only of their monetary gain. The results obtained are close to those of Fehr & Schmidt (1999)

and Fischbacher & Gaechter (2008). We established, as these authors, participants' contribution's declining during the sequence of the game. This declination is attributable to the presence of free riders whose low contributions induce a decline in individuals' contributions. We thus confirm the results of Fischbacher & Gaechter (2008) who show that the decline in contributions in social interactions is not the fact of cooperation behavior's change but the influence of individual stories on their behavior. This result based on data collected in African context aims at confirming that African people react as other homo-economicus in other economic area. Its implication is that the causes of the social and economic inefficiencies are not necessary the consequences of a typical way of thinking. Additionally, we highlight the place of the inequity aversion in the resilience of the equilibrium favoring cooperation in organization.

The conclusion of this research open a discussion on its managerial implications. The research has been implemented in WAEMU's context preoccupied by the identification of the suitable means to push their socio-economic development. The understanding of cooperation is a prerequisite to shed a light on the consequences of the low development of regional financial market. Indeed, despite an enormous development potential and the prediction of endogenous growth models, we observe that the WAEMU's regional financial market remain entangled in inefficiencies. The most important is the low depth and liquidity of the stock exchange, bonds and interbank markets. These compartments record little transaction and an insufficient involvement of companies which can realize an IPO. A priori, their low participation could be interpreted as the result of a cost advantage's trade-of.

The results of the analysis of the influence of social preferences on the propensity to cooperate can be mobilized in the study of the decision to proceed an IPO at WAEMU's regional stock exchange. It can help to understanding the development of the interbank market. Its application highlights the fact that the equilibrium that prevails in the WAEMU's regional market is aroused, at least partially, from actors' propensity to cooperate.

Indeed, in deciding to proceed their IPO, company's shareholders can contribute to the deepening of the market. This improvement would contribute to the creation of a better financial market, lead diversification and better risk sharing in the business environment and its improvement, provide additional information to investors and attract others international fund managers, …The consequences for the entire economic zone would be the improvement of wealth creations financing and thus an increase in socio-economic development. The decision to avoid their company's listing by the grand majority of company's shareholders as we observed in the market at this moment, leads to the market's lethargy, establishes a climate of mistrust and legitimate suspicion, …Situation that inhibits activities' funding and limit WAEMU's socio-economic development.

The research of means to break this equilibrium and initiate a new dynamic require the understanding of the place of actors' social preferences. Indeed, the research results show that if participants are motivated by the search of their individual interests, the equilibrium that currently prevails would persist. Has the opposite, if they are driven by an inequity aversion, the pulses in terms of regulation or companies' IPO would contribute to reverse the trend. The results of this research make some clarification in this direction but requires an enrichment by mopping up certain methodological and external validity limits. Indeed, the results deserve to be extended in real organizations. In this study, we considered the situation of individuals who do not know each other. It would be interesting to study the influence of lifting of this anonymity hypothesis on the conclusions. In addition, the identification of social preferences is based on declaration: intentional sharing, acceptance's threshold and reciprocal gift. An analysis of the consistency between intention and practice should allow us to refine our knowledge of social preferences' characteristics. The lifting of these limits can be done in future researches.

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