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Free riding and norms of control: self determination and imposition. An experimental comparison

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Abstract

This is an experiment on the effect of norm application in a public good game. We want to investigate whether a control norm affects the contribution level differently, only in relation to the way in which the norm is applied in the game. We compare the amount of public good provided in two different groups. In the first group (constituent group), experimental subjects create a control norm, and then they self-apply it in a basic public good game. In the second group (control group), the norm created by the constituent group is exogenously imposed. Experimental results show a significant difference between the two public good levels considered. Self determination implies a higher level of efficiency, as compared to the exogenous one.

JEL classification: H41, C92

Keywords: public good games, free riding, norm of control, voluntary contribution

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1. Introduction

Free riding is one of the main implications arising from theoretical models for public good provision by voluntary contribution mechanisms. This is well known in contribution problems, and has been studied in many disciplines, from Economics (see, for example, Samuelson (1955), McMillan, 1979) to Social Psychology (see, for example, Olson (1965) and Kerr, 1992).

In the experimental literature a large class of public good games with voluntary contribution mechanisms is present. These games often translate the public good's pureness, using payoff structures that guarantee Nash equilibrium in zero contribution to a public fund. Many studies focus on the possible variables that affect free riding dimension. Marginal per capita return, provision point, group size, repetition, communication, learning and strategy, are the main elements that concur to determine the presence of free riding behaviour (Ledyard, 1995).

According to the microeconomic model of voluntary contribution, free riding is a rational behaviour, which people rationally adopt when they have to choose how much of their personal endowment is to be invested in two funds, one private and one public, where the latter presents non-excludability and non-rivalry properties. Conversely, a common experimental result is that the level of personal contribution is often greater than zero, and many explanatory reasons are still being discussed for this weak free riding. This may be interpreted by following two possible lines of explanation. The first one concerns how to manage the gap between the theoretic prediction of no contribution, and the empirical results. Regarding this aspect, consider the famous invalidating factors of Kim and Walker (1984), or Fisher et al (1995), Chu and Li (1999), Cornes and Schweinberger (1996), Sandler, Sterbenz and Posnett (1987). The second line explains the positive contribution in terms of behavioural effects, for instance as due to fairness (Fehr and Schmidt, 1999), altruism or co-operation (Sefton and Steinberg (1996), Gachter, Fehr and Kment (1996), Fehr and Schmidt, (1999), Fischbacher, Gachter, Fehr, 2001), reciprocity (Sudgen, 1984), inequity aversion (Fehr and Schmidt, 1999), or to peculiar Value Orientation (Offerman, Sonnemans and Schram, 1996).

Apart from the possible explanations of positive levels, there is another perspective for the experimental analysis of free riding, which is about experiments concerning instruments aimed at improving individual contributions. To limit the inefficiency level of contribution, there are at least two different instruments: one is to increase co-operation by using systems of incentives, and the other is to repress opportunism by adopting sanctioning systems. Moreover, there are two typologies of incentives: the first is obtained by modifying factors that positively affect the co-operation in the experimental design. To this class, belong the modifications of environment variables, such as group size, the possibility of communication, mutual monitoring upon the contributions, relevant information exchange, symmetry of initial endowments and the perception that the personal contribution is critically effective on the aggregate level of provision, as well as the anonymity and unanimity conditions (Weimann, 1984 and

Orr, 2001). The second type of incentives concerns more directly the aspects linked with monetary returns, like the payoff structure and rewards (Sefton et al.2006). Sefton and Steinberg (1996) point out how the possibility to insert a structure of donor behaviour - no money back guarantee for the sums invested in the public good- affects the contribution in a negative sense.

In the economic tradition, punishment models are based on the representative-agent hypothesis (i.e., the classical micro-assumption of homogeneous agents with optimising behaviour). According to this approach, the problem becomes how to design an efficient system that does not make agents deviate. This strong homogeneity condition may be a possible means to explain why, in the real context, the average behaviour does not fit with the optimal one. To make the model more realistic, the heterogeneity assumption may be inserted. The problem now becomes much more similar to an incomplete contract, in a principal –agent relationship, in which the principal is the social group, and the agent is the single member. In this frame, an efficient control system would require not only the perfect information about all the personal typologies, but also a multiplicity of norms, one for each type of person.

The heterogeneity assumption increases the level of adaptability to the real context, but simultaneously also increases the complexity of the problem to design a perfect and efficient control norm/sanctioning system.

A possible way to bridge this informative gap may be to search for alternative instruments that may indirectly lead to a personal conformity, without excluding the heterogeneity hypothesis.

Non-monetary and psychological factors are considered to be determinant for agent behaviour too. Following this approach, individual choices are interpreted by comparing and taking into account other persons' contributions, also because of the mere awareness of acting in a group. Gachter and Fehr (1999) recognise the importance of some social elements, such as the reference to the peer group, social influence, social customs, and the correlated sanctions like the loss of reputation.

Economic and psychosocial approaches differ because of the absence/presence of the motivation as an element that explains individual behaviour. In the context of norms, conformity may have two interpretations following the two approaches. For the economists of the classical model of voluntary contribution, conformity is the result of a choice in utility terms. Subjects decide to conform if the alternative option does not give a greater return. In this sense, there is the traditional trade-off between costs and benefits in relation to the adhesion or not to the norm, and the preference is always quantifiable in terms of monetary payoffs.

For psychosocial authors, conformity to the norms should be interpreted as complying with, and recognition of, the feedback linked to the norm in terms of padronancy, affiliation, and social approval (see for example Homans, 1961).

Recent studies formalise the previous considerations in the so-called conformity models, and they do not exclude the possibility to insert motivational inputs (Bicchieri, 2000).

The existence of a norm as a possible instrument to solve opportunistic behaviour is recognised in public-good experiments. Tyran and Feld (2005) compare the effect of a mild law and of a severe law, both determined by the experimenters. Experimental agents only choose by a referendum whether to adopt or refuse the law.

Our experiment allows us to compare a between-group effect - i.e. comparing the effect of a self-determined rule, versus the same rule when imposed-, and also an infra-group effect - analysing personal vote and personal contribution.

We proceed as follows: section 2 describes our hypotheses to be tested as well as the theoretical background; section 3 presents our experimental design and our procedures, section 4 shows our experimental results, section 5 provides a discussion of our experimental results, and section 6 is the conclusion.

2. Theoretical background and Hypotheses to be tested

Our experiment does not rest on a single and specific theoretical background, because it concerns the free riding problem in an atypical collective dimension, by means of social norm, voting rules, social interaction, and conformity behaviour in an experimental environment.

Our hypothesis is that the efficacy of a controlling rule does not depend only on its *fattispecie,* but it depends positively also on the presence of another variable, that we call Participation in the building process of the norm.

Let the efficacy be measured by the level of the total amount of public good provided, Q.

Let E be the level of efficacy obtained by a specific norm of control; F the *fattispecie* of the norm; P the participation. We can simplify our hypothesis as follows:

Hypothesis 1*:*

$$Q = Q(E)$$

$$E = f(F) + g(P)$$

With

f, g positive functions

$Q = h\,(\sum_i q_i,)$, where q_i is the individual contribution to the public good with $i = 1....N$

To test if our hypothesis is correct, and to isolate the impact of our Participation variable, we will compare the level of the total public good provided, in two groups, one defined as Constituent Group, the other one defined as Control Group. The Constituent Group participates in the norm creation, and then it self-applies the rule. The Control Group receives exogenously the norm created by the

Constituent Group, without participating in the creation process. Both groups have to take into account the same norm, F, so that F can be considered as given in the efficacy function (i.e $F = \overline{F}$)

Let G_{const} be the Constituent Group, and $G_{control}$ the Control Group. Our Hypothesis now becomes:

Hypothesis 2:

$$Q_{Gconst} > Q_{Gcontrol}$$

where

$$Q_{Gconst} = Q[f(\overline{F}) + g(P)]$$

$$Q_{Gcontrol} = Q[f(\overline{F})]$$

We are focusing on the aggregate results that arise from a norm application, only analysing the total amount of the public good provided, and the total number of free riding after a norm application.

In order to understand why and how participation affects the efficacy, there is no specific theoretical reference, but several contributions may be taken into account. We can consider at least three different perspectives correlated to our topic:

a. Buchanan and Tullock Model (1962). This contribution may clarify what are the possible elements that enter our g function, in a collective choice dimension.
b. Conformity Models. This approach may explain our greater efficacy hypothesis in terms of greater conformity, in an individual choice dimension.
c. Socio-psychological contributions. They may explain our Participation effect in terms of socio-psychological dynamics, in a double perspective: individual and collective ones.

For each approach, we underline below what could be the main parallelism with our frame, and what could constitute a limit.

a. Buchanan and Tullock Model (1962)

A possible theoretical reference for the collective dimension may be recognised in Buchanan and Tullock's model (1962). The authors present a model for collective choices, based on collective agreement by means of voting procedures. Individuals are assumed to be rational and they choose by using a maximising behaviour. The model explains when individuals decide to maximise their utility by means of a collective action, and when it is advantageous to establish a social/political interaction. Individuals are heterogeneous, and a collective choice is an instrument to reconcile different interests. The convenience of a collective agreement is measured in terms of its costs. A collective choice is the result of individual interactions, in which each member weighs up personal cost and benefit deriving

from the participation in a collective action. A collective decision requires a general consensus. Any final consensus is obtained by a process that implies costs.

The authors decompose Committee Costs (CC) into Decisional Costs (DC) and External Costs (EC). The first ones refer to costs that a group has to sustain in order to obtain an infra-member agreement; the second ones are costs that members outside a winner coalition have to suffer. In general, decisional costs are in positive relation with the group size of a constituting coalition, i.e. it is easier and costless to obtain an agreement into a small group rather than into a bigger one. External costs act inversely to the group dimension, i.e. they decrease as the norm becomes more inclusive (see Figure 1).

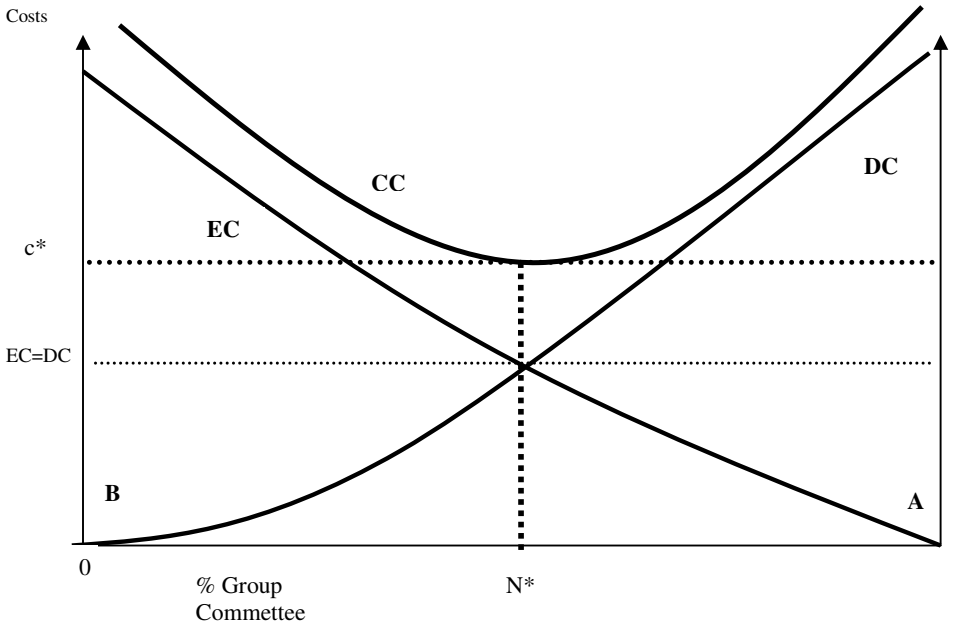

Fig.1 Committee Costs (group's perspective)

In general, a group will finally adopt a decisional rule that guarantees simultaneously the minimisation of the expected interdependence costs (associated with the organisation of a specific activity), and the expected utility value deriving from its adoption. In a constituting committee, external costs are minimised when the decisional rule is adopted by using a unanimity rule (see point A in figure 1), but decisional costs are minimised once there is a single person who decides for the other members (point B). A majority rule can be considered as an instrument that, in part, compensates a trade-off between the two different cost typologies. Adopting less inclusive rules than the unanimity one, an amount of personal protection from others' decisions (external cost) is exchanged with a reduction in decisional costs.

Decisional costs and external costs are sustained if, rationally, the net expected value of the output obtained by following the decisional process will be qualitatively and quantitatively greater than the

initial status. In other words, any collective choice should minimise the sum of external and decisional costs.

Taking an individual perspective, let H be a collective choice that requires an agreement of $\frac{R}{N}$ persons (see fig.2). RR' are the positive costs sustained by a single agent accepting the choice H. OA are private costs that a single agent sustains when he/she chooses privately. RR'< OA, so that the agent expects a benefit from the collective choice. AB represents gains deriving from the personal participation, which an individual expects from a collective exchange. Positive gains from the exchange exist when the group adopts a choice that is more inclusive than $\frac{Q}{N}$, and less inclusive than $\frac{Q'}{N}$. For collective decisions less inclusive than $\frac{Q}{N}$, external costs associated to the collective decision itself become so high that the agent prefers to opt for private choice alone. If a rule more inclusive than $\frac{Q'}{N}$ is accepted, the decisional costs become so high that the collective negotiation nullifies any benefit.

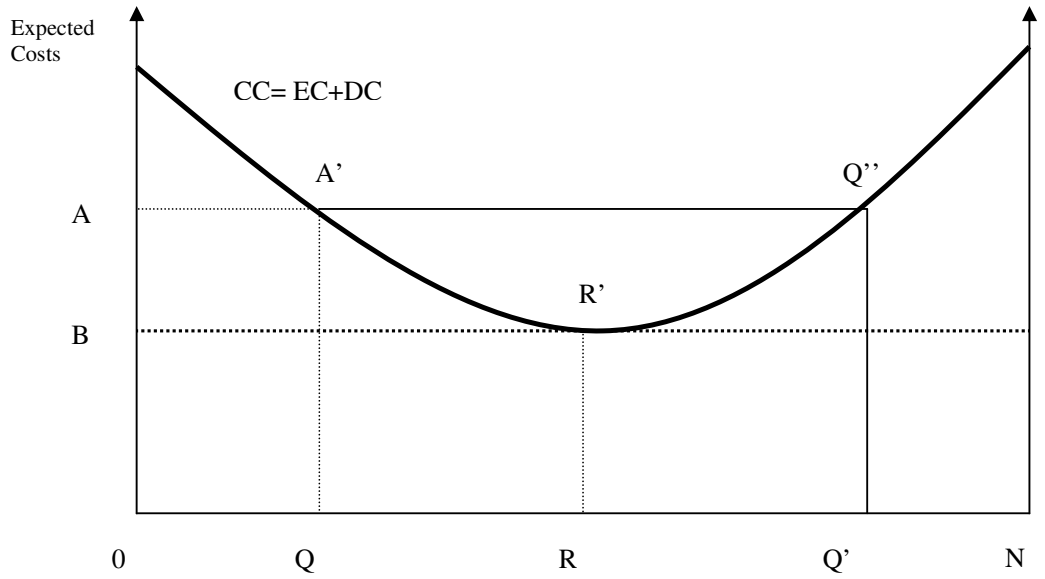

Fig. 2 Committee Cost (individual perspective)

Following Buchanan & Tullock's model, in order to eliminate the committee costs, it is necessary to delegate the decisional authority to a single individual, considering his/her choices as binding for the whole group. Assuming homogeneous individuals, a dictatorial choice is the most efficient one. Assuming heterogeneous agents, with homogeneous preference intensity, the majority rule guarantees

that the total benefits will be greater than the total losses, even though not necessarily optimal. Assuming heterogeneous agents with heterogeneous preference intensity, a logrolling phenomenon may arise, due to an imperfect voting market[2].

A representative government is a general instrument to reduce interdependence costs, because it reduces the decisional cost function. There are two extreme examples: the first one is a direct democracy, with a direct relation between the number of subjects that participate in the decisional process (the number of representatives), and the total number of the group members; the second one is a single representative that decides for the whole group. The cost of a representative organisation is directly linked to the group size. Also in this case, the decisional cost increases as the number of the committee members increases, but the external cost is now more directly influenced by the fraction of the population in the committee (See Fig.3).

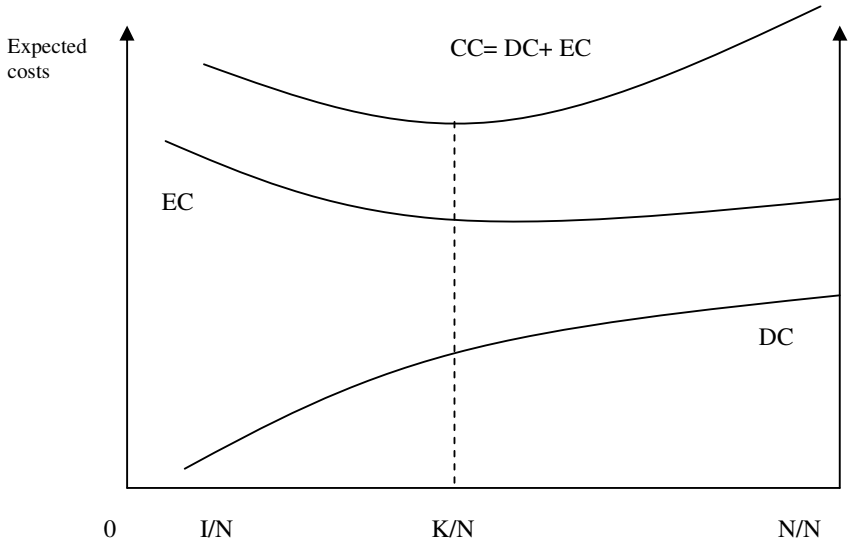

Fig. 3 Committee Costs (number of representatives/ number of group members)

Describing our environment in Buchanan and Tullock's terms, we may configure the Constituent Group as the constituent committee. Choosing the norm, subjects in the experimental group find implicit costs of interdependence, concerning both decisional and external costs. Conversely, in the Control Group we may assume positive external costs and zero decisional cost.

[2] In this case, a referendum is a procedure that ignores the preference intensity. By logrolling mechanism, voting results may be modified only if the minority has a major preference intensity regarding a specific topic.

Let CD_{const} be the decisional costs for the Constituent Group, and $CD_{control}$ be decisional costs for the Control Group, CE_{const} the external costs for the first group, and $CE_{control}$ the external costs for the second group. Given Buchanan e Tullock's perspective, we may assume that, *ceteris paribus*:

$CD_{const} > 0 \qquad CD_{control} = 0$

$CE_{const} > 0 \qquad CE_{control} > 0$

with

$CD_{const} + CE_{const} > CE_{control}$

In what direction may Buchanan and Tullock's model support our hypothesis? How may different costs affect the efficacy of a norm?

We can suppose that in a constituent committee there are greater costs in order to achieve an agreement, than in another group that merely receives an already-made rule. In the latter group we can consider only the external costs.[3]

Suppose that the constitutional group voted a final norm G that minimises the total committee costs, C*, with the private costs OA and the net gain from collective choice AB (Fig.1). Considering the aggregate costs, the situation for the control group may be represented as in figure 4, in which the cost C* proposed by the committee, and the zero decisional costs for the control group are reported.

Excluding explanations in terms of group selection, the efficacy of the norm ought to be independent of the committee costs, i.e. its efficacy may be considered in net terms.

[3] We consider the case in which individual external costs are taken from the same population, i.e. we randomly select population with the same *a priori* distribution of preferences.

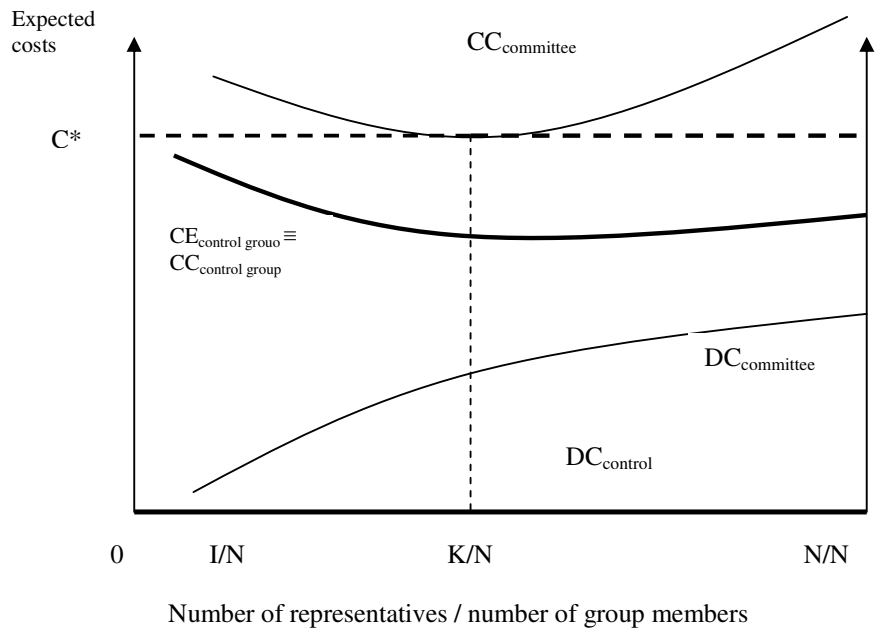

Fig. 4 Our possible Committee Costs

Buchanan and Tullock's model has the added value of decomposing the participation costs by distinguishing some possible elements of our *g* function, but it does not explain why, in a constituent committee, higher costs imply higher efficacy, *ceteris paribus*. The model clarifies how a committee agreement may modify its decision costs in terms of group size variation, but it does not explain why the same agreement may differently affect the efficacy in two groups with the same group size. We are not testing variation costs, but an efficacy variation effect. Thus, we may consider the existence of some other indirect factors that, linked with committee costs, may affect the efficacy of a collective decision.
What emerges from Buchanan and Tullock's model is that participating in a committee group implies higher agreement costs, which are not present in the control group. We do not exclude the possibility of justifying the participation effects in terms of agreement cost, but we must look for some other linked elements that implicitly arise in a participation procedure.

We now proceed to propose some other theoretical background that could provide indirect support for our participation variable, which is by means of conformity models and of socio-psychological theories.

b. Conformity Models

Adopting this perspective implies changing the level of analysis, i.e. from a group dimension to an individual dimension. In this theoretical approach, we insert all models that explain individual

conformity to a norm, in terms of individual preferences (social preferences, reciprocity, fairness, equity, etc), strategic behaviour, beliefs and cognitive implications.

None of these models give direct explanations about the relation between participation and greater efficacy. They may be useful to clarify why a person conforms to a norm, but they do not explain why the conformity may vary because of participation. What could be the individual factors that may be significant to our frame? What are possible individual factors that enter our *g* function?

In several models, the utility function is designed to capture some individual preference in social dimensions, in which individual choices are taken, considering implications on the others' welfare (see for example Charness and Rabin (2002), Fehr and Schmidt, 1999). The conformity to a norm may be considered as an individual choice that affects other persons' utility too, so it can be inserted in the individual utility function.

Adapting this perspective to our experimental hypothesis, we may consider conformity in individual preferences. Without considering the participation variable, differences in conformity may be explained only in terms of different group composition. However, the Heterogeneity condition is taken for both of our groups, so that different preference composition is not considered to be a main factor in our hypothesis.

Conformity is strictly linked with reciprocity theories (see for example Rabin, 1993), in which not only individual preferences can be defined on social consequences, but also intentions and choice procedures have an important role. In this frame, beliefs about others' actions affect individual choices. These models may interpret, even if not explicitly, participation as a factor that influences the personal beliefs about others, but they do not explain in what direction. In particular, we cannot exclude the possibility that the participation effect positively reinforces reciprocal or conditional behaviour. In a public good frame, positively reinforcing beliefs about others' contribution has an important strategic implication. Positive beliefs about others' positive contributions make defecting more attractive. According to the classical voluntary contribution mechanism, a rational player would defect if he/she believes that the other will contribute more to the public fund.

If participating activates beliefs of positive contributions, we ought to observe greater level of free riding and less total public good provided, contrary to our initial hypothesis. Hence, our hypothesis that greater contribution/greater efficacy is associated with our participation variable, does not find a complete justification in belief reinforcement.

Beliefs are recognised to be factors that explain positive contributions in public good games (see Offerman, 1997). Many models focus on how these beliefs are created and how they affect personal contribution, in particular by distinguishing how people estimate the behaviour of others, and how their individual contribution becomes critical, futile or redundant[4]. Several studies confirm that there is a

[4]Offerman (1997, Chapter 2) distinguishes three relevant states of world that determine individual contribution, according to

positive correlation between subjective estimated probability of being critical, and propensity to contribute (see for example Caporael et al. (1989), Dawes et al. (1986), Rapoport et al. (1989) and Suleiman et al. 1992).

Also following this perspective, we have the added value in understanding what affects individual choices by means of expected contribution of other members, but we do not have any direct quotation about the role of participation. In particular, we cannot exclude that participation activates mechanisms that involve both probabilistic beliefs and cognitive systems, because - for example- people signal any particular conformity behaviour by voting a particular rule, or because of a particular 'focal point' moved by the creation of the norm.

We suppose that participation positively affects the total amount of public good provided. As said at the beginning, we consider a positive relation between participation and norm efficacy. But if a norm efficacy is associated also with the level at which an individual complies, it could be useful to recognise the elements that concur to norm compliance. We, however, focus on aggregate effects, because we are analysing group differences, so that we are searching for reasons that may support variations among groups, and not infra group. If we justify our position in terms of conformist preferences (see for example Grimalda and Sacconi, 2002), we will focus on individual preferences, and compliance variations among groups will be explained in terms of group composition. We are not taking into

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how this is perceived in a group size dimension (s). Contribution may be:
a) futile: public good will not be provided no matter the individual choice, that is fewer than s-1 of the other subjects contribute (where s means the threshold)
b) critical: exactly s-1 contribute
c) redundant: the public good will be provided whatever the individual choice, that is more than s-1 contribute.
According to this theory, people associate subjective probability with the personal contribution, that is they have different estimations about P(< s-1), P(s-1), P(> s-1). Often individual probability estimations are distinguished according to the type of agents, for example:
a) Material cooperators (Warr, 1982). Here, people are assumed to acquire an extra social utility x for the provision of the public good. People contribute if and only if:

$$P(s\text{-}1) \geq \frac{c}{f(s) - c + x}$$

Where
c: cost for contributing,
f(s)-c: value of public good
b) Warm glow cooperators (Andreoni, 1993). The act of contributing makes people feel good about themselves, acquiring an extra utility y from contributing. People contribute if and only if:

$$P(s\text{-}1) \geq \frac{c - y}{f(s) - c}$$

c) Social identity theory and in-group cooperators (Taifel, Turner (1986), Taylor, 1994). Here it is recognized that self-imaging obtains an extra utility z if they belong to the group that provides the public good. People contributes iff:

$$P(s\text{-}1) \geq \frac{c - zP(> s-1)}{f(s) - c + z}$$

As in the expected value hypothesis, also in expected utility theory people are assumed to make no errors in their evaluation. Under both hypotheses, people give the best responses to their expectations. However, in recent literature it is well recognised that such assumptions determine strong cognitive limitations. To allow people to make errors during their evaluation, quantal response approach is well fitting (McFadden, 1976; McKelvey and Palfrey, 1995).

account what an individual chooses in a game with a control norm, but we are investigating if, and eventually why, he/she may choose differently according to the participation in a creation norm.

Bicchieri (1997) considers social norms in terms of independent motivating factors. She says that norms usually allow an individual to anticipate the behaviour of the others. In this sense, conformity is the result of preferences and beliefs (motivating factors), given the following two conditions:

1. "Almost every member of the population *prefers* to conform to the regularity, on condition (and only on condition) that almost everyone else conforms, too.

2. Almost every member of the population *believes* that almost every other member of the population conforms to R" (where R is the regularity). (See Bicchieri, 1997, pages. 27).

A social norm is an equilibrium, in the game theoretic sense of being a combination of strategies, one for each individual, such that each individual's strategy is a best reply to the others' strategies, where one takes them as given. Each individual prefers to conform on condition that nearly everybody else conforms to the norm. The conditional preference does not imply that conformity is a dominant strategy.

In a development of her model of norm compliance (Bicchieri, 2000), Bicchieri assumes that conformity reasons are different from those recognised in reciprocity and conformist preferences. She assumes that there exist several individual reasons that make people comply but, above all, she recognises the role of the context in which people have to decide. In a certain sense, the context is able to activate some cognitive mechanisms, and compliance is explained in terms of individual conformity- categorisation recognition. Categorisation seems to be a macro class that could be useful to distinguish our two groups. The Constituent group may be categorised differently from the Control Group, but Bicchieri's model does not explain why participation may be categorised differently, and activate different conformity mechanisms.

As seen above, several economic models can be quoted and extended to our hypothesis, but no one in particular is able to fully recognise our hypothesis. Some socio-psychological contributions are now considered, in order to investigate if they could fill the previous gap.

c. Socio –psychological contributions

Socio –psychological disciplines have an old tradition in group dynamic studies, and we may consider them to open our *g* function 'black box'. The role of participation may be thought about combination of other socio- psychological and cognitive elements, both in an individual perspective (by means of beliefs, closeness effect, effectiveness effect, awareness effects), and in an individual-group relationship (by means of group dynamics, goal insetting, procedural decomposition, and inner coherence). These contributions have to be adapted to our experimental frame, but they are not so far from it, because also in the socio-psychological approach the free riding problem is well know in the so-called Social Dilemmas.

Beliefs and expectations about others' behaviour are often self-centred, that is, people tend to use their behaviour as a cue in predicting the choices of other people (see Dawes et al., 1977). People give a pivotal role to self- knowledge as a source of social hypothesis (Allport, 1924).

The main difference among psychological contributions is recognised in the causal relationship between expectations and behaviour, that is, if expectations determine behaviour or vice versa. The former direction characterizes the so called Triangle Hypothesis (Kelley and Stahelski, 1970), while the latter direction- i.e. behaviour determines expectations- is the so-called false Consensus (Kuhlman and Wimblerly, 1976).

Following these two different approaches, different levels of contributions may be interpreted according to the causal effects of three distinct individual characterisations (see Offerman, 1997). According to the Triangle hypothesis, Competitors do not contribute, and expect the others not to contribute either. Individualists contribute if and only if they expect the others to. Co-operators contribute as long as they do not perceive they are being exploited.

According to the False Consensus, people expect that other people's behaviour is the same as the behaviour prescribed by their own value orientation. It means, for example, that competitors expect others to be competitors too, and the same is true for individualists and competitors.

These considerations may be translated in terms of conformity, distinguishing why an individual chooses to comply according to his/her expectations, or to his/her own behaviour. In any case, assuming one causal relation is more suitable to our hypothesis than the other one, it may be useful to explain our between-group differences in terms of norm compliance, only if the participation would affect beliefs or personal behaviour. Following these perspectives, there is no direct quotation in understanding if, and eventually how, participation can play a role.

Among instruments to resolve an opportunistic problem, Kerr (1992) considers social interdependence, which may reinforce the group identity through reciprocal commitments among people. This can be achieved by the definition of a common goal, based on the respect of the group's norm.

Yamagishi (1996) suggests the implementation of a Sanctioning System and a Structural Goal/Expectation (SG/E) to limit the free riding inefficacy. Efficient levels of contribution are observed if they are supported by mutual co-operation and mutual trust. In this sense, free riding could be limited if, in the game, we insert a sanctioning system, seen as an achievement of a group's goal, and obtained by the co-operation of the agents. This is properly related to what the author defines as instrumental and elementary co-operation.

Social interdependence, which differs from simple interaction, is reinforced every time communication is possible among the group members. This feature is well known in economic experiments about free riding, where an increase of co-operation may be due to the possibility of communication (see, for

example, Isaac et al, 1988). Psycho-social contributions explain why communication affects positively the contribution levels, in terms of norm influence and of the significance of deviance.

An innovative characteristic, compared to economic observations, is represented by the so-called accessibility to the norm. It coincides with the necessity of recalling to people's minds the importance of the connection among individual efforts in social interaction. In other words, norms are efficiently activated if they are rapidly accessible, recalling that individual efforts - contribution in our frame- produce a perceptible difference at aggregated level.

Direct reference to a participation effect, is stressed by Neuberg and Fiske (1987), by defining the role of outcome-dependence. Outcome-dependence is a situation that arises when a person is dependent on another individual to obtain a desired outcome, and that outcome cannot be attained through the person's own effort alone. Being outcome-dependent would make the participants evaluate more closely the information they received about others. This may support our hypothesis, if we were to translate the desired outcome into our public fund, and the information evaluation into the explicit procedure in norm's constitution. In our experimental design, we do not adopt a specific frame to directly test the consideration of Neuberg and Fiske (1987); however, it would be inserted in our explanations of the results.

3. Experimental design and procedures

The game[5] is proposed to two groups, the experimental (Constituent) group and the Control one. Each group consists of 14 members, chosen randomly (by voluntary subscription to the game) among the Students of the Faculty of Economics at the University of Trento.

Before the game starts, each member is given a personal identity number (ID), in order to maintain the anonymity condition during the entire game, and to allow experimenters to follow personal choices. Each participant is provided with the payoff table, the game instructions, and a first card for the first allocation choice. Before making the first choice, all the instructions are read aloud by the experimenter and any doubts are clarified.

The sequence of the game is the following (see details in the next sections):

1. Both groups play five rounds of the "basic game". The "basic game" belongs to the family of public good games with a voluntary contribution mechanism with repetition, without infra-group communication, and with the insertion of the donor behaviour's structure.

   At the beginning of each round, people have to decide their personal investment choice and write it down on a choice card. After this, the experimenter collects all the choice cards and communicates the total amount of public good provided.

[5] The complete instructions are available on request.

2. The Constituent Group proceeds with the "constituent game", in which the control norm is determined by a discussion phase followed by a voting rule (majority required). The final rule may be considered as a puzzle consisting of five different parts (components of the norm). Each part is determined in a separate phase. In each phase, people have to decide their preferred option among a list. After reading each option, people freely discuss the effect of a single option, and then they vote anonymously for their preferred ones. The option that obtains the majority is called the "finalist". This procedure is repeated for all five parts. At the end, the constituent group determines the final rule, by joining the five different options, one for each part.
3. Both groups have the possibility to discuss the existence of the norm in an identical interval of time, by means of discussing phases in the constituent group, and of a discussion period in the control group.
4. Finally, each group is presented once more with the "basic game", and subjects play again the initial game, but both groups have to respect the norm determined by the experimental group (we call this "basic game with norm").

The effective final payoff is determined according to the personal performances in the "basic game with norm". In particular it is based on the personal performance observed in one round extracted randomly by the experimenter at the end of the game.

A. ***The "Basic Game" (BG)***

The basic game is a classical public good game with voluntary contribution mechanism, without communication, and with repetition upon five rounds.

The initial endowment of 10 euros has to be allocated into two funds, a private fund (Y) and a collective fund (Q), with the only restraint that the sum of the parts has to be equal to the initial endowment. The choice is made considering a payoff table, initially illustrated to the 28 members.

In our case, the payoff function is the following:

$$л = y\,(1+ p) + Q\,(1+ r)\,/14$$

$$s.t\;\; y + q = 10$$

[where л is the payoff;
y represents the allocation to the private fund Y;
q represents the allocation to the collective fund Q;
p is the constant rate of return associated with a Y;
Q is the total amount present in the collective fund (given by the sum of the 14 q's);
r is the variable rate of return for Q].

The distinctive difference between the two funds is represented by the remuneration modality for the invested sums. For the private one, the rate is fixed at 5%; for the collective fund, the rate is variable and increasing, and it is correlated to the money present in the fund itself (obtained by summing all of the 14 individual contributions, q). Nevertheless, the different rates of return respect the condition of marginal pre capita return[6] that- considering the theoretic arguments- predicts that the collective fund will converge to zero.

In particular, the payoff structure has the characteristic of introducing the donation for the collective fund. The allocation in Q does not constitute a sure investment, for the reason that the initial sum invested is not assured to the subject. In fact, this component goes to increment the fund that is, however, shared with all the members, independent of the individual contribution. The inserted modality arises the risk of the loss associated with the collective investment, in the case that only few agents choose it.

The optimal choice for the single agent corresponds to the investment of the whole endowment in the private fund. This assures the return of the sum invested, increased by the corresponding guaranteed interest. Independently of the choice of the others, there is an equilibrium with q= 0 euros. On the other hand, by inserting a variable and increasing rate of interest in the public good, also the collective fund allows one to obtain high profits but, in this case, these are associated with the level of Q and, thus, strictly dependent upon the contribution of the other agents.

B. ***The "Constituent game"***

This game is of an atypical kind and it is the original element of our experiment. It consists of the determination of a norm of control by the experimental group. To this end, the players are told that the norm concerns the repression of opportunism, which means inserting punishment for the contribution to the collective fund from 0 to 4 euros (weak free riding).

The agents have to discuss and vote step by step the five components of the control norm, one in each phase of the game. They establish:

1. When the control takes place (1st. phase; 1st. component)
2. The number of subjects to be investigated (2nd. phase; 2nd. component)
3. The eventual possibility to give rewards to people who contribute more than 4 euros (3rd. phase; 3rd. component)
4. The type of reward (4th. phase; 4th. component)
5. The type of sanction (5th. phase; 5th. component)

[6] In order to have a unique equilibrium of dominant strategies, in the marginal per capita return (MPCR= r/p) it is necessary to consider the following condition (see Sefton and Steinberg, 1996):
MPCR<1<MPCR·n*, where n* is the group size at equilibrium.

Each component presents several options, established considering different levels of a trade-off personal benefit- group benefit, also in relation to a ratio cost- certainty of the control.
At the end of the discussion of the single options, within a specific time determined before the phase, agents have to vote anonymously for their preferred alternative. The option that obtains the majority is called the winner. After repeating the procedure for the other components, the final rule is formed, consisting of the combination of the winning options of each phase.
The established rule is applied to the Basic Game in the experimental group, identifying in this way a self-determined norm. On the other hand, the norm is directly inserted in the Basic Game of the control group, with no possibility of choice. In this sense, the norm is imposed.

4. Experimental Results[7]

We now test our fundamental hypothesis, that is:

$$Q_{Gconst} > Q_{Gcontrol}$$

where

$$Q_{Gconst} = Q[f(\overline{F}) + g(P)]$$

$$Q_{Gcontrol} = Q[f(\overline{F})]$$

We compare the impact of the final norm[8] in both groups, in terms of its effect on:

1. the total number of pure free riders (i.e. no personal contribution to the public fund), the total number of free riders (i.e. the number of people that give personal contribution to the public fund between $0 \leq q_i \leq 4$),
2. the total public fund provided
3. the personal contribution.

We use non-parametric tests to check if the observed differences are statistically significant. For all of the following results, we find that there is a significant difference between the two groups at 95% level of confidence. In particular:
1. We test the hypothesis H_0 of no difference between the total number of free riders in the constituent group, and in the control group, that is:

H_0: $FR_{const} = FR_{control}$

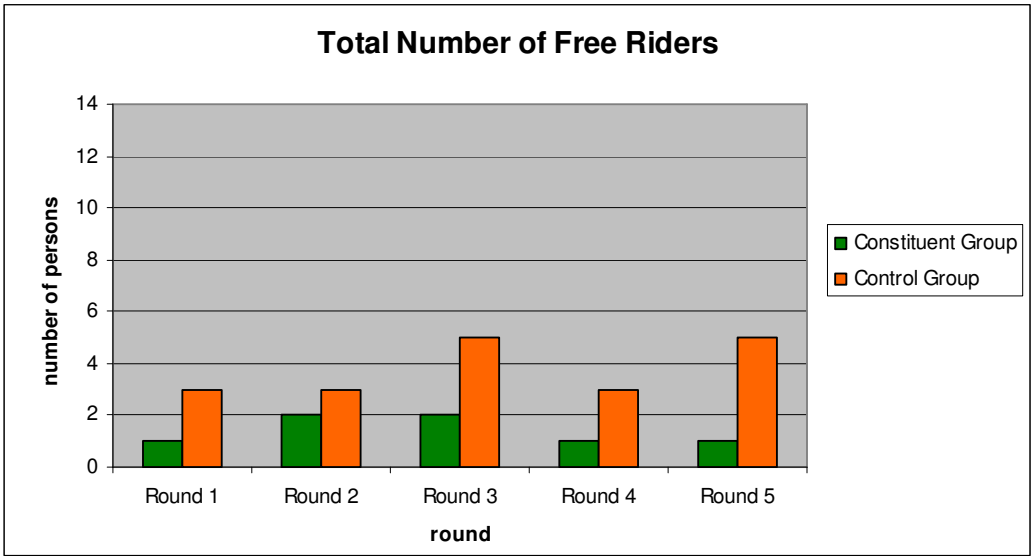
H_1: $FR_{const} \neq FR_{control}$

[7] Here we report the result of our first pilot experiment.
[8] In the pilot experiment, the final norm is the following: "In a round extracted at the end of the game, 5 persons will be controlled. Among them, if anyone had contributed from 0 to 4 € to the Public Fund, she/he would not receive anything,, but if she/he had, she/he would receive 2% of the net public fund in recompense.
The total cost for the norm's implementation is 3.5% of the public fund, Q".

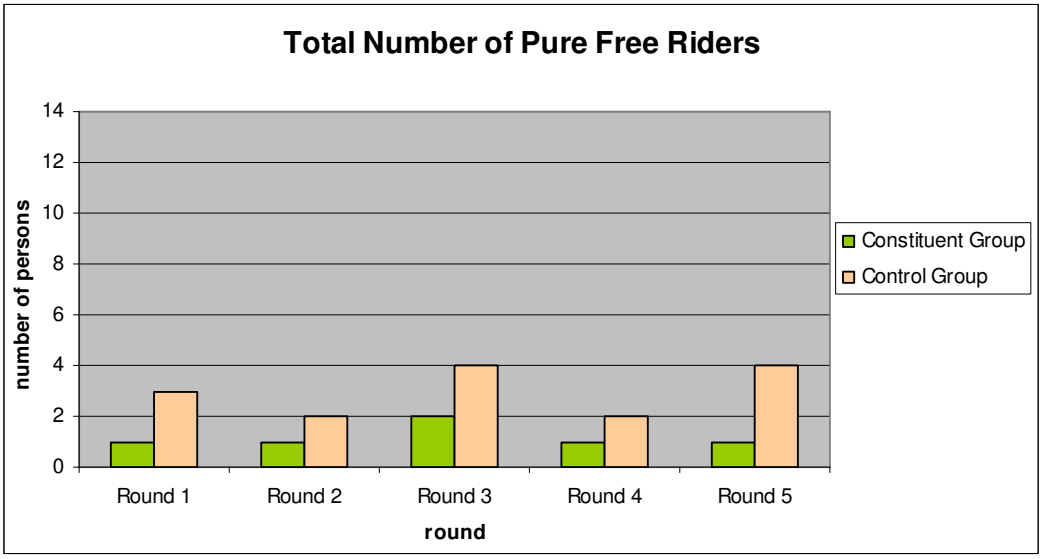
Result 1

The p-value is 0.00035. Given $p<0.05$, we reject the null hypothesis. Given the same control norm, in the Constituent Group we observe a significantly smaller number of free riders, both total and pure ones (see Graphs 1 and 2).

Graph 1.



Graph 2



2. We test the Hypothesis H_0 of no difference between the total public fund provided in the two groups, that is:

H_0: $Q_{const} = Q_{control}$

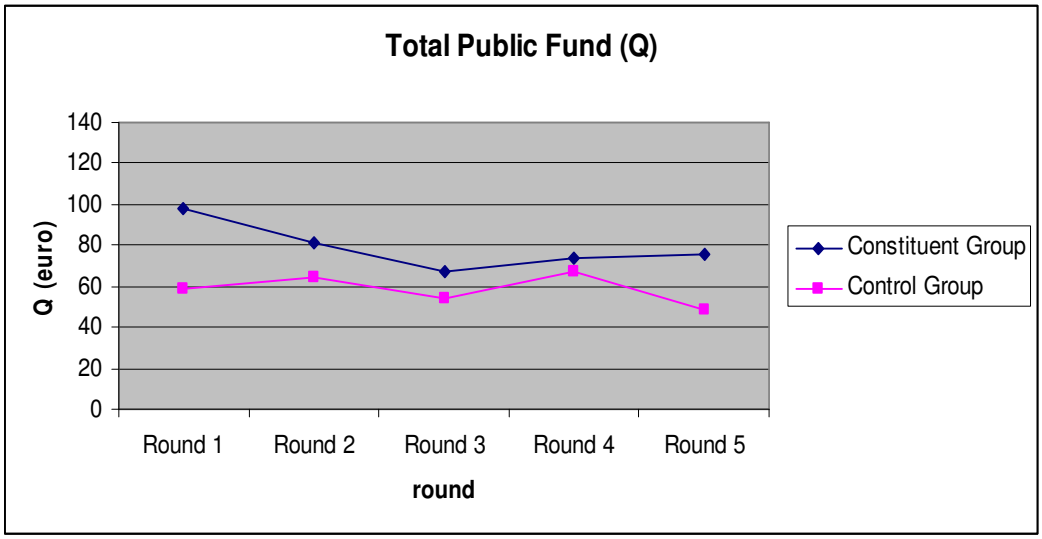
H1: $Q_{const} \neq Q_{control}$

Result 2

The approximate p-value is 0.0< 0.05, so that we reject the null Hypothesis.

Given the same control norm, in the Constituent Group, we have a significantly higher level of total public contribution (see graph 3 below).

Graph 3.



3. We now test the Hypothesis H_0 of no difference in personal contribution, that is:

H_0: $dnb_{q\ const} = dnb_{q\ control}$

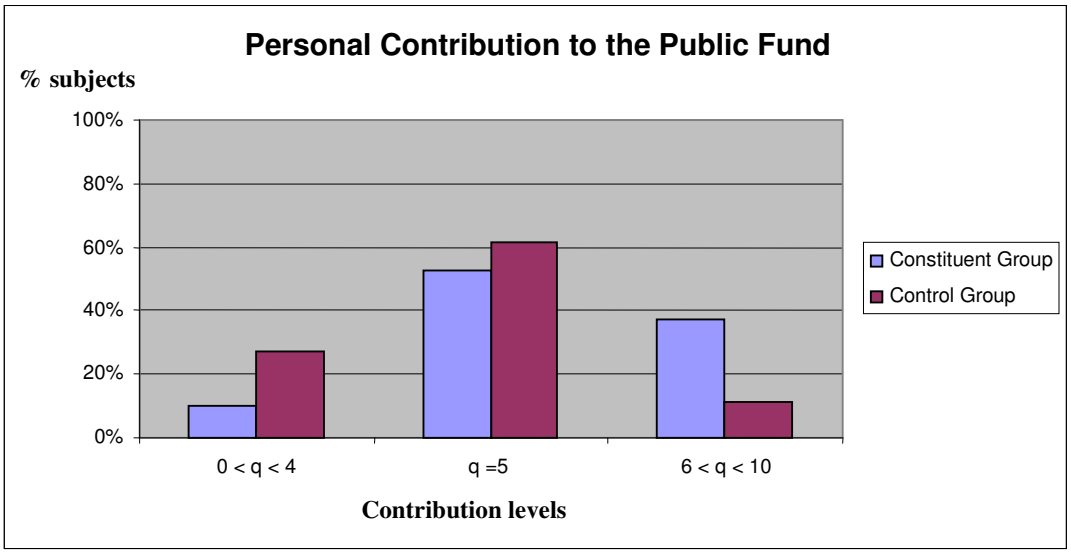
H_0: $dnb_{q\ const} \neq dnb_{q\ control}$

Result 3

The approximate p-value is 0.0001< 0.05, so we reject the null hypothesis in favour of the alternative one.

Given the same control norm, in the Constituent Group personal contributions are significantly more "co-operative" ($6 \leq q_i \leq 10$) (see graph 4)

Graph 4



5. Discussion

The experimental literature acknowledges the improving effect of a norm application in public good games. In this sense, also our experiment reports higher levels of contributions after the norm insetting. In the literature, however, there is no prediction about the effect of different ways of insetting a norm. In our case, higher levels of contributions, and smaller numbers of free riders (strong, weak and total), are observed in the constituent group. There is also a personal propensity to contribute more in the group that creates and self applies the norm. All of these results are connected with the only difference between the groups, which is the participation in the norm-creation in the constituent group.

We have already run the same version of the pilot experiment two other times[9], and also in these cases, we have obtained significant differences between the two groups[10], in the same direction as the pilot one. We may define a sort of behavioural regularity, i.e. participation in the creation of a constituent rule improves the level of contributions to a public good.

The aim of these pilot experiments, is to test (firstly in aggregate terms) if the different modality of inserting a rule may play a role, ceteris paribus, without entering into details and without explaining why and how this participation improves the effectiveness of a norms.

To open our "black box" *g* function, that is to test several hypotheses about the components of the participation variable, it is absolutely necessary to modify some characteristics of our experimental design. We cannot exclude that in the constituent group there may be a set of possible elements, that

[9] Further details are available on request.

[10] Of course, the total amount of public good provided depends on the type of norm chosen. For example, there are norms potentially more severe in terms of punishment than others (in terms of different options' composition), and this has effect on individual contribution, in line with several experiments on rewards and punishment (see for example Sefton, M. Shuump, R. Walzer, M.J, 2006)

concur to explain our experimental provisional gap. For example, we may consider the following explanations for the higher level of public good provided in the constituent group:

a) Interdependence and group-effect due to communication. This could be an important element if, in the control group, communication were not allowed. On the contrary, both groups can discuss the existence of the norm, so that this element seems to play a role, but not the most important.

b) Decomposition of the norm. The difference may exist in the decisional phase, where the constituent group decomposes step by step the single elements. In this sense, it is not simple communication that may have an effect, but rather a sort of cognitive feedback due to the facility in better understanding the effectiveness of a possible norm. This could be linked with the so-called accessibility of the norm, and with the procedural simplification.

c) Sanctioning system as group goal. Inserting a group goal may focus agents' attention on goal achievement (free riding repression), also in terms of inner coherence.

d) Group identity and other social factors. Socio-psychological literature may consider the effect of group identity circumscribed to the norm creation, and in this sense identifying a group responsibility to achieve the final goal.

e) Conformity reasons. In the constituent group the norm may represent a social focal point, on which people focus their attention.

f) Belief explanations. Participating in a norm creation may represent a signal for others to co-operate in subsequent rounds.

g) Committee costs. It is still not defined whether in the constituent group there are greater costs in terms of decisional costs. These may be linked with a greater group effort in terms of personal contribution, in order to compensate the decisional costs.

h) Effectiveness effect. Participating in a norm creation may increase the perception of individual effectiveness in a small group size. This may underline the role of individual contribution in obtaining the final goal.

These are only several possible explanations, but they remain at a hypothetical level, since none of them has been separately tested.

6. Conclusions

With our pilot experiment and its two replications, we observed a sort of behavioural regularity. In a public good game with voluntary contribution mechanisms, and with a control norm insertion, the level of total public good provided, the total number of free riders (strong and weak), and the individual contribution, are significantly related to the modality by which a norm is inserted into the game.

Participating in a constituent group, that decides what norm should be created and adopted, seems to be relevant for improving the level of public good provided, ceteris paribus.

In this preliminary version, we limited our observations to the main aggregate comparison, without entering details of justification. Many contributions may be useful to support our hypothesis and our tests, even if none of them have an explicit quotation to our peculiar frame.

We recognise, in a multidisciplinary approach, an added value, by means of non economic contributions. In any case, these remain in the class of possible explanations, because it is necessary to adapt our design to test them separately.

Several modifications are being considered for our future developments, in particular to keep the environment controlled under these considerations.

We want to analyse the participation effect in an individual perspective, in order to isolate some considerations in terms of expectations or beliefs about personal effectiveness and others' conformity. To this end, it is important to monitor individual contribution following some hypotheses about expectations.

It could be interesting to analyse the voting choices and the corresponding contribution behaviours, to check if some parallelisms or strategic issues exist in the constituent group.

As shown above, our pilot experiment is only a first step towards the extension of further hypotheses, starting from the behavioural regularity due to the participation effect.

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