An Experimental Study of Secession under Alternative Levels of Decentralisation*

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Abstract: Faced with a secessionist threat in one or more regions, central governments have the option to devolve some power to a regional entity, hoping that such a move may appease the separatist movement. However, greater independence for a region may also have the opposing effect. In this paper, we provide an experimental test of this trade-off using a novel public goods game with multiple public goods in nested groups. Our results indicate that decentralisation reduces the probability that subjects vote to secede from their group.

Keywords: Secession; Decentralisation; Voter Behaviour.

JEL Classification Numbers: D72, H77

1. Introduction

In recent decades, we observe two parallel trends: an increasing number of countries, and an increase in fiscal and political decentralization within many of these countries. Nowadays, for example, the OECD counts about 140 000 sub-national governments, which were also made more influential by the decentralization trend of the last twenty years (OECD, 2014). These two parallel trends raise the question whether decentralization can affect the ardour of regional secessionist groups. Indeed, when confronted with a secessionist threat in one or more regions, central governments might decide to devolve some power or competences to the regional entity, in the hope that the decentralization of power will accommodate regional demands and thereby quell the separatist movement. However, granting a region greater autonomy could also have the opposite effect (Sorens 2004; Lustick, Miodownik, and Eidelson, 2004; Miodownik and Cartrite, 2009; Spolaore, 2008; Ezgi, 2009).

The objective of this paper is to find, using a laboratory experiment, whether decentralisation increases or decreases the probability of votes for regional secession. Our original experimental design is based on the voluntary contribution mechanism (VCM) (Isaac and Walker, 1988), but using multiple public goods. When arriving at the laboratory, subjects are randomly put into global groups of 9 subjects. These 9 subjects are then divided in 3 local groups of 3 subjects. Consequently, each subject is a member of two groups. The public goods game has multiple public goods supplied at two different levels: at the local level and at the global level. All 9 subjects in a global group contribute to the global public goods, while subjects can only contribute to the local public goods corresponding to their own local group. Since there are more individuals in the global group, the global public good has a higher potential social return. Additionally, the marginal per capita returns (MPCR) of these two types of public goods are different.

The timing of the experiment is as follows. In the first and second parts, for a total of 24 periods, subjects contribute to public goods under different institutional arrangements. At the beginning of the third part of the experiment, individuals are asked to vote whether they want their local group to secede from the global group. In practice, secession corresponds to the choice of subjects to only have public accounts with their local group. In the third part, they play 12 periods in the configuration that obtained the majority of votes.

Our experiment uses a 2x2 design, where the two dimensions of treatment are the level of decentralisation and the salience of the local group identity. The first dimension, the level of decentralisation, modifies the configuration of the public goods available to the subjects. In the Centralisation treatments, subjects face two global public goods and one local public good. In the Decentralization treatments, subjects instead contribute to one global public good and two local public goods. The second dimension is the salience of local group identities. In the Identity treatment, we use a different procedure for the formation of local groups. Instead of forming local groups randomly, groups are constituted based on the proximity of the subjects' opinions in a preliminary questionnaire. Each local group is formed with subjects that share the closest opinions.

Overall, we therefore obtain four different treatment groups: centralisation without reinforced local identities, centralisation with reinforced local identities, decentralisation without reinforced local identities, and decentralisation without reinforced local identities. Our experimental design tests the effects of the treatments on contribution levels and on the probability of votes for secession. In our paper, a vote for secession is defined as a vote for the institutional arrangement that includes only local public goods.

Our experimental protocol stems from previous papers looking at the trade-off. This literature argues that on one hand, greater regional autonomy increases the confidence of citizens that their interests are well-represented, for example by bringing the overall mix of public goods closer to the local preferences. On the other hand, greater autonomy reduces the costs of secession (Ezgi, 2009) or grants additional resources to

regions to wage separatist struggles (Lustick, Miodownik, and Eidelson, 2004). Spolaore (2008), in a related theoretical model, argues that this increase in resources can increase the chance of success if an attempt to secede is made. The total effect of decentralisation is ambiguous since it simultaneously reduces the probability of a secession attempt, but increases its chance of success if attempted. Ezgi (2009) argues that the effect of decentralisation depends on the nature of the regions' grievances. If they are material, such that the conflict arises from, e.g., the composition of public goods, then decentralisation will reduce secession incentives. However, if grievances are symbolic (e.g., they result from ethnic differences), then decentralisation does nothing to reduce secession incentives, and instead just provides regions with self-governing experience, essentially reducing the costs of secession.

Our experimental protocol captures some important features of decentralisation and secessions, and provides a large dataset of comparable votes on secession, without the endogeneity or measurement problems inherent to empirical studies on the topic.[3] First, one important feature of decentralisation is that a greater number of decisions are made at a more local level.[4] In our protocol, the Decentralisation treatment allows our subjects to make more contribution decisions with their smaller local group. One possible limitation of this design is that multiple goods at the same level of decision are virtually identical. However, Bernasconi et al. (2009) show that when subjects contribute to two identical public goods, they contribute more than if there was only one good. Therefore, our simple decentralisation does affect the subjects' decision: their choice process is different when faced with more local goods. Second, decentralisation brings the "government" closer to the voters. One interpretation is that local governments can achieve a better match between the public goods provided and the preferences of the voters.[5] It is also possible that local governments are closer by being more accountable to voters. Fellner and Lünser (2014) show, in an experiment with local and global public goods, that cooperation is easier to sustain in small local groups. Similarly, our local goods are thus "closer" to our subjects even without differing preferences, due to an attenuated free-rider problem.

Our results show that the Decentralisation treatment increases the contributions to the local public goods. Regarding the votes, the Decentralisation treatment (i.e., when subjects make relatively more decisions with their smaller group) decreases the probability that subjects vote for secession. This result is true even net of the effect of contributions on votes. Indeed, we also find that subjects vote less for secession when the global group is more cooperative, and vote more for secession when the local group is more cooperative. Finally, our results are inconclusive regarding the Identity treatment, both on the level of individual contributions, and on the votes of subjects.

This question is more than theoretical. One example is Mali, where conflict ended in the 1990s with peace agreements that created a greater number of local governments across the country. Conflict resumed in the 2000s, culminating in the unilateral declaration of independence by the region of Azawad in 2012. These events prompted suggestions for further decentralisation. However, Pezard and Shurkin (2015:32) instead argue that "decentralization has been plagued by a set of more prosaic problems, among them a lack of financial resources and human capital, which impede newly created administrations and their elected

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[3] Some authors who attempted such analyses include Bakke and Wibbels (2006), Sorens (2004), Brancati (2006), and Ezgi (2009). However, such empirical analyses can suffer from two main difficulties: correctly measuring the degree of decentralisation and the strength of secessionist movements, and correctly determining the direction of causality between decentralisation and the presence of secessionist movements.

[4] Here, we abstract from decentralization reforms where local governments simply implement decisions made by a higher tier of government. In these reforms, we would argue that there is no *decentralization*, but instead only *deconcentration*.

[5] The theoretical analysis of secession (Alesina and Spolaore, 1997; Bolton and Roland 1997) highlights the trade-off between a better matching of public goods to the preference of voters in smaller jurisdictions and the economies of scale to be gained in larger jurisdictions. However, it would be difficult or virtually impossible to introduce exogenously different preferences in a public goods experiment.

members from accomplishing much of anything." While the question is not fully settled yet, this example clearly illustrates that decentralisation is not necessarily a cure for secessionist conflict. Bakke (2015) discusses further examples in the regions of Chechnya, Punjab, and Quebec.

The examples above all consider the secession of a region from a country. However, similar issues are present in other contexts. For example, political parties, while often ruled from the centre, must sometimes give in to demands of specific factions, lest they would face the possibility of a break-up of their party (Ceron, 2015).

The remainder of the paper is organised as follows. Section 2 surveys the related literature. Section 3 describes the experimental design and procedures and states our predictions. Section 4 reports the experimental results, while Section 5 briefly discusses them and concludes.

2. Related Literature

This paper relates to the experimental literature with multiple public goods and multiple groups, as well as on the literature on group identity.

As in our paper, Nitta (2014) investigates individuals' simultaneous contributions to a local and a global public good, albeit without a vote for secession by the subjects. However, this author considers the possibility of heterogeneous endowments. His key finding is that overall contributions are higher when endowments are homogeneous across local groups (i.e., every subject receives the same endowment). Interestingly, when endowments are heterogeneous (i.e., endowments vary by local group), subjects contribute more to the local public good and less to the global public good. In our experiment, we do not consider differences in endowment, focusing instead on the role of different institutional arrangements.

In our paper, we split our public goods in multiple identical public goods (for example, some subjects will contribute to two local public goods). In a related paper, Bernasconi et al. (2009) explore how contributions differ when a single group of subjects contributes to one public good or to multiple public goods. They show that the aggregated contributions of the subjects increase when a single public good is later split into two identical public goods. While our experiment includes three total public goods, only one or two of them are provided with the same group of people, and are thus identical, as in Bernasconi et al. (2009).

McCarter, Samak and Sheremeta (2013) also run an experiment where subjects are facing multiple public goods, but varying how subjects are matched with each other. In one treatment, subjects play two public goods games with the same group of players. In the other treatment, subjects play each public good with a different group of players. They find that participants matched with different groups shift their contributions towards the more cooperative group. We expect to find similar results in our experiment. In addition, our subjects will be allowed to choose to only play with one of the groups, a choice that could be driven by the contributions of others in their respective groups.

Our experiment includes local and global public goods, with groups of small and large sizes. Projects at a local level can provide more direct and larger benefits to their members than global projects that are distributed over more individuals. Additionally, interacting in local groups enables mutual monitoring and creates opportunities to gain social approval. These two factors have a positive effect on cooperation, especially because they are prerequisites of conditional cooperation (Fehr and Gächter 2000; Fischbacher et al., 2001; Gächter 2007). Thus, the return from contributing to a local public good can be higher. However, individuals may prefer more efficient outcomes and choose actions that maximise social surplus. Since more individuals can contribute to the provision of a global public good, contributions to the global public goods may lead to higher efficiency. In their experiment, Fellner and Lünser (2014) find that stable cooperation is

only achieved for the local public good. Individuals first attempt to cooperate for the global public good, especially when it has a higher potential payoff (they vary the MPCR of the global account), but this tendency rapidly collapses and cooperation builds up and remains stable in the provision of the local public good instead. Fellner and Lünser (2014) only provide subjects with information on the contributions from local group members, reflecting how it is easier to monitor local group members. In turn, this helps explain their results: cooperation was more sustained in local groups.

Our experiment also involves groups of different sizes, and differing marginal per capita returns (MPCR). The literature shows that participants in sessions with a high marginal per capita return[6] contribute more that participants in sessions with a low marginal per capita return (MPCR) (Marwell and Ames (1979); Isaac, Walker and Thomas (1984); and Isaac McCue and Plott (1985)). Furthermore, Kim and Walker (1984) and Brown-Kruse and Hummels (1993) find that participants significantly increase (decrease) their contributions when the marginal per capita return is increased (decreased) during the experiment. Regarding group size, Isaac and Walker (1988) show that increasing the group size from 4 to 10 participants (while keeping the marginal per capita return fixed) increases the average contributions of the participants. In a subsequent study, Isaac, Walker and Williams (1991) find that a group of 40 participants contributed a larger portion of their endowment than groups of 4 or 10 participants with the same marginal per capita return.

Wachsman (2002) builds a public goods experiment in which participants can allocate their endowment to a local group account with a relatively high marginal per capita return and a global group account with a lower marginal per capita return. He finds that when participants were not allowed to communicate with their local group, they allocated more resources to the global group account, suggesting that individuals assign greater importance to the potential payoff[7] of the global group account than to the higher MPCR of the local group account. When communication was allowed, subjects attempted to coordinate their contributions to the global group account with members of the other local groups.

Blackwell and McKee (2003) also study contributions to local and public goods, while varying the returns of one of the accounts. The local account has a marginal per capita return of 0.3 that remains fixed through all the sessions while the global account has a return that varies across treatments, taking on four possible values: 0.1, 0.15, 0.2, and 0.3. They introduce the concept of average per capita return (APCR) for the comparison of the relative payoffs from the global public good and local public goods.[8] The results indicate that when the APCR of the global public good exceeds the APCR of the local public good, individuals contribute more to the global public good but do not reduce their contributions to the local public good. Blackwell and McKee (2011) also find that individuals contribute more to a local public good (with a smaller group), even across three different cultures: US, Russia, and Kazakhstan.

Our experiment also involves subjects choosing, through a vote after a number of sessions, their experimental partners. Page et al. (2005) find that voluntary association can mitigate the free-rider problem. Indeed, in their experiment, subjects sorted themselves into groups of high and low contributors. Charness and Yang (2014) also let subjects form endogenous groups via voting: groups can be merged, individuals can be cast out, and individuals can "secede" from their group. They also find that such institutions can increase contributions. In contrast to these two examples, subjects in our experiment have less freedom in choosing

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[6] The marginal per capita return (or the marginal payoff) corresponds to the factor that multiplies the total amount of contributions invested in the public good. It determines how much each participant will get for every unit invested (by any of the participants) in the public good and independently of the fact that a participant is a free-rider or not.

[7] The potential per capita return (or the potential payoff) corresponds to the maximal possible payoff each participant can get from a public good when all participants contribute the totality of their endowment. It is positively correlated to the number of participants playing the public good game.

[8] The APCR a theoretical tool only, expressing how much a subject in the whole session receives, on average, for each token contributed to the good.

their fellow group members. We impose such a feature deliberately, mimicking how real-world secessions are usually only possible for pre-determined regions.

Finally, this paper is related to the literature in both psychology and economics about group identity and how it affects contribution behaviour. For instance, Campbell (1958) argues that grouping individuals into a reference group enhances cooperation amongst members of the group, while Kramer and Brewer (1984) and Brewer and Kramer (1986) find that individuals show more restraint in the consumption of a common good when they are identified as a part of a group.

Later, Hoffman, McCabe and Smith (1996), Dufwenberg and Muren (2006), Buchan, Johnson and Croson (2006), and Ahmed (2007) have shown that group identity as well as social distance, defined as the perceived affinity and nearness between people or groups, are important factors of the economic decision-making. Luttmer (2001) shows, empirically, that individuals may dislike providing social welfare when recipients are of another ethnic group, while Falk et al. (2013) bring evidence that individuals have a differentiated cooperative attitude towards the different groups they are affiliated with. Similarly, Carpenter and Cardenas (2011) report evidence of a significant change in the behaviour of individuals in a common pool resource game depending on the cultural diversity within the group.

Even in situations in which individuals have been assigned to groups based on arbitrary characteristics, they treat the members of their group differently than members of other groups (Festinger 1954; Tajfel et al. 1971; Tajfel 1974; Tajfel and Turner 1979). Tajfel (1970) named this experimental technique the minimal group paradigm. Following the minimal group paradigm of Tajfel (1970), Chen and Li (2009) and Chakravarty and Fonseca (2012) study the effects of induced group identity on social preferences and public good provision, relying, in their experimental designs, on artificially-induced identities. They introduce identity through an arbitrary task completely unrelated to the main focus of the experiment. Subjects were asked to review the paintings of two modern artists, Paul Klee and Wassily Kandinsky. Groups were formed according to the preferences of the participants for these two artists. In our experimental design, we have two degrees of local group identity. First, when individuals are placed in three local groups randomly, we may assume, based on the minimal group paradigm, that our experimental design induced a local group identity. To reinforce this local group identity, we apply a second treatment in which subjects were asked to answer a short questionnaire, and were then grouped with the 2 other subjects (out of 9) that expressed the opinions nearest to theirs.

3. The Experiment

Our experiment employs a 2x2 research design. We thus have a total of 4 treatment groups, differing on two dimensions. The first treatment dimension is the configuration of the public goods (decentralization or not), and the second is the creation of local group identity. In each treatment participants interacted under a partner matching protocol.

3.1. The Baseline Experimental Protocol

We first describe the basic experimental protocol, used in the sessions where there was no decentralisation or local identity (i.e., the Baseline treatment, or, as will be introduced later, the Cent-NI treatment). Before the start of the first part the computer program forms randomly groups of 9 subjects. Each group of 9 subjects is composed of three sub-groups of 3 subjects. A group of 9 subjects is called a "global group" and a sub-group of 3 subjects a "local group". A global group thus comprises 3 local groups labelled A, B and C. Each subject is at the same time a member of a local group with 2 other subjects and a member of a global group that includes his local group and the 6 members of the two other local groups (see Figure 1).

Figure 1: Formation of Local and Global Groups
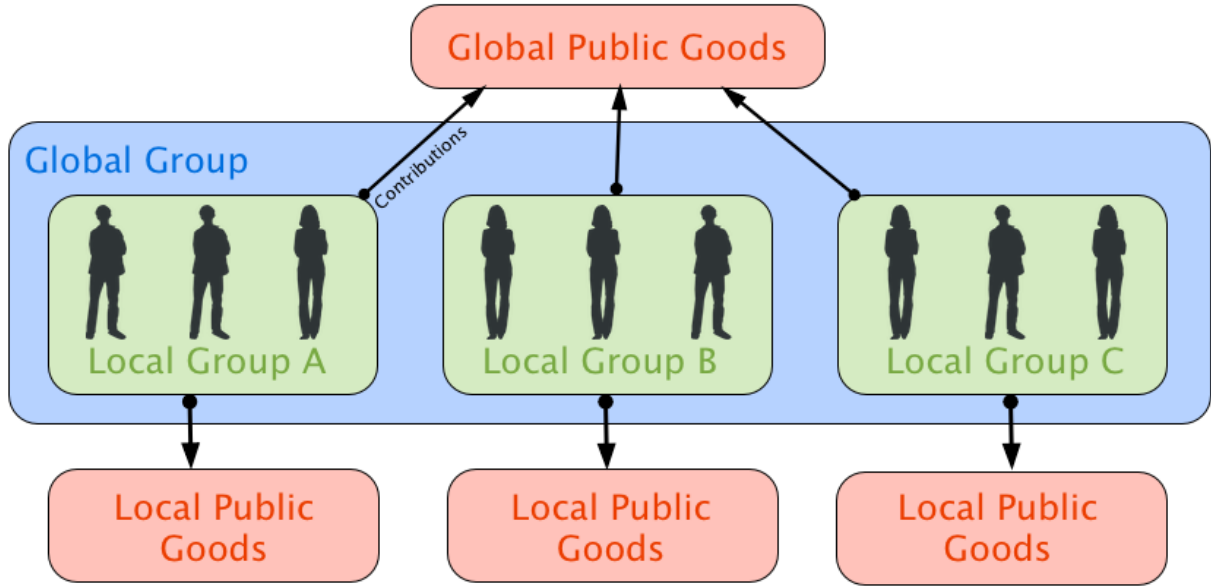
Note: This figure illustrates the formation of the groups. It shows how the three local groups are embedded in a global group. Arrows represent contributions to public goods. Subjects of different genders are randomly assigned to groups.

A session consists of 36 periods divided in three parts of 12 periods each. In each part subjects can contribute to three public goods. Public goods are either local or global. Two main differences distinguish local public goods from global public goods. First, their potential contributors are different. While only 3 subjects can contribute to a local public good, all 9 subjects can contribute to the global public good. Consequently, the global public good has a higher social return. Second, local and global public goods have different marginal per capita returns (MPCR). Namely, the MPCR is 0.5 for the local public goods and 0.2 for the global public goods. Thus, each Experimental Currency Unit (ECU) allocated to a local group account pays back 0.5 ECU while each ECU allocated to a global group account pays back 0.2 ECU. At the beginning of each period, each participant receives an endowment of 60 ECU to allocate between a private account, a local group account and a global group account. Participants can allocate all of the 60 ECU endowment to a single account (and 0 to the others), or split it between multiple accounts. The private account yields a one-to-one return. Players do not observe contribution decisions of any other player before they make their own choices.

The payoff of subject i, π_i equals:

$$\pi_i = (60 - c_i) + 0.5 \sum_{j=1}^{3} c_j + 0.2 \sum_{k=1}^{9} c_k$$

where c_i is player i's contribution to the local and global public goods, and c_j and c_k that of each local group member, $j=1,2,3$ and global group member, $k=1,…,9$.

In the first part of the Baseline treatment, at each period players have to choose how many ECU of their endowment (between 0 and 60) to contribute to the unique local group account and to two global public accounts, with the remainder kept in their private account. The total amount contributed to the local public account times the MPCR is shared equally among the 3 local group members while the total amount contributed to the global public accounts times the MPCR is equally shared among the 9 global group members (see instructions in the appendix for snapshots of computer screens displayed to participants).

After each period, each participant is informed of his individual contributions to each one of the three public goods, his payoff, the total contributions of the global group to each good, and the total contributions of the local group to each good (i.e., both local and global goods). Participants are not informed of the contributions by the members of the two other local groups of which they are not members.

In the 12 periods of the second part of the Baseline treatment subjects can contribute to 3 local public goods. There are no more global public goods. At each of the 12 periods players have to choose how to allocate their endowment between these three local group accounts and their private account.

As in Makussen *et al.* (2014), Putterman *et al.* (2011), Sutter *et al.* (2010) and Dal Bó *et al.* (2010) subjects are asked at the beginning of the third (and last part), after having experienced the settings of part 1 and part 2, to choose democratically the institution that will be implemented for the last block of 12 periods. To that purpose, subjects are invited to express their preference for one of these two institutions with a vote between two options:

- The option with one local group account and two global group account (as in part 1)
- The option with three local group accounts (as in part 2).

Subjects can answer yes to only one of these two options. The final outcome of the vote is based on a double majority rule. Concretely, the computer program first determines how many members voted in favour of three local public goods in each local group. The majority is attained when two members out of three voted for that configuration. Then, the computer calculates how many local groups attained a majority in favour of that situation. Again, majority is reached when two local groups out of three voted for the same situation. The third part of the experiment is the application of the configuration that won the vote to all local groups.

A double majority rule was necessary to ensure that subjects would end up in a configuration they already experienced, namely either public goods with only the members of their local group, or public goods with both the members of their local groups and all 8 other members of the global group. Allowing a single local group to secede would create global groups of six people only, which would be a completely new situation for the subjects and bring additional uncertainty. Concretely, a double majority rule resembles decentralised countries such as Switzerland, for instance, where the use of double majority rule is common in referenda and popular initiatives. It also captures some aspect of secession decisions in countries such as Canada, which adopted a law that allows some level of federal oversight in the decision of provinces to secede.

The results brought by the above mentioned literature indicate that endogenously chosen institutions are more efficient in comparison to exogenously imposed institution. This result is referred to as "dividend of democracy". In contrast to these authors, our main interest is to determine which one of the two exogenously imposed institutions is preferred by the subjects. This choice, expressed with a vote, is crucial to us. The level of efficiency attained in the democratically chosen institution is less important to answer to our main research question.

Finally, to account for the effect of the order in which parts 1 and 2 are played on the outcome of the vote, each treatment is conducted with parts 1 and 2 inverted. Figure 2 schematises the parts of the experiment.
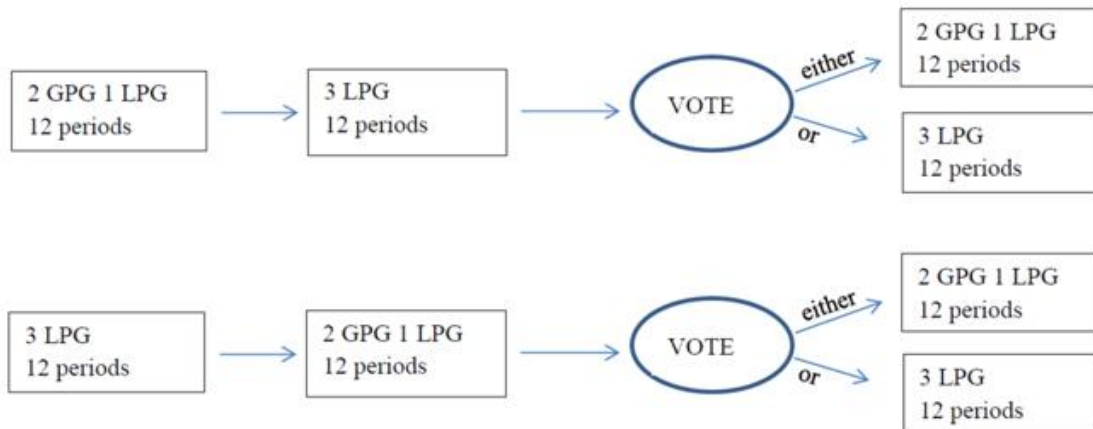
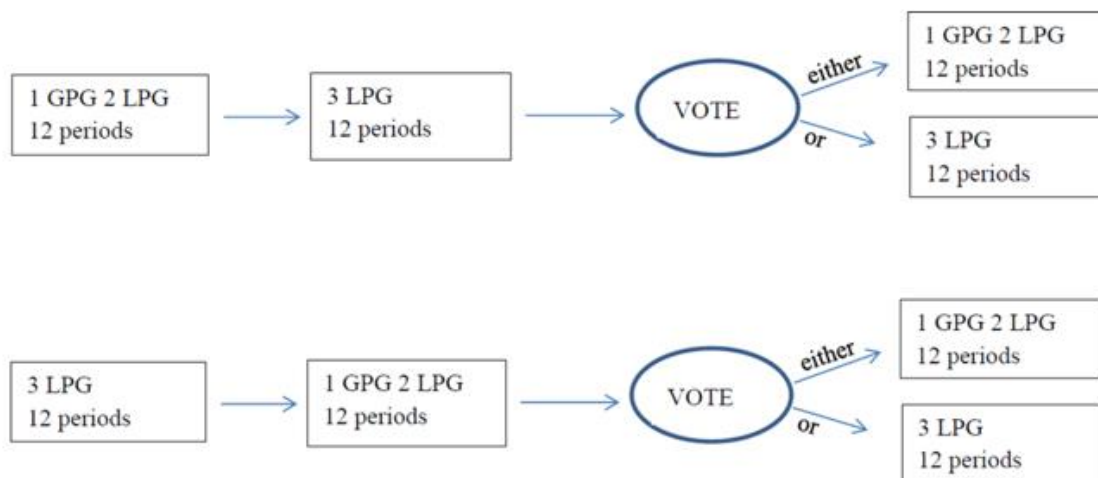Note: GPG and LPG stands for global public goods and local public goods, respectively.

3.2. The Decentralization Treatment

The difference between the Baseline and Decentralization treatments is the number of public goods in each category. Instead of two global public goods and one local public good, there will be one global public good and two local public goods. As a result, players at each period have to choose how many ECU of their endowment (between 0 and 60) to contribute to the two local group accounts and to the unique global group account, with the remainder kept in their private account.

All the other features of the Decentralization treatment are identical to those of the Baseline treatment. Consequently, our implementation of decentralization captures an increase in the number of decisions that are made with local group members, but does not add additional distortions that would come from having different public goods, for which subjects would have different preferences. One criticism of this approach is that the increased number of local decisions might be artificial. Since the local goods are perfectly substitutable, subjects might in fact only decide on the total contribution, without taking into account that there are two public goods. However, Bernasconi et al. (2009) show that subjects behave differently when faced with two experimental public goods, even when they are identical.

This treatment tests whether individuals vote differently at the beginning of the third stage after experiencing a different configuration where more local group accounts are available. Figure 3 schematises the Decentralization treatment.

Figure 3: The Experimental Protocol under the Decentralisation Treatment

Note: GPG and LPG stands for global public goods and local public goods, respectively.}

3.3. The Identity Treatment

The difference between the Baseline and the Identity treatments is the reinforcement of local identity, prior to the procedure as explained above. As the literature shows (Festinger 1954; Tajfel et al. 1971; Tajfel 1974; Tajfel and Turner 1979), placing participants of an experiment in random groups and simply labelling those groups already creates group identity. Thus, even when we do not apply the Identity treatment, members of local groups already share a local group identity. The Identity treatment reinforces this local group identity and tests how it affects the outcome of the vote. In particular, we test if emphasising local group identity increases the tendency of subjects to vote for secession (i.e., in favour of three local public goods).

As in previous treatments, at the beginning of the experiment the computer program randomly forms groups of 9. But in the Identity treatment, subjects are not assigned randomly to local groups. Instead, they are grouped according to a measure of their general preferences (arts, sports, etc.).

Prior to the first part of the experiment, subjects respond to a short questionnaire. The questionnaire contained four statements to which subjects were asked to give an appreciation by selecting one of the four following options: 1. I strongly disagree, 2. I disagree, 3. I agree, and 4. I strongly agree.[9] Once the questionnaire is completed the computer program used an algorithm to form the local groups according to the proximity of the answers given to the different statements.

At the local level, each subject is thus paired with the two other subjects that, among the overall group of 9 subjects, express the opinions nearest to his. As a result, each local group is formed with subjects that share the closest opinions. Consequently, from the point of view of each local group, members of the other two local groups have opinions more distant to them. All the other characteristics of the Identity treatments are identical to the Baseline and Decentralization treatments.

3.4. Predictions

In all treatments, assuming that players maximise their own earnings, the theoretical sub-game perfect equilibrium is to not contribute at all to the public goods, regardless of the category. Indeed, the marginal per

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[9] The statements in the questionnaire covered subjects unrelated to the experiment. See the instructions in the appendix for a detailed presentation of the questionnaire.

capita returns of both types of public goods are always lower than the marginal return of the private goods. In contrast, the socially optimal behaviour is for subjects to contribute their whole endowment to the public goods, since $0.5 * 3 > 1$ and $0.2 * 9 > 1$. Moreover, since the global public good is more socially efficient ($0.2 * 9 > 0.5 * 3$), subjects should contribute only to the global goods. In reality, as previous laboratory experimental studies on public good games have reported, individuals do, generally, contribute to the public good (Ledyard, 1995). Our first prediction is then that total contributions to public goods will not be zero.

Hypothesis 1.A: *Individuals will contribute a positive amount to the public goods.*

The next hypothesis pertains to how individuals allocate their contributions across local and global goods. To the extent that the subjects identify more as a member of their local group, they will have a preference for contributing to local public goods. We expect local groups to be more cohesive, leading to larger contributions to local public goods. Fellner and Lünser (2014), for example, show that cooperation is easier to sustain in a smaller group. In their experiment, subjects initially contribute to both types of goods, but contribute relatively more to the local good as time passes. Free riding in smaller local groups is easier to detect and, consequently, less likely to occur. For these reasons, we hypothesise that individuals will contribute relatively more to local public goods as the experiment advances.

Hypothesis 1.B: *Individuals will allocate a larger share of their contributions to the local public goods in later periods of the experiment.*

The next two hypotheses concern the effect of the treatments on the contribution behaviour of the subjects. First, we make the hypothesis that the Decentralisation treatment will incite greater contributions to the local goods. Bernasconi *et al.* (2009) show that subjects contribute more when there are two public goods than a single one. Therefore, we expect that contributions will be higher to any given type of good when subjects face multiple goods of that type. This hypothesis translates how decentralisation usually implies more spending and public goods at the local level.

Hypothesis 2.A: *The Decentralisation treatment will lead to more contributions to the local public goods.*

Similarly, we make the hypothesis that the Identity treatment will incite greater contributions to local goods. Indeed, as subjects identify with other members of the local group more strongly, we expect that they will contribute more, and that this cooperation will be easier to sustain.

Hypothesis 2.B *The Identity treatment will lead to more contributions to the local public goods.*

We are ultimately interested in the effect of the treatments on the probability of secession votes. Regarding the Decentralisation treatment, there are two effects at play. The first effect operates through contributions. If, under decentralisation, contributions to the local public goods are higher, subjects might be more likely to vote for secession. Indeed, faced with a relatively more cooperative local group, subjects might decide they prefer only having local goods. The second, more interesting effect is net of contributions. As explained in the motivation to this paper, the direction of that effect is ambiguous; decentralization can increase or decrease the probability of secession. However, our experimental implementation of decentralisation mainly captures how "close" the decision-making process is to the subjects, while ignoring the fight for resources (as theorized by Spolaore, 2008). Consequently, we predict that decentralization, in our experiment, will reduce the probability of votes for secession.

Hypothesis 3.A: *Net of contributions, the Decentralization treatment will decrease the probability of secession.*

Our experimental protocol does capture, however, another aspect of the relationship between decentralization and secession, namely the material vs. symbolic grievances. In particular, by introducing a reinforced identity at the local level, we introduce a potentially larger role for symbolic grievances. We thus make two hypotheses regarding the Identity treatment. First, we expect that this treatment will increase the probability of secession votes.

Hypothesis 3.B: *The Identity treatment will increase the probability of secession votes.*

Second, following the argument of Ezgi (2009), we also test whether decentralisation and local identities have (anti-)synergistic effects on the decision to secede. Indeed, the desire of a local group (or, in the real world, a region) to secede might be influenced by the distance between decision-making and the subjects (in the real world, the match between preferences and provided public goods), or to the fact that subjects in the local group feel closer to one another. Our Identity treatment was designed to capture that identification of subjects to the local group. For that reason, decentralisation could be less efficient at reducing secession votes when we reinforce local identities, given the implied presence of symbolic grievances.

Hypothesis 3.C: *The Identity treatment will reduce the effect of the Decentralisation treatment on the probability of secession votes.*

We also hypothesise that contributions by other members of both groups will affect the individuals' votes for secessions. In particular, when local group members contribute more to public goods, it should incite more votes for secession. Indeed, it allows subjects to choose the group members that they know are co-operators. Conversely, if global group members contribute more to public goods, it should incite fewer votes for secession. Indeed, as the global goods have potentially greater payoffs (given the larger number of participants), subjects that experience a more cooperative global group will choose to continue sharing public goods with that group.

Hypothesis 4: *Greater contributions to public goods by other members of the local (global) group increases (decreases) the probability of votes for secession.*

3.5. Procedures

The experiment consists of 33 sessions conducted at the GATE-LAB research institute located in Lyon, France. The 432 participants were recruited from local engineering and business schools, using the ORSEE software (Greiner, 2004). No subject participated in more than one session. 55.79 % of the participants are females and their mean age is 22.97 years (S.D. = 6.22). We organised three sessions per treatment. To account for the effect of the order in which parts 1 and 2 are played on the outcome of the vote, three supplementary sessions were organised for each treatment with parts 1 and 2 inverted. This results in a total of six sessions per treatment. 108 participants took part in each treatment. The experiment was computerised using the ZTree software package (Fischbacher, 2007). Table 1 summarises the characteristics of the experimental sessions.

Upon arrival, participants were randomly assigned to a computer after drawing a tag from an opaque bag. Sets of instructions were distributed at the beginning of each part and read aloud. On average a session lasted 90 minutes, including payment. The participants were paid the sum of their earnings in each period, at the rate of 100 Experimental Currency Units = 0.45 Euro. In addition, they were paid a 5 Euro show-up fee. On average, participants earned 17.12 Euro ($S.D.=1.68$). Payments were made individually in cash and in private in a separate room.

At the end of the experiment, we administered a demographic questionnaire including questions on gender, age, and relative wealth of the family compared to other students (on a scale from 0 for the poorer to 10 for the wealthier).

Table 1: Characteristics of the Experimental Sessions

Session	Number of Participants	Treatment Name	Decentralisation	Identity	Order
1	18	Cent-NI	No	No	Mixed first
2	18	Cent-NI	No	No	Mixed first
3	18	Cent-NI	No	No	Mixed first
4	18	Decent-NI	Yes	No	Mixed first
5	18	Decent-NI	Yes	No	Mixed first
6	18	Decent-NI	Yes	No	Mixed first
7	9	Cent-NI	No	No	Three Local First
8	18	Cent-NI	No	No	Three Local First
9	18	Decent-NI	Yes	No	Three Local First
10	18	Decent-NI	Yes	No	Three Local First
11	9	Cent-NI	No	No	Three Local First
12	18	Cent-NI	No	No	Three Local First
13	9	Decent-NI	Yes	No	Three Local First
14	9	Decent-NI	Yes	No	Three Local First
15	9	Cent-I	No	Yes	Mixed first
16	9	Cent-I	No	Yes	Mixed first
17	9	Decent-I	Yes	Yes	Mixed first
18	9	Decent-I	Yes	Yes	Mixed first
19	9	Cent-I	No	Yes	Mixed first
20	9	Cent-I	No	Yes	Mixed first
21	9	Cent-I	No	Yes	Mixed first
22	9	Cent-I	No	Yes	Mixed first
23	9	Decent-I	Yes	Yes	Mixed first
24	9	Decent-I	Yes	Yes	Mixed first
25	9	Decent-I	Yes	Yes	Mixed first
26	18	Decent-I	Yes	Yes	Three Local First
27	18	Cent-I	No	Yes	Three Local First
28	9	Decent-I	Yes	Yes	Three Local First
29	9	Cent-I	No	Yes	Three Local First
30	9	Cent-I	No	Yes	Three Local First
31	18	Cent-I	No	Yes	Three Local First
32	18	Decent-I	Yes	Yes	Three Local First
33	18	Decent-I	Yes	Yes	Three Local First
Total	432				

Note: The "Order" column refers to the order of the first two parts of the experiments. All subjects experienced 12 periods with a mix of local and global public goods and 12 periods with only local goods. The difference was in the ordering. Some sessions started in Part 1 with a mix of local and global public goods, while others started Part 1 with only three local goods.

4. Results

Our experiment yielded these main results:

- **1.A (Contributions)** Subjects contribute non-null amounts to public goods
- **1.B (Contributions)** Subjects contribute relatively more to local goods as the periods pass.

- **2.A. (Contributions)** The Decentralisation treatment increases contributions to local goods, but has no effect on contributions to global goods.
- **2.B. (Contributions)** The Identity treatment has no effect on individual contributions.
- **3.A. (Vote)** The Decentralisation treatment decreases the probability of a secession vote.
- **3.B. (Vote)** The Identity treatment has no effect on the probability of a secession vote.
- **4. (Vote)** The probability of a secession vote is increased when local group members contribute more, but decreased when global group members contribute more.

4.1. Preliminary Results on Contributions

Table 2 shows the average individual contributions to local and global public goods in the four treatment categories across different periods. First, note that contributions are positive on average, thus replicating the usual result of public good games:

Result 1.A: *Subjects contribute non-null amounts to the public goods.*

Figure 4 shows the evolution in average individual contributions over the 36 periods, separately for the two possible orderings of the experiment. In shades of red, it shows average individual contributions when the experiment started with both types of public goods. In this environment, subjects initially contribute more to local public goods, and cooperation is sustained longer for those goods while it declines rapidly for global goods. There is a large restart effect in Period 13, when subjects were faced only with local public goods. In blue and black, Figure 4 shows the results for the other ordering of the experiment. Here, subjects initially contribute large amounts to local public goods in the first 12 periods, even more than those who also had public goods available. Here, while contributions to the global goods initially surpass those to the local goods, the pattern is reversed after a few periods. Therefore, cooperation is again sustained longer for local public goods. Figure 4 illustrates one result that is common to both orderings of the experiment:

Result 1.B: *Subjects contribute relatively more to local goods as the periods pass.*

Table 2: Summary Statistics on Contributions, by Treatment and Block of Periods

	Period	Start with Only Local	Cent-NI	Decent-NI	Cent-I	Decent-I
Contributions to local public goods	1-12	NO	15.46 (4.62)	28.80 (7.48)*** p=0.0065	20.04 (3.52) p=0.1093	31.75 (5.04)*** p=0.0039
	13-24	NO	28.83 (7.42)	27.61 (6.88) p=0.6310	32.10 (5.70) p=0.4704	34.07 (3.76) p=0.2623
	1-12	YES	30.12 (7.89)	28.58 (10.50) p=0.8728	32.41 (5.38) p=0.8728	30.28 (2.12) p=0.7488
	13-24	YES	11.03 (4.57)	10.36 (6.55) p=0.6884	9.60 (2.61) p=0.5218	14.33 (3.92) p=0.2623
	25-36 Secession	-	17.36 (8.81)	9.49 (2.82) p=0.1416	21.28 (6.09) p=0.6242	24.07 (8.10) p=0.1797
	25-36 No Sec	-	9.93 (3.45)	13.69 (5.90) p=0.1649	13.06 (6.53) p=0.4179	17.14 (5.92)** p=0.017
Contributions to global public goods	1-12	NO	15.92 (3.43)	10.06 (4.69)* p=0.0547	15.04 (4.79) p=0.6310	10.53 (4.34) p=0.8322
	13-24	NO	-	-	-	-
	1-12	YES	-	-	-	-
	13-24	YES	8.38 (5.28)	7.97 (5.85) p=0.6310	13.63 (4.84)* p=0.0782	7.95 (1.89) p=0.7488
	25-36 No Sec.	-	6.62 (3.81)	7.01 (4.42) p=0.8170	9.12 (4.39) p=0.3545	6.34 (4.15) p=0.8322
Average percentage of maximum efficiency reached in public goods (%)	1-12	NO	74.51	76.34 p=0.6310	75.98 p=0.4704	78.05*** p=0.0039
	13-24	NO	82.67	82.00 p=0.6310	84.50 p=0.4704	85.58 p=0.2623
	1-12	YES	83.40	82.54 p=0.8728	84.66 p=0.2002	82.37 p=0.7488
	13-24	YES	66.87	66.25 p=0.8728	69.93 p=0.2002	68.08 p=0.2623
	25-36 Secession	-	76.51	71.93 p=0.1416	78.48 p=0.6242	80.03 p=0.1797
	25-36 No Sec.	-	65.05	67.08 p=0.3545	68.36 p=0.2472	68.18** p=0.0172

Numbers indicate mean values. Standard deviations are in parentheses. The significance levels of two-tailed Mann–Whitney tests are represented by ***, **, and *, with p<0.01, p<0.05, p<0.10, respectively, in which we compare each treatment to the Cent-NoID treatment. Each bloc of 12 periods gives only one independent observation for each global group.

Figure 4 also illustrates the restart effect that takes place after the vote. Notably, that restart effect is larger for the subjects that voted for, and obtained secession.

Figure 4 also shows that (over all treatments) average individual contributions to both types of goods generally decrease over time, especially before the vote, when the institutional arrangement is exogenously imposed.[10] Therefore, implementing a setting that was decided endogenously by a vote did not encourage the subjects to increase their contributions at a level higher than before the vote. Wilcoxon tests (W, hereafter) at the global group level confirm that, in all the treatments, the mean individual contributions (both to local and public goods) before the vote and in the last 12 periods after the vote are significantly different (W tests local goods: Cent-NI p=0.0037; Decent-NI p=0.0029; Cent-I p=0.0076; Decent-I p=0.0060. W tests global goods: Cent-NI p=0.0180; Decent-NI p=0.01117; Cent-I p=0.01117; Decent-I p=0.0077).

Figure 4: Average Individual Contributions across All Treatments, for Both Experimental Ordering (by Period)
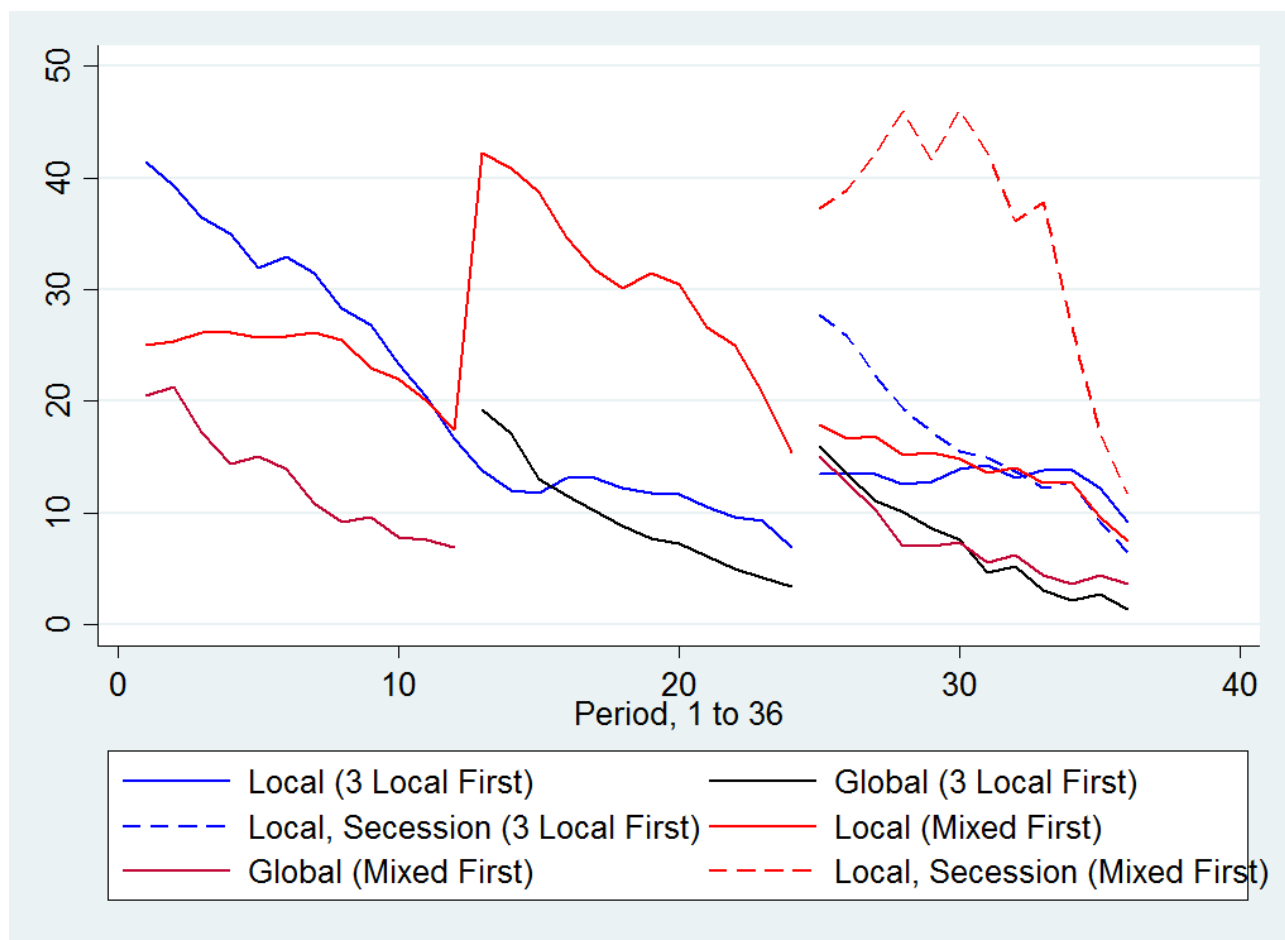
4.2. The Effect of the Treatments on Contributions

Table 2 compares contributions across treatments. First, it displays the average contributions to each category of public good over each sequence of 12 periods. It also displays the average percentage of maximum efficiency reached in each global group for each category of public good, for the three parts of the experiment (12-period block).

Table 2 shows that contributions to local public goods are higher under the Decentralisation treatment (Decent-I and Decent-NI) than under the baseline case of centralization and no identity (Cent-I), but only when subjects participated in the experiment under the ordering that started with the mix of local and global

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[10] We do observe, however, the usual restart effects in Periods 13 and 25.

goods (and not only local goods). Indeed, a two-tailed Mann-Whitney[11] test—MW, hereafter—comparing these two treatments indicate that contributions to the local goods are higher (in the first 12 periods) in the Decent-I treatment (MW p=0.0377), as well as in the Decent-NI treatment (MW p=0.0065). Table 2 also shows that contributions were higher in the last block of the game after the vote (periods 25 to 36), but only when no secession took place (MW p=0.017).

As for contributions to global public goods, we find that contributions were lower under the Decentralisation treatment without reinforced identity, in the first 12 periods (MW test, p=0.0547). We also find, somewhat surprisingly, that contributions to the global goods (in periods 13 to 24) are higher under the Centralisation treatment with reinforced identity at the local level than under the baseline (MW test, p=0.0782). However, most results from these statistical tests are inconclusive, or only at very low levels of statistical significance.

The last two sections of Table 2 describe the average percentage of maximum efficiency reached for each type of public goods. Notably, it shows that efficiency for local goods is higher in the Decent-I treatment (decentralisation with local identities) than in the Cent-NoID treatment, at least for the first and last 12 periods (without a secession).

To further analyse the determinants of contributions, Table 3 presents the estimations from OLS models using random effects on our panel of 144 local groups, with standard errors clustered at the local level (local groups are fixed throughout the session). The data only includes contributions in periods 1 to 24, before the vote. Moreover, it only includes periods in which both types of goods are available to the subjects.

In all the models our variables of interest are the dummy variables indicating the administration of the Decentralization and Identity treatments. We are also interested in the effect of the previous contributions of fellow group members. In addition, we control for the order in which parts one and two were played by adding a supplementary dummy that takes one when the experimental secession started with three local public goods. We also add a time trend and control for various individual characteristics (age, gender and wealth level).

In the first and second columns of Table 3 the dependent variables are individual contributions to the local and global public good, respectively. In the third column, the dependent variable is the difference between the contributions to the local good and those to the global good (i.e., the individual's bias towards the local goods).

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[11] An independent observation corresponds to the contributions of each global group averaged over each sequence of 12 periods

Table 3: Determinants of Individual Contributions to Local and Global Goods, and of the Difference between Contributions to Each Type

	Contributions to Local Goods	Contributions to Global Goods	Difference Between Local and Global
Decentralisation	3.2187**	-1.8997	4.9801**
	(1.64)	(1.52)	(2.04)
Local Identity	0.3943	1.4654	-1.0561
	(1.47)	(1.44)	(1.69)
Interaction Effect	1.9789	-0.9133	2.8345
	(2.18)	(1.98)	(2.54)
Start with 3 Local Goods	-7.1442***	-2.7897***	-4.2385***
	(1.30)	(1.03)	(1.46)
Contributions by others to Local Goods (lagged)	0.2147***	-0.0213*	0.2428***
	(0.02)	(0.01)	(0.02)
Contributions by others to global goods (lagged)	0.0019	0.0329***	-0.0330***
	(0.01)	(0.01)	(0.01)
Period	-0.4137***	-0.9090***	0.4785***
	(0.11)	(0.10)	(0.16)
Age	0.0304	0.2448***	-0.2155*
	(0.10)	(0.07)	(0.12)
Gender	1.4869	1.7623**	-0.2712
	(1.06)	(0.87)	(1.22)
Wealth Level	-0.4204	-0.3816*	-0.0331
	(0.27)	(0.22)	(0.29)
Constant	14.3151***	11.6228***	2.7646
	(3.21)	(2.68)	(4.01)
N	4752	4752	4752
R2	0.339	0.149	0.208
$\chi 2$	570.4***	357.7***	301.4***

Clustered standard deviations in parentheses. Significance levels: *** ($p<0.01$), ** ($p<0.05$), and * ($p<0.10$).

Estimations only include periods in which subjects had to contribute to both types of goods.

The first column shows that the Decentralization treatment increases individual contributions to local goods, but the second column shows that this treatment has no effect on contributions to global goods. Put differently, when faced with two local goods, subjects increase their contributions to that good, but the opposite is not true: when faced with two global goods (i.e., centralisation, or no decentralisation), subjects do not increase their contributions to global goods. Finally, the third column shows that decentralization increases contributions to the local good relative to the global good. We can summarise the results as such:

Result 2.A: *The Decentralisation treatment increases contributions to local goods, but has no effect on contributions to global goods.*

The contributions of fellow group members also affect contributions to public goods. In particular, the third column shows that as members of an individual's local group contribute more to the local good, that subject then contributes relatively more to the local good. Conversely, as members of an individual's global group contribute more to the global good, he or she contributes relatively more to the global good.

The time trend has a negative effect indicating that individual contributions declined over time, as expected. However, the time trend positively affects the relative contribution to the local goods, indicating that as time passes, individuals allocate a larger portion of their total contributions to the local goods.

The order in which parts one and two are played significantly and negatively affects contributions to both types of public goods. These reduced contributions could be an artefact of the experiment design. Figure 4 shows, for example, that under the ordering with only local goods at first, the restart effect for the local goods is small compared to the other ordering. This difference might be due to the addition of a new type of good in Period 13 for those who only had one type in the first 12 periods. On average over the whole experiment, this smaller restart effect may lead to lower contributions. Note that the results on our main variables are significant even if this order variable is not included. Consequently, our results are not driven by this order effect.

Table 4: Marginal Effects of the Decentralisation Treatment, at Both Values of the Identity Dimension

	Contributions to Local Goods	Contributions to Global Goods	Difference Between Local and Global
M.E. of Decentralisation under:			
Reinforced Local Identity	5.1976***	-2.8130**	7.8146***
	(1.53)	(1.52)	(1.70)
No Reinforcement of Local Identity	3.2187**	-1.8997	4.9801**
	(1.64)	(1.28)	(2.04)
$\chi2$ (Wald test: equality of coefficients)	0.07	1.03	0.39

Standard deviations in parentheses. Significance levels: *** ($p<0.01$), ** ($p<0.05$), and * ($p<0.10$).

Our regressions included interaction effects between the two treatments, to test whether the increased saliency of local identities affected the effect of the Decentralisation treatment. Table 3 shows that the interaction term is not significant. Table 4 shows that the marginal effects of the Decentralisation treatment are larger under the Identity Treatment. However, Wald tests indicate that the differences between the marginal effects are not statistically significant. This result, along with those of Table 3, are summarised as follows:

Result 2.B: *We do not find an effect of the Identity treatment on individual contributions.*

4.3. The Effect of the Treatment on Votes for Secessions
We turn now to the analysis of the subjects' votes, taking place before the third part of the experiment. First, note that 159 subjects voted for secession, or 36.8 per cent of all subjects. These votes translated into secessions for 16 global groups.[12]

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[12] Our voting rule (double majority) did not allow for secession by only one local group in any given global group.

	(1) Probit	(2) M.E.	(3) Probit	(4) M.E.	(5) Probit	(6) M.E.
Decentralisation	-0.3062	-0.1361***	-0.3124	-0.1375***	-0.2969	-0.1279***
	(0.19)	(0.04)	(0.19)	(0.04)	(0.19)	(0.04)
Local Identity	0.0618	-0.0252	0.0646	-0.0246	0.0747	-0.0170
	(0.21)	(0.04)	(0.21)	(0.04)	(0.21)	(0.04)
Interaction Effect	-0.2867		-0.2892		-0.2608	
	(0.28)		(0.28)		(0.28)	
Start with 3 Local Goods	1.0214***	0.3105***	1.0297***	0.3110***	1.0088***	0.3018***
	(0.16)	(0.04)	(0.16)	(0.04)	(0.16)	(0.04)
Average Individual	0.0038	0.0012	0.0075	0.0023	0.0134*	0.0040*
Contributions to Local Goods	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
Average Individual	0.0080	0.0024	0.0022	0.0007	0.0000	0.0000
Contributions to Global Goods	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
Average Profits, Local Goods	0.0126	0.0038				
	(0.01)	(0.00)				
Average Profits, Global Goods	-0.0656***	-0.0200***				
	(0.02)	(0.01)				
Average contributions from local group members to:						
All Public Goods			0.0080**	0.0024**		
			(0.00)	(0.00)		
Local Public Goods					0.0019	0.0006
					(0.00)	(0.00)
Global Public Goods					0.0182***	0.0054***
					(0.01)	(0.00)
Average contributions			-0.0078***	-0.0023***	-0.0107***	-0.0032***
from global group members			(0.00)	(0.00)	(0.00)	(0.00)
Age	-0.0032	-0.0010	-0.0035	-0.0010	-0.0023	-0.0007
	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
Female	0.5685***	0.1728***	0.5758***	0.1739***	0.5757***	0.1722***
	(0.14)	(0.04)	(0.14)	(0.04)	(0.14)	(0.04)
Wealth Level	0.0291	0.0088	0.0299	0.0090	0.0332	0.0099
	(0.04)	(0.01)	(0.04)	(0.01)	(0.04)	(0.01)
Constant	-1.1054***		-1.1218***		-1.0561**	
	(0.40)		(0.41)		(0.41)	
N	432		432		432	
Pseudo-R2	0.182		0.187		0.197	
χ2	90.1		90.4		89.4	

Clustered standard errors in parentheses. Significance levels: *** (p<0.01), ** (p<0.05), and * (p<0.10).

We estimate Probit models in which the dependent variable takes value 1 if an individual voted in favour of secession, i.e. in favour of three local public goods, and 0 otherwise.

Our variables of interest are the dummy variables for each treatment dimension (Decentralization and Identity). We also include variables for the ordering of the experimental sessions (equal to 1 when it started

with three local public goods), as well as for the individual's contributions and average profits from each type of good. We also control for individual characteristics (age, gender and wealth level).

Table 5 presents the results of the regressions, as well as marginal effects. The difference between the three models is the variable used to control for the degree of cooperation in the different groups. First, in all models, we see that the Decentralization treatment decreases the probability that subjects vote for secession by about 13 per cent. This result is significant at the 1 % level.

Result 3.A: *The Decentralisation treatment decreases the probability of a secession vote.*

The Identity treatment, however, does not affect the outcome of the vote.

Result 3.B: *We find no effect of the Identity treatment on the probability of secession votes.*

Furthermore, there is no indication of a significant interaction effect between the two treatment dimensions. Table 6 shows the estimated marginal effects of the Decentralisation treatment at both values of the Identity dimension.

Table 6: Marginal Effects of the Decentralisation Treatment on Votes for Secession, at Both Values of the Identity Dimension

	Vote for Secession
M.E. of Decentralisation under:	
Reinforced Local Identity	-0.1677***
	(0.06)
No Reinforcement of Local Identity	-0.0881
	(0.06)
χ2 (Wald test: equality of coefficients)	0.13

Standard deviations in parentheses. Significance levels: *** ($p<0.01$), ** ($p<0.05$), and * ($p<0.10$).

The marginal effect is only significant under the reinforced local identity, indicating that decentralisation affects votes only when the local groups' identities are made more salient. However, our results are not statistically robust, as a Wald test finds no significant difference between the values of the marginal effects. We summarise the results on the Identity dimension as follows:

Result 3.C: *The Identity treatment does not modify the marginal effect of the Decentralisation treatment on secession votes.*

Regarding the control variables, we first find that subjects are more likely to vote for secession when the experiment starts with three local public goods. Second, individual contributions have no effect on vote behaviour. Finally, among the demographic variables, gender affects voting behaviour. Namely, interestingly, women vote more frequently in favour of secession. The literature on the gender effect in public goods games does not bring a clear cut answer (Plott and Smith, 2008). In some studies women are more cooperative in other less, and in some other there is no significant gender difference. However, all these studies do no analyse differences in behaviour between men and women when faced with different categories of public goods as it is the case in our experimental design. On the other hand, the literature has shown that women are more sensitive to the context of the experiment than are men and prefer more secure environments (Croson and Gneezy, 2009). As local groups are smaller and thereby facilitate the monitoring they might be seen as less risky than the global group. This might in turn explain women's preference for a secessionist context constructed only with local public goods. Lastly, age and wealth level have no effect on the vote.

4.5. The Effect of Group Contributions to Secession Votes

The average profits from public goods also affect the votes for secession. In particular, Table 5 (Columns 1 and 2) shows that when subjects receive higher profits from the global public goods, the probability that they vote for secession is lower. The marginal effects of Column 2 indicate that for each additional unit of experimental currency in profit, the probability decreases by about 2 per cent. The average profits per period received from global goods, over the 432 individuals, is of 10.1 ECU with a standard deviation of 5.0 ECU. Therefore, the coefficient is also economically significant (a reduction of 10 percentage points in the probability of a secession vote for an increase of one standard deviation in global profits). We do not find a significant effect for profits from local goods. Since larger profits from global goods indicate that the global group was more cooperative, this result suggests that a vote for secessions is less likely when the global group is cooperative.

We can also analyse contributions of others directly, instead of summarising them through average profits. Columns 3 to 6 of Table 5 present the result of this analysis. We always include the contributions of other members of the global group to global public goods. Columns 3 and 4 show the result when including contributions from other local group members to *all* public goods, while Columns 5 and 6 include contributions from other local group members to both types of goods, but disaggregated.[13]

First, we see that higher contributions from global group members lead to a lower probability of a secession vote. Specifically, when global group members contribute an additional unit, the probability of a secession vote decreases by between 0.2 and 0.3 percentage points. An increase of one standard deviation in this variable (45.43 units) would decrease the probability of a secession vote by between 10.4 and 14.5 percentage points.

Second, we see that contributions from local group members have the opposite effect (Columns 1 and 2). Moreover, contributions to *global* goods from local group members increase the probability of a secession vote. Indeed, Column 4 shows that an increase of one unit in contributions from local group members to global goods increase the probability of a secession vote by about 0.54 percentage points. An increase of one standard deviation in this variable (16.16 units) would increase the probability of a secession vote by 8.73 percentage points. This effect is somewhat lower than contributions from the global group. We can summarise the results as such:

Result 4: *The probability of a secession vote is increased when local group members contribute more, but decreased when global group members contribute more.*

5. Discussion and Conclusion

The question that motivates this paper is whether devolving some responsibilities to regional governments can quell the secessionist aspirations of these regions. The literature does not answer this question in a clear-cut way. Our contribution lies in the design of an original experiment that uses a public good game with multiple public goods played with either a large (global) or small (local) group. The subjects are either faced with a "decentralised" or "centralised" structure, which differ by the number of public goods played at the global or local levels. We also reinforced the local group identities for some of our subjects, to examine whether this feature affects secession votes. In our design, secession is the choice by subjects to only interact with members of their local, smaller group for the remaining experimental periods.

Our results indicate that the Decentralisation treatment, where subjects contribute for two public goods with local group members, increases the contributions to local public goods. This result is in line with the results

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[13] Subjects had access to this information during the experiment.

of Bernasconi *et al.* (2009), who show that when faced with multiple identical public goods, subjects contribute more than faced with a single good. However, the treatment has no effect on contributions to global public goods, which instead goes against the results of Bernasconi et al. (2009).

We also find that the Decentralisation treatment decreases the probability of votes for secession. Notably, this result is net of the effect of fellow group member contributions. Indeed, since under that treatment, contributions to the local goods are higher, we could expect more votes for secessions if subjects choose the public goods to which others contribute the most. However, net of those increased contributions, we still find that decentralisation reduces the likelihood that subjects vote for secession. Therefore, even under the relatively simplified institutions possible in a laboratory, subjects choose to secede less often when they are allowed to interact with the smaller group for a larger number of public goods, or in other words if they interact with the smaller group for more decisions.

One possible criticism of our implementation of decentralisation is that it does not capture one primary reason to decentralise: voters in different regions have different preferences over the public goods provided. Indeed, since our experimental public goods are essentially identical (they all provide ECUs), our subjects cannot have preferences that differ. While this criticism is fair and further experiments could try to introduce preferences, we believe that our results are interesting nonetheless for two main reasons. First, it is important to note that the public goods differ on one important feature: they are provided with a different pool of subjects. As highlighted in Fellner and Lünser (2014) and replicated in this paper, subjects sustain cooperation longer in the case of local public goods. This finding suggests that, as could be argued for local goods in a decentralised country, our local goods are "closer" to our subjects. In other words, free-riding is more easily monitored and less prevalent. Second, while at a given level of provision (local or global), the goods are identical, our results indicate that subjects are actually influenced by the presence of multiple goods. As in Bernasconi et al. (2009), we find that subjects contribute more in total to local goods when there are two of them. This result indicates that our experiment created institutions that induced different contribution behaviour by the subjects. While a more realistic implementation of decentralisation would probably capture the preference matching aspect of decentralised public goods provision, our institutions reflect, to some level, how decentralisation implies more decisions at the local level.

Regarding the Identity treatment, we do not find any significant effect. This result is in contradiction with our initial hypotheses. The interaction effect between the two treatments (decentralisation and reinforced local identities) is also insignificant. However, when estimating the marginal effect of decentralisation separately at both values of the Identity treatment, we only find a significant effect of decentralisation when local identities are reinforced. Notably, this result goes against the reasoning of Ezgi (2009), in which symbolic grievances are supposed to reduce the efficiency of decentralisation to calm the secessionist desires. However, these results are not statistically robust, so we are unable to make strong conclusions on the effect of local identities.

One shortcoming of our Identity treatment is how local group identities were reinforced symmetrically. Indeed, the treatment was the same for each local group in the session. This might translate real-world settings such as ex-Yugoslavia or the Soviet Union, for example, where there are a large number of different and relatively small ethnic groups. However, secessionist movements frequently appear where one relatively small group is different than the remainder of the national community, as in Canada, Spain, or the United Kingdom,[14] for example. It might be interesting, then, to consider an experiment where we strongly reinforce local identity in one of the local groups, but not in the others. Another potential shortcoming of this treatment

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[14] Note, however, that the United Kingdom was composed of several regions with specific identities and secessionist groups in the past. Indeed, Ireland only achieved independence in 1921, but was part of the United Kingdom before that.

is that we created local identities even in the non-treated groups. Indeed, previous authors have shown that simply creating groups can induce some group loyalty.

We are aware that the experimental design reported here is a simplification of real-world separatist movements, and does not capture every aspect of the relationship between decentralisation and secession. Nevertheless, we believe that it captures some features of these movements and decentralisation. On the one hand, our design captures one aspect of the relationship between decentralisation and secession, namely how supplying public goods closer to the contributing subjects (i.e., at the local level) increases the confidence of voters that their interests are better represented and that free-riding is less prevalent. As in the theoretical literature, however, this comes at the cost of efficiency, since global public goods can benefit from economies of scale. On the other hand, our design does not capture the other aspect of the relationship between decentralisation and secession concerning the conflict over resources to wage secessionist struggles. However, by introducing reinforced local identities, we argued that our design should capture how the effect of decentralisation is not always identical, depending on the characteristics of the country. As argued by Ezgi (2009), decentralisation should be more effective when the grievances of the secessionist region are of a material nature, instead of symbolic. Given our inability to make conclusions, future research extensions could consider enriching the experimental design by, for instance, using a subject pool with pre-existing ethnic identities.

Finally, while we do acknowledge some shortcomings to our experimental design, this paper is one of the first to study secessions, and particularly the relationship between decentralisation and secessions, using experimental methods. Other possible extensions for future research include the introduction of regional disparities in endowments, to simulate the presence of natural resources or differences in income distributions. Future research could also consider refinements on the institutions, by using mechanisms other than voluntary contributions, for example.

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Appendix X: Instructions (translated from French)

The following instructions are for the Baseline treatment. We add the instructions that are specific to the Decentralization and Identity treatments in italics into brackets. The instructions for the sessions where we control for the order effect are identical to these instructions we only invert part 1 and part 2. The questionnaire used to form the groups in the Identity treatment is presented at the end of the instructions.

General information

We thank you for participating in this experiment in economics. Your payoffs depend on your decisions. It is therefore important that you read the following instructions carefully.

Instructions are distributed for your personal use. We thank you for not communicating with other participants during the experiment.

During the experiment, we will not talk about Euros but about ECU (Experimental Currency Units). All payoffs will be calculated in ECU. At the end of the experiment, the total number of ECU that you earned will be converted into Euros at the following conversion rate:

100 ECU = 0.45 Euro

In addition to this amount, you will receive a show up fee of 5 Euros. All payments will be made in private and in cash in a separate room. Other participants will never know the amount of your payoffs in this experiment.

Groups' formation

Before the start of the first part, the computer program will form randomly groups composed of 9 people. Each group of 9 people is composed of three sub-groups of 3 people.

A group of 9 people is called "global group" and a sub-group of 3 people a "local group". A global group thus comprises three local groups, A, B and C.

[Additional instructions for the Identity treatment:

Each local group of 3 people within a global group is formed according to the proximity of the answers given in a questionnaire that will appear on your screen. The questionnaire consists of four proposals. For each of them, we ask you to tell if you:

- Strongly disagree
- Disagree
- Agree
- Strongly agree

Once the questionnaire is completed by each participant the computer program will use an algorithm to form the local groups according to the proximity of the answers given to these different proposals.

Thus, you will be paired in your local group with two other people in the overall group of 9 that expressed the nearest opinion to yours. You will not know at any time the detailed answers of the other participants; likewise, no one will know the details of your answers.

The two other local groups are composed of participants whose views are less similar to yours but the name of the local group (A, B, C) is independent of the distance with the opinions of your local group (for example, if you are in Group A, the members of group C are not necessarily further from your opinions than the members of group B).

To sum up, each group of 9 people is composed of three sub-groups of 3 people. Groups of 9 people are randomly formed while the sub-groups of 3 are formed using the algorithm. *]*

Thus, you will be at the same time a member of a local group with 2 other people and a member of a global group that includes your local group and the 6 members of the two other local groups.

The following table illustrates the composition of a global group and its local groups.

Global group	Local group A	Local group B	Local group C
participant 1	participant 1		
participant 2	participant 2		
participant 3	participant 3		
participant 4		participant 4	
participant 5		participant 5	
participant 6		participant 6	
participant 7			participant 7
participant 8			participant 8
participant 9			participant 9

For example, one participant is a member of both the global group and the local group A.

The composition of each group will remain the same throughout the experiment. You will remain paired with the same co-participants in your local group and in your global group in all parts of the experiment. You will never know the identity of your co-participants and your co-participants will never know your identity. All decisions are anonymous.

Part 1

The first part consists of 12 periods during which you may allocate ECU between multiple accounts. Your payoff in this section is the sum of your earnings in each period.

<u>**Description of each period**</u>

At the beginning of each period, each participant receives 60 ECU. We call this sum the "endowment". You have to decide how to allocate this endowment between your private account and several public accounts.

You have the choice to allocate the ECU in three public accounts: **two global public accounts and one local public account**. *[This sentence is replaced by the following in the Decentralization treatment:* You have the choice to allocate the ECU in three public accounts: **one global public account and two local public accounts**.*]*

- The 9 members of the global group may allocate ECU to the global public account G1 and to the global public account G2. The amount of a global public account is the sum of the ECU allocated by you and the other 8 members of the global group to this account.
- Only the 3 members of your local group may allocate ECU to your local public account. The amount of your local public account is the sum of the ECU allocated by you and the two other members of your local group to this account.

Members of the two other local groups to which you do not belong also have their own local public account. The local group A can allocate ECU to the local public account A, the local group B may allocate ECU to the local public account B, and the local group C may allocate ECU to the local public account C.

Thus, you have to decide how much of your 60 ECU you keep on your private account and how much ECU you allocate to:

- The global public account G1 (between 0 and 60 ECU)

- The global public account G2 (between 0 and 60 ECU) *[In the Decentralization treatment this is replaced by:* Your local public account (A, B or C) (between 0 and 60 ECU).*]*

- Your local public account (A, B or C) (between 0 and 60 ECU).

You must enter a value in each box on your screen. The difference between your endowment 60 ECU and the sum of ECU allocated to each public account remains on your private account. The sum of your ECU allocated to these accounts, public and private, may not exceed 60 ECU.

You will make your decisions as in the screen shown in Figure 1. The consequences of your decisions are explained in detail on the next page.

Figure 1. Example of a decision screen

Once all group members have decided the amount they allocate to the three public accounts, you are informed of:

- The total amount allocated to each global public accounts by the 9 members of the global group (including your allocation) *[In the Decentralization treatment this is replaced by:* The total amount allocated to the global public account by the 9 members of the global group (including your allocation).*]*
- The total amount allocated to each global public accounts by the 3 members of your local group (including your allocation) *[In the Decentralization treatment this is replaced by:* The total amount allocated to the global public account by the 3 members of your local group.*]*
- The total amount allocated to your local public account by the 3 members of your local group (including your allocation). *[In the Decentralization treatment this is replaced by:* The total amount allocated to your local public accounts by the 3 members of your local group (including your allocation).*]*

Your screen will also remind you the amount of your allocation to the global public accounts and the local public account and the amount held on your private account. *[This sentence is replaced by the following in the Decentralization treatment:* Your screen will also remind you the amount of your allocation to the global public account and to the local public accounts and the amount held on your private account.*]* It also shows your gain in that period. You are not informed of the amounts allocated to local public accounts by the two other local groups.

Figure 2 reproduces the feedback screen at the end of a period.

Figure 2. Example of the feedback screen displayed at the end of a period.

Calculation of your payoff

The revenue drawn from a public account is different depending on whether it is a global public account or a local public account:

− The revenue drawn from each global public account represents 20% of the sum of the 9 individual allocations to this global public account, *[This sentence is replaced by the following in the Decentralization treatment:* The revenue drawn from the global public account represents 20% of the sum of the 9 individual allocations to the global public account, *]*

− The revenue drawn from the local public account represents 50% of the sum of the three individual allocations to the local public account. *[This sentence is replaced by the following in the Decentralization treatment:* The revenue drawn from each local public account represents 50% of the sum of the three individual allocations to this local public account.*]*

Your payoff at each period is calculated using the following formula (if you have difficulty understanding these formulas do not hesitate to ask questions):

Payoff in a period = Your endowment in ECU
        - Your allocation to the two global public accounts and the local public account
        + 20 % of the total number of ECU allocated to the global public account G1
        + 20 % of the total number of ECU allocated to the global public account G2 *[In the Decentralization treatment this sentence is replaced by:*
        + 50% of the total number of ECU allocated to your local public account (A, B or C)]*
        + 50% of the total number of ECU allocated to your local public account (A, B or C)

This formula shows that your payoff at the end of a period consists of two parts:

1) of the ECU that you have kept for yourself (namely your endowment - your allocation to the public accounts)

2) of the sum of the total revenues from both global public accounts and your local public account. *[This sentence is replaced by the following in the Decentralization treatment: of the sum of the total revenues from the global public account and your both local public accounts.]*

Here are some examples.

Example 1
Suppose that the sum of the allocations of the 3 members of a local group to their local public account is 90 ECU. Suppose also that the sum of the allocations of the 9 members of the global group is 70 ECU to the global public account 1 and 300 ECU to the global public account 2. In this case, the revenue from public accounts is:
50% (90) + 20% (70) + 20% (300) = 45 + 14 + 60 = 119 ECU
[This example is replaced by the following in the Decentralization treatment: Suppose that the sum of the allocations of the 3 members of a local group is 90 ECU to their local public account 1 and 70 ECU to their local public account 2. Suppose also that the sum of the allocations of the 9 members of the global group is 300 ECU to the global public account. In this case, the revenue from public accounts is:
50% (90) + 50% (70) + 20% (300) = 45 + 35 + 60 = 140 ECU]

Example 2
Suppose that the sum of the allocations of the 3 members of a local group to their local public account is 60 ECU. Suppose also that the sum of the allocations of the 9 members of the global group is 90 ECU to the global public account 1 and 50 ECU to the global public account 2. In this case, the revenue from public accounts is:
50% (60) + 20% (90) + 20% (50) = 30 + 18 + 10 = 58 ECU.
[This example is replaced by the following in the Decentralization treatment: Suppose that the sum of the allocations of the 3 members of a local group is 60 ECU to their local public account 1 and 90 ECU to their local public account 2. Suppose also that the sum of the allocations of the 9 members of the global group is 50 ECU to the global public account. In this case, the revenue from public accounts is:
50% (60) + 50% (90) + 20% (50) = 30 + 45 + 10 = 85 ECU.]

You always have the option to keep the ECU on your private account or to allocate them to a public account. Each ECU you keep on your private account increases your payoff in the current period by 1 ECU.

If you allocate 1 ECU to a public account, the total allocation of this public account increases by 1 ECU. In this case, your revenue increases by 50% × 1 = 0.5 ECU if it is a local public account and 20% × 1 = 0.2 ECU if it is a global public account. Your allocation to a public account also increases the revenue of other members:
  − If it is a local public account, the revenue of the two other members of your local group will also be increased by 0.5 ECU each. So, the total revenue of your local group from your local public account will be increased by 3 × 0.5 = 1.5 ECU.
  − If it is a global public account, the revenue of the eight other members of the global group will also be increased by 0.2 ECU each. So, the total revenue of the global group from the global public account is increased by 9 × 0.2 = 1.8 ECU.

Similarly, your income increases for each ECU allocated to a global public account by the other members of the group and for each ECU allocated to your local public account by the other members of your local group.

For each ECU allocated by another member of your local group or global group, you win 0.5 and 0.2 ECU respectively.

However, your income is not affected by the ECU allocated by members of other local groups to their local public account.

To sum up:

- You receive an endowment.
- You decide of your allocation to two global public accounts and one local public account. *[This sentence is replaced by the following in the Decentralization treatment:* You decide of your allocation to one global public account and two local public accounts.*]*
- You are informed of the amount of allocation to each global public account and local public account associated with your local group and your payoff. *[This sentence is replaced by the following in the Decentralization treatment:* You are informed of the amount of allocation to the global public account and to each local public account associated with your local group and your payoff.*]*

At the end of each period, a new period starts automatically. You receive a new endowment 60 ECU.

* * *

Please read again these instructions. If you have any question, raise your hand and we will answer to your questions in private. Thank you to fill out the understanding questionnaire that has been distributed. We will come to you to check your answers in private.

Part 2

(distributed after completion of Part 1 and the questionnaire)

The second part consists of 12 periods. Your payoff in this section is the sum of your earnings in each period. The composition of your local group and your global group is the same as in the previous part, but in this part you will only interact with the other two members of your local group.

Description of each period

The second part is similar to the first part: at the beginning of each period, each participant receives 60 ECU and has to decide how to allocate this endowment between his private account and three public accounts.

The only difference with the previous part is that the three public accounts are now **three local public accounts**.

Only three members of your local group may allocate ECU to your local public accounts. The amount of the local public accounts is the sum of the ECU allocated by you and the two other members of your local group to these accounts.

Members of the two other local groups to which you do not belong also have their own local public accounts. The local group A may allocate ECU to the local public accounts A1, A2 and A3; the local group B may allocate ECU to the local public accounts B1, B2 and B3; and the local group C may allocate ECU to the local public accounts C1, C2 and C3.

Thus, you need to decide how much of your 60 ECU you keep on your private account and how much you allocate to:

- Your local public account 1 (A, B or C) (between 0 and 60 ECU)
- Your local public account 2 (A, B or C) (between 0 and 60 ECU)
- Your local public account 3 (A, B or C) (between 0 and 60 ECU)

You must enter a value in each box displayed on your screen. The difference between your endowment 60 and the sum of the ECU allocated to each public account remains on your private account. The sum of all your ECU allocated to these accounts, public and private, may not exceed 60 ECU.

Once all group members have decided the amount they allocate to these three public accounts, you are informed of the total amount allocated to each of the three local public accounts by the 3 members of your local group (including your allocation).
Your screen will also remind you the amount of your allocation to each local public account and the amount held on your private account. It also shows your payoff in that period. You are not informed of the amounts allocated to local public accounts by the two other local groups.

Calculation of your payoff

The revenue drawn from each local public account represents 50% of the sum of the 3 individual allocations to this local public account.

Your payoff at each period is calculated using the following formula:

> Payoff in a period = Your endowment in ECU
> - Your allocation to the three local public accounts
> + 50% of the total number of ECU allocated to your local public account (A, B or C)
> + 50% of the total number of ECU allocated to your local public account (A, B or C)
> + 50% of the total number of ECU allocated to your local public account (A, B or C)

This formula shows that your payoff at the end of a period consists of two parts:

1) of the ECU that you have kept for yourself (namely your endowment - your allocation to the public accounts)
2) of the sum of the total revenues from your local public accounts.

As previously, each ECU you keep on your private account increases your earning in the current period by 1 ECU. If you allocate 1 ECU to a local public account, the total allocation of this public account increases by 1 ECU. In this case, your revenue increases by $50\% \times 1 = 0.5$ ECU. The revenue of two other members of your local group will also be increased by 0.5 ECU each. Thus, the total revenue of the local group from the local public account will be increased by $3 \times 0.5 = 1.5$ ECU.

Similarly, your income increases by 0.5 ECU for each ECU allocated to a local public account by other members of your local group. However, your income is not affected by the ECU allocated by members of other local groups to their local public accounts.

At the end of each period, a new period starts automatically. You will receive a new endowment of 60 ECU.

* * *

Please read again these instructions. If you have any question, raise your hand and we will answer to your questions in private.

Part 3

(distributed after completion of Part 2)

The third part consists of 12 periods. Your payoff in this section is the sum of your earnings in each period. The composition of your local group and your global group is the same as in the previous parts.

Choice of the available public accounts

Before the start of the first period, you have to vote to select the nature of the public accounts that will be available for the next 12 periods. You will vote only once in this part.

You can choose between two options:

– An option with a local public account and two global public accounts (as in part 1) *[This sentence is replaced by the following in the Decentralization treatment:* An option with two local public accounts and one global public account (as in part 1).*]*
– An option with three local public accounts (as in Part 2).

If the option with a local public account and two global public accounts is selected *[This sentence is replaced by the following in the Decentralization treatment:* **If the option with two local public accounts and one global public account is selected***]*, you will interact at the same time with the 2 other members of your local group and with the members of the other two local groups (i.e. with 8 other people).

If the option with three local public accounts is selected, you will only interact with the two other members of your local group.

Once all the members have voted, the computer program calculates the majority choice in each of the three local groups. The option that will be applied to the next 12 periods of the game is the one that was chosen by a **majority of three local groups** within your global group of 9 people.

Before the start of the first period, you are informed of the outcome of the vote in your local group and of the majority choice in the global group. You are not informed about the details of the votes in your local group nor in other groups.

<u>Description of each period</u>

You receive 60 ECU at the beginning of the period. According to the majority vote, you can allocate the ECU of your endowment either between your private account, a local public account and two global public accounts (according to the rules of Part 1) *[This sentence is replaced by the following in the Decentralization treatment:* you can allocate the ECU of your endowment either between your private account, two local public accounts and one global public account (according to the rules of Part 1)*]* or between your private account and three local public accounts (according to the rules of Part 2).

* * *

Please read again these instructions. If you have any question, raise your hand and we will answer to your questions in private.

Questionnaire for the groups' formation

Please read each statement very carefully and evaluate how much you agree or disagree with each one of them.

For each statement, give your answer by checking the box that best describes your opinion.

You can only choose one answer from the following options:

1. Strongly disagree;
2. Disagree;
3. Agreement;
4. Strongly agree.

Statement 1: I enjoy visiting museums of contemporary art.
Statement 2: Surrogate motherhood should be authorized.
Statement 3: I am willing to consume genetically modified food.
Statement 4: I love practicing sports.

The rest of the instructions is similar to the other treatments.