How does Altruism Enlarge a Climate Coalition?

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Abstract

This study examines the relationship between individual altruistic attitudes and the incentives of participating in a climate coalition by using a laboratory experiment. A dominant strategy solution design assigns players into two roles in the game: critical and non-critical players. The critical players have a weakly dominant strategy of joining and are essential to an effective coalition. On the other hand, the non-critical players have a dominant strategy of not-joining. The theory suggests that strong altruism would lead non-critical players to join a coalition. The experimental evidence supports that coalitions are therefore enlarged from the self-interest prediction. However, the result indicates that the individual incentives for participation seem to be negatively correlated with altruistic attitudes. It implies the stronger the altruistic tendencies the less likely individuals are to join a coalition. In other words, coalition formation may be expanded by egoistic players.

Keywords: International environmental agreement, social preference, altruism, experimental design

JEL code: C91; C92; H41; Q54;

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1. Introduction

International environmental agreements (IEAs) have been constructed to mitigate the greenhouse gas emissions that contribute to climate change. Since Barrett (1994), a large amount of literature (such as Barrett (2001), Bratberg, Tjøtta, and Øines (2005), Bahn et al. (2009), Breton, Sbragia, and Zaccour (2010), Finus and Rübbelke (2013)) has discussed this issue. Without any policy mechanism, the existing theoretical literature suggests that a large-scale IEA does not usually happen due to high levels of free riding. However, experimental studies (Willinger and Ziegelmeyer 2001, Kosfeld, Okada, and Riedl 2009, Burger and Kolstad 2010) suggests that high levels of cooperation do exist. They claim that people are far less likely to offer a free ride and more likely to cooperate than the Nash prediction suggests. Therefore, social (or other-regarding) preferences have been proposed by recent studies (such as Charness and Rabin (2002), Dannenberg et al. (2012), Vogt (2016), Lin (2017)), to address this knowledge gap.

Kosfeld, Okada, and Riedl (2009) discussed one of the major social preferences, inequality-averse preference, and claimed that the coalition size could be larger than a Nash equilibrium outcome. Grüning and Peters (2010) also agreed that, when the countries' preferences incorporate justice and fairness, countries' agreed abatement levels and level of cooperation both increase. In contrast to them, Kolstad (2014) argued that inequality-averse preferences could reduce the equilibrium size of a climate coalition. He claimed transfers among members is necessary to sustain cooperation. Lin (2017) also suggested that the coalition formation could be unstable due to individual inequality-averse attitudes. On the other hand, the inequity-averse preferences had poor performance in within-subject tests (Blanco, Engelmann, and Normann 2011). Dannenberg et al. (2012) also questioned that "seeing the uncertainties in real world social dilemmas, the applicability of the F&S (Fehr and Schmidt 1999) model beyond the lab is at least questionable."

This paper seeks to enrich the literature on IEAs by introducing individual altruistic attitudes. This is done for two reasons. Firstly, altruistic behaviours and high degrees of cooperation are rather commonly observed in public-good provision experiments Fischbacher (2007). Several recent studies of IEAs (e.g. McEvoy et al. (2014), van der Pol, Weikard, and van Ierland (2012)) examined altruism behaviour in a two-stage IEA game. They suggested a certain degree of altruism is sufficient to stabilise a grand coalition.

Secondly, previous experimental studies, including McEvoy et al. (2014) and Burger and Kolstad (2010), allowed multiple coalition combinations exist. Such design may lead subjects make same decisions because they faced the same payoffs. In other words, the discussion on social preferences was limited at the scope of coalitional formation, and the individual motivation has yet not been well explored. Hahn and Ritz (2014) examined strategic behaviours by assuming altruistic preferences may not directly reflect on the player's behaviour and membership status. In other words, a player can behave differently than his or her true preference. They hypothesised that a country usually behaves less altruistically than its true preference. Their conclusion argued that as a result of this observed behaviour it may be difficult to infer social preferences. However, neither argument has been supported by empirical or experimental evidence.

The following questions will be answered: Does individuals' altruistic attitudes affect their decisions on participating in a climate coalition? How do their altruistic attitudes influence the coalition formation?

This study examines the relationship of individual altruistic attitudes and incentives to cooperate by the theoretical prediction and the experimental evidences. A particular design was built by assigning players two roles in the membership game: *critical* and *non-critical* players: the critical players had a dominant strategy of joining and were essential to an effective coalition. By contrast, the non-critical players had a weakly dominant strategy of not-joining. With such design, this study could distinguish individual motivations on the participation.

The theory predicts that strong altruism could lead individuals to participate in a coalition and thereby enlarge the coalition. Experimental evidence confirms that the coalition scale could be enlarged. However, the individual altruistic attitude seems to be negatively correlated with the incentive for cooperation: this means counter-intuitively that a coalition is usually enlarged by egoists.

This study is structured as follows. Section 2 presents a model of altruistic preferences. Following this, an experiment is designed to test the theory. Section 4 reports the experimental outcomes and the data analyses. The final section presents the findings.

2. The Model

Considering N heterogeneous players playing a two-stage game, the first stage is a membership game: players decide whether or not joining a coalition. The second stage is an abatement game: players decide their abatement level based on their membership status. We solve the game by backward induction.

In the abatement game, the payoff function of a nonsignatory j is its benefits from total abatement minus its individual abatement costs.

$$\pi_j = \gamma_j X - x_j \tag{1}$$

where x_j[2] denotes the pollution abatement by player j, the marginal benefits[3] are ranked from high to low as $\gamma_1 > \gamma_2 > \cdots > \gamma_N$, and X is the total abatement from all players. The linear payoff function implies that countries either do no abatement or full abate. From (1), the optimal abatement of a nonsignatory j is no abatement and the payoff is the marginal benefit times the overall abatement from signatories.

By contrast, suppose that n players ($n \in [2, N]$) decide to join a coalition and choose a common abatement level to maximise their joint payoff, Π,

$$\Pi = \sum_{i=1}^{n} \pi_i = \sum_{i=1}^{n} (\gamma_i X - x_i) \tag{2}$$

From (2), signatories do full abate and an effective coalition is formed when their collective marginal benefit is more than the abatement cost. This mechanism also suggests a less unequal distribution of payoffs through transferring. The coalition members using transfers to equalise net payoffs between players may be an inferior assumption in studying IEAs. Because the cooperative coalition members decide a common abatement level and share the responsibility of maximising the coalition payoff, it is adequate to assume that the coalition payoff is equally shared by the members. In practice, members usually have equal voting rights in the international conventions. When the coalition payoff is equally shared, each signatory has the same payoff. Accordingly, the post-redistribution payoff for a signatory i is presented as $\pi_i = (\sum_{i=1}^{n} \gamma_i) - 1$.

We firstly consider a scenario when players are self-interested, a country's welfare function is its own payoff function. A stable n-member coalition exists when d'Aspremont et al. (1983)'s internal and external constraints are satisfied.

$$U_i(n) \geq U_j(n-1) \tag{3}$$

The internal constraint (3) requires all signatories have no incentive to leave the coalition. In other words, the coalition size should be large enough to form an effective coalition which requires the collective marginal benefit of members being greater than the standard cost. When any signatory quits, the coalition collapse and all players gain nothing. Hence the internal constraint is written as $\sum_{i=1}^{n} \gamma_i - 1 > 0$.

$$U_j(n) \geq U_i(n+1) \tag{4}$$

On the other hand, the external constraint makes all nonsignatories, even the

2 To simplify, we assume $x_k \in [0,1]$ that the individual abatement is standardised between two choices: 0 (full pollute) and 1 (full abate).

3 All players' marginal benefits are in the range of 0 and 1.

one with the lowest free-riding benefit, have no incentive to be the $(n+1)$-th member in the coalition. The external constraint can be presented as $n\gamma_j \geq \sum_{i=1}^{n} \gamma_i + \gamma_j - 1$.

In order to have a clear observation on individual decisions, Lin (2017) suggested a dominant strategy equilibrium condition[4]

$$1 + \gamma_n \quad > \sum_{i=1}^{N} \gamma_i \tag{5}$$

When both constraints and the condition are satisfied, there exists only one stable coalition. Such setting categorises countries into two groups: the dominant strategy of *critical players* is joining an effective coalition and the dominant strategy of *non-critical players* is not to join an effective coalition. This condition implies that any critical country cannot be replaced by all of the non-critical countries. The condition ensured that the coalition formation is the only stable effective coalition. While we acknowledge this is indeed a strong condition, in order to have better observation of the individual decisions in the membership game, this setting provides a purified environment in the following experiment.

Following, we consider another scenario with altruistic players. Altruistic decision makers not only concern about their own payoff but also other participants' payoffs. Following Hahn and Ritz (2014), a player k faces the following welfare function

$$U_k = \pi_k + \theta_k \sum_{k' \neq k} \pi_{k'} \tag{6}$$

where θ_k denotes altruistic attitude of k, π_k is the payoff of k, and k' is any other player except k. The altruistic attitude parameter, $\theta_k \in [0,1]$, implies a concern about the payoffs of others. From formula (6), we have learnt that the welfare of k is positively correlated with its altruistic attitude. Moreover, welfare is also positively correlated with the payoffs of others. This welfare function includes k's own payoff and k's altruistic attitude toward the others' payoffs.

Turning now to discuss the constraints of stable coalitions, the internal constraint (3) compares a signatory i's welfare and the potential welfare of being a nonsignatory. The welfare of being a signatory, $(\sum_{i=1}^{n} \gamma_i - 1) + \theta_i \left[(n-1)(\sum_{i=1}^{n} \gamma_i - 1) + \sum_{j=n+1}^{N} n\gamma_j\right]$, is higher than individual's own payoff when altruism is considered. But the potential welfare of turning into a nonsignatory remains zero due to no payoff from a collapsed coalition. Hence the internal constraint still holds. By contrast, the external constraint (4) compares a

[4] The internal and external constraints help us to find stable coalitions, but multiple coalition combinations may happen. Hence individual decisions may not be predictable with only two constraints.

nonsignatory j's welfare and the potential welfare of being a signatory. The welfare of nonsignatory j's is $(n\gamma_j) + \theta_j\left[n(\sum_{i=1}^{n}\gamma_i - 1) + \left(\sum_{j'\neq j} n\gamma_{j'}\right)\right]$ and the potential welfare of turning into a signatory is $\left(\sum_{i=1}^{n}\gamma_i + \gamma_j - 1\right) + \theta_j\left[n\left(\sum_{i=1}^{n}\gamma_i + \gamma_j - 1\right) + \sum_{j'}(n+1)\gamma_{j'}\right]$. When altruistic attitude parameter is positive, the external constraint may be violated. The violated constraint is because when the player becomes the $(n+1)$-th member in the coalition, the spillover effects upon all other players enhance the welfare of the player. This implies that the becoming a signatory leads higher welfare from others, compared to being a nonsignatory. Therefore, if the internal constraint holds and the external constraint is violated, the altruistic attitudes could lead to a larger coalition than the outcome with self-interest.

3. Experiment Design

The experiment was conducted at the centre for Experimental Economics laboratory at the University of York in 2013 and programmed with z-Tree (Fischbacher 2007). Fifty students were invited through the Online Recruitment System for Economic Experiments (Greiner 2004). They were diverse in ethnicity, nation, and study major. This sample group mimics the diversity in the real world where international policy makers and multidisciplinary knowledge are present. Their political orientation and the level of belief in a religion were gathered as well. However, any content related to environmental issues had been excluded from the instructions to avoid biases due to subjects' attitudes towards the environment.

Appendix 1 shows the experiment instructions. The experiment contains two parts. The first part examined their individual altruistic attitudes. The second part assessed their motivation a public good game. The design took place as follows.

3.1 Altruism test

The altruism test is a dictator game developed from Andreoni and Miller (2002) and Bettinger and Slonim (2006) experiments. Subjects were anonymously and randomly paired with each other to make 20 '*keep*' or '*give*' decisions. In each round, each was given 1 token and decided whether to give it to their partners. They did not know whether or not to receive from their partners until the end of the session.

The token means different monetary values for keeping and giving (z_1 and z_2 respectively). In order to capture indicate the subject's altruistic attitude (θ), the ratio of keeping to giving values (z_1/z_2) was designed from 1 to 0.05 in 20 rounds. If players are self-interested and rational, this test has a dominant strategy that they shall always keep the token. In other words, they are altruism when they do not follow the dominant strategy. The more frequent a subject gave the token means the subject was more altruistic.

3.2 Membership Game

As discussed in Section 2, signatories do full abate to form an effective coalition whilst nonsignatories do full pollute and free ride in the abatement game. Thus this experiment collapsed the two stages game into a single stage membership game: subjects only decide whether or not to join a coalition. Depending on their membership status, signatories do full abate whilst nonsignatories do full pollute.

Having mentioned earlier, the feature of unique equilibrium coalition could offer a better observation on individual behaviour. Subjects were randomly assigned to groups of 5 persons for the whole session in anonymity[5]. Under the assumption of self-interest, with the constraints (3), (4) and condition (5), eight treatments were built for the stable coalitions. The stable coalition size in each treatment was either 2, 3 or 4.

Subjects were given a payoff table which contains all 26 possible coalition combinations and their correspondent payoffs. Depended on their membership status and the coalition formation, their corresponding payoffs are different but in the range of £0 and £24. Everyone was asked repeatedly to make a decision on the membership status for 4 different treatments in 60 rounds. In the end of each round, their payoffs and the coalition formation would be revealed to everyone.

4. Results and Analyses

Table 1 shows the token's values for keeping and giving and the number of subjects decided to give. In this altruism test, it is perhaps unsurprising that subjects all chose the dominant strategy to keep his/her tokens in the first round. However, when the ratio of keeping to giving values becomes smaller, more and more subjects would give their tokens away. In the final round, nearly 60% of subjects gave up the token for £0.5 to allow a stranger to earn £10. This result implies that more than half of the subjects had positive altruistic attitudes.

[5] Subjects did not have the information about which role they were assigned and the stable coalition size.

Table 1. The token's values for keeping (z_1), giving (z_2), the ratio of keeping to giving and the number of subjects decided to give

Round	1	2	3	4	5	6	7	8	9	10
z_1	£1	£10	£7.5	£5	£2.5	£7.5	£5	£0.5	£5	£2.5
z_2	£1	£10.5	£8	£5.5	£3	£10	£7.5	£1	£10.5	£5.5
z_1/z_2	1	0.95	0.94	0.91	0.83	0.75	0.67	0.5	0.48	0.46
Number of Giving	0	3	7	7	8	8	8	20	14	9

Round	11	12	13	14	15	16	17	18	19	20
z_1	£1	£2.5	£2.5	£0.5	£1	£1	£0.5	£1	£0.5	£0.5
z_2	£2.5	£7.5	£10	£2.5	£5.5	£7.5	£5	£10.5	£7.5	£10
z_1/z_2	0.4	0.33	0.25	0.2	0.18	0.13	0.1	0.095	0.07	0.05
Number of Giving	17	15	17	23	18	18	24	21	25	29

In general, an increasing trend is noticed that subjects became altruistic when the token was more valuable to receivers than to givers. However, there were multiple switching points when the value of keeping to giving decreases. This implies that the value to the giver was an important factor in a subjects' decision-making. When the opportunity of giving was small (e.g. rounds 8, 14, and 17), subjects were more likely to behave altruistically by giving it up.

Regarding the effects of subjects' personal characteristics, the results of one-way analysis of variance show that the effects of age, field of study, and ethnicity groups were insignificant with respect to subjects' altruistic attitudes. Table 2 reports the ordinary least square (OLS) estimation of altruistic preference. The dependent variable is the number of times giving the token. Independent variables are the subject's age, political attitude (from left-wing as 1 to right-wing as 5), and religious attitude (from atheism as 1 to religionist as 5). Religious attitude is positively correlated to the altruistic attitude at a 10% significance level, whilst no significant relationship between altruistic attitudes and other factors include age and political attitudes. The result suggests that the subjects who identified themselves as religionists behaved altruistically in this anonymous altruism test.

Table.2. OLS Regression Estimation of Altruistic Attitudes (Times of Giving the Token)

Variable	OLS		
Constant term	203.35 (403.35)		
Age	-0.1 (.20)		
Political attitude	-0.69 (1.01)		
Religious attitude	1.19 $*$ (.63)		
Adjusted R Square	0.012	R-squared	0.07
Total Observation	50		
Note: Each cell contains coefficient and standard error in parenthesis, $*$ means 10% significant level			

Turning now to the membership game, subjects became less cooperative when they learned about the decisions of others. In the first round, when they did not know each other's decisions, more than 90% of 110 critical observations and 60% of 90 non-critical observations decide to join. Compared to other observations, the level of cooperation was higher when they had not learned the historic data. When they knew the historical records of decisions, only 85% of 1,540 critical observations and 46% of 1,260 non-critical observations decided to join. This result shows that subjects were cooperative if they did not learn other players' decisions. In particular, when they were non-critical players, more than half of the observations were cooperative. But their behaviour changed when they learnt from the historical data.

With the unique equilibrium setting, the coalition formation is one of the key discussions in this study. It is worth noting that coalitions are usually unstable as in the findings of Burger and Kolstad (2010) and other literature. The result rejects the hypothesis that public good decisions were motivated by self-interest. In other words, the coalition formation could be influenced by individual social preferences.

To have a better understanding of the individual decisions in the membership game, the observations are examined by binary regressions in Table 3. The variables are the individual's decision made in the former round (past decision), a dummy variable which indicates the role of critical player as 1 whilst that of non-critical player is 0 (player role), the times of *giving* in the altruism test (altruistic attitude), the year of birth (age), political attitudes (from left-wing as 1 to right-wing as 5), religiosity (from atheism as 1 to religionist as 5), and the marginal benefit from the total contribution (marginal benefit) and the total coalitional in the former round (past contribution). Decisions were made by 50 subjects in 56 rounds; hence there are 2,800 observations from the membership game[6].

Table 3. Binary Estimations of Probability of Joining a Coalition

Variable	Binary(1)	Binary(2)	Binary(3)	Binary(4)	Binary(5)
Constant	−8.53 (22.45)	−9.67 (16.96)	1.83 (0.10)	0.34 (15.89)	−0.03 (0.07)
Past Decision	1.85 *** (0.11)	1.23 *** (0.12)		0.98 *** (0.08)	
Player role	1.98 *** (0.20)				
Altruistic attitude	−0.01 (0.01)	0.17 (0.14)	−0.01 (0.01)	−0.01 (0.14)	−0.02 ** (0.01)
Age	0.004 (0.01)	0.01 (0.01)		−0.00 (0.008)	
Political attitude	0.07 (0.06)	−0.11 ** (0.05)		0.16 *** (0.04)	
Religious attitude	−.061 * (0.04)	0.01 (0.03)		−0.10 *** (0.03)	
Marginal benefit	−2.02 *** (0.62)	−0.75 *** (0.25)		−5.21 *** (1.03)	
Past contribution	−0.09 (0.19)	−0.11 (0.18)		−0.14 (0.14)	
Total Observation	2800	1540	1650	1260	1350
Decision of Joining	1884	1308	1410	576	629
Log likelihood	−1321.26	−565.87	−683.96	−737.33	−930.17

Note: Each cell contains coefficient and standard error in parenthesis. *, **, *** mean significant at 10%, 5%, and 1% respectively.

Binary(1) examines all factors through 2,800 observations. The subjects decide to join the coalition 1884 times. The factors for decisions in the former round and the player role have a significant positive effect on the decision. This is intuitive, and means that subjects were usually consistent with the decisions they made before and usually pursue higher payoffs. On the other hand, the factors of marginal benefit and religious attitude have a significantly negative impact. An

[6] When the decisions in the former round are considered, the first round observations of treatments are not included. Hence, we have 2,800 observations for the regression estimations.

intuitive explanation is that subjects were less likely to cooperate when the free-riding benefit was high. In addition, the religionists were less cooperatively in the coalition game. This result contradicts the earlier result in the altruism test and requires more attention to detail.

Since subjects were given two roles in the game, the analyses examine individual social preferences and decisions separately. Binary(3) and Binary(5) use 1,650 and 1,350 observations include the first round data to examine the relationship between individual altruistic attitudes and the decisions of critical and non-critical players respectively. Surprisingly, at the 5% significance level, the lower altruistic attitude would lead a non-critical subject to participate in a coalition. This result is in contrast to our intuition.

In order to understand this surprising result, a full consideration with all possible factors is required. Binary(2) and Binary(4) examine critical players with 1,540 and non-critical players with 1,260 observations respectively. Binary(2) suggests that, when subjects were critical, the internal constraint was violated by 15% of the observations. The result shows that the decisions of critical players were affected by their past decisions, marginal benefit and political preference. As mentioned earlier, the coalition members share the collective payoff equally, members face the same collective marginal benefits rather than individual marginal benefits. Having said that, the design in this study implies that the higher marginal benefit critical players have, the less number of critical players required to an effective coalition. In other words, critical players were less likely to cooperate when they were small number. In addition, the result also suggests that left-wing critical players were more likely to obey the internal constraint by joining a coalition.

Binary(4) suggests that, when subjects were non-critical to the coalition, the external constraint was violated in about 55% of the observations. Political attitude is significantly positive to participation as left-wingers were more likely to follow the constraint by not joining a coalition. Comparing this with the result of Binary (2), it seems that left-wing non-critical subjects attempted to pursue higher payoffs. This interesting result might imply something about the core of environmental policies of left-wing parties. Due to the sample constraint, the implication cannot be extended but remains an interesting point for further studies. Regarding the religious attitudes, non-critical religionists are less likely to join a coalition. It implies that a lower religious attitude leads to a stronger motivation to participate.

5. Conclusions

This study investigates the impact of individual altruistic attitudes on the willingness to participate in a climate coalition. The theoretical result suggests that the coalition formation could be enlarged by the participation of altruists. The unique equilibrium design is one of the main characteristics of this study used to investigate individual motivation by assigning players two dominant strategies.

The experimental results confirm the existence of altruism among 60% of the subjects. The altruistic attitudes are significantly correlated to religious attitudes, such that a stronger belief leads to a higher altruistic attitude. Following, the result in the membership game indicates that the coalition size was usually larger than the self-interest prediction. The incentives for participating in a coalition were examined by the binary estimations.

This study provides several intuitive implications: subjects had consistent logic and pursue higher payoffs. Usually, subjects followed the weakly dominant strategies when they were critical to the coalition. When they became non-critical, higher altruistic attitudes would lead to lower incentives of joining a coalition. It implies that one-way altruistic subjects had less motivation to give up the free-riding benefit in the interactive game. The coalition formation, on the contrary, was more likely to be expanded by the egoists. The result implies that decision makers are not self-interested in the international convention. However, the decision process is too complicated to be captured by one-way social preferences. Altruists might expect reciprocation in the interactive game.

Moreover, the subjects' preferences significantly affect their decisions. The left-wingers were more likely to cooperate if they were critical and disobliging when they were non-critical. This interesting result implies that they had less motivation to give up the free-riding benefit by joining a coalition. Another important aspect of self-awareness is that religionists were less likely to join a coalition. Particularly when subjects were non-critical players, a higher religious attitude leaded to a weaker motivation to participate. Subjects with a stronger religious belief behaved altruistically. However, this does not mean that a higher religious attitude would lead to an altruistic decision in the interactive game.

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Appendix 1. Experiment Instructions

Please read the following instructions carefully.

You will have the guaranteed show-up fee £3. On top of that, you may – depending on your decisions and the decisions of others – earn more. There are three Parts in this experiment; in each Part there are several Rounds. The payoffs in each Round are independent: which means that the payoff in any one Round does not affect your payoffs in the following Rounds. At the end of each Part, a particular Round will be randomly selected and that will determine your payoff from that Part. Your total payment for this experiment is the sum-up your payoffs from these 3 Parts, plus the possible payoff from your partner in Parts 1 and 2. You will be paid in cash at the end of the experiment.

These Instructions are for your information. All subjects have identical Instructions. The experiment is anonymous. Please do not communicate with other participants during the experiment. If you have any questions, please let the experimenter know and he will answer you privately. We fear that if you violate this rule, we will have to exclude you from further participation in the experiment.

Before starting the experiment, please answer the following questions:

- your user number, which is on the top of your monitor
- your major (Business, Economics, Humanities, Science, Laws, Engineering, Psychology, Others, pick up the one you belong to)
- your gender (male or female)
- the year you were born (in 4-digit format, e.g. 1980)
- your ethnicity (White, Mixed/multiple ethnic group, Asian/Asian British, Black/African/Caribbean/Black British, Other ethnic group)
- what level do you consider yourself as a religionist? (from 0 is *no religion* to 5 is *religionist*)
- what is your political preference? (0 is *left*, 1 is *centre-left*, 3 is *neutral*, 4 is *centre-right* and 5 is *right*)

The information will be kept confidential and used only in this study.

After answering the questions above, please click the "Start" button on your screen to proceed to the next stage of the experiment.

Part 1

This is a decision problem. Your partner is reshuffled. He or she may be different to your partner in Part 1. Your identity and decisions will remain anonymous and confidential. There will be 20 *rounds* in this Part, preceded by a **trial round** for you to familiarise yourself with the game. In each round you will be asked to take a simple decision. Your payoff for this Part will depend upon your decision in a randomly chosen one of the 20 real rounds.

You are given 1 ‘token’ to share with your partner. There are 2 options for you to choose.

- In Option 1, you keep the token.
- In Option 2, you give the token to the partner.

The value of the token to you and to your partner may differ, and are different in different rounds. There is an example of the decision problem on the screen.

In each round, you will be given 30 seconds to make your decision. Your decision will be counted as Option 2 if you do not take a decision in these 30 seconds. At the end of Part 2, one of the 20 real rounds will be randomly chosen to determine your payment and that of your partner. The money you get from both your and your partner's decisions in this round will be paid to you at the end of the experiment.

Control Questions

The following questions are designed to help your understanding of the experiment.
Q1) Does the decision in one Round affect the decision in another Round?
Q2) Does the partner know your decision?
Given that the value of the token is 50p for you and £1 for your partner.
Q3) How much you get if you choose Option 1?
Q4) How much you get if you choose Option 2?

Part 2

This Part is different from Parts 1 and 2, in that you are now in a Group with **4** other players in this room. Your identity and decisions will remain anonymous and confidential. You will be indicated as a particular player in the Group, such as 'Player 1', 'Player 2' and so on. You will remain in this role in the same Group in Part 3. Your payoff depends on the combination of your and other 4 players' decisions.

Your payoff for this Part will depend upon your decision in a randomly chosen one of the 60 real rounds. The whole session will take about 50 minutes.

In each round of this Part, you and each of the other 4 players in you Group have simply to decide, simultaneously and independently, whether or not to *join a coalition* with the other players. If you decide to join, please click 'YES'. If you decide not to join, please click 'NO'. If 2 or more players in your Group decide to join a coalition, then a coalition is said to be formed. If no-one decides to join, or if only 1 decides to join, then a coalition is *not* formed. If a coalition is not formed, everyone gets nothing.

There follows a sample payoff table, in which 'IN' means that the player has chosen to join the coalition and 'OUT' means that they have not.

- For the Trial Round and Rounds 1 to 15, please read Table 1.
- For Rounds 16 to 30, please read Table 2.
- For Rounds 31 to 45, please read Table 3.
- For Rounds 46 to 60, please read Table 4.

No one will know the decisions of the other players in the Group until all have made their decisions. When all have done so, all will be told the payoffs and decisions of all the players in the Group. Your decision has to be made within 180 seconds; otherwise the system will count your decision as that of 'not joining'.

Control Questions

The following questions are designed to help your understanding of the experiment.

Q1) Does the decision in one Round affect the decision in another Round?

Q2) In any Round do you know who has decided to join your Coalition before you take your decision?

Suppose that you are Player 3 in the Sample Table below.

Sample Payoff Table									
PLAYER 1		PLAYER 2		PLAYER 3		PLAYER 4		PLAYER 5	
IN	5.25	IN	5.25	IN	5.25	OUT	9	OUT	6.75
IN	4.5	IN	4.5	OUT	11.25	IN	4.5	OUT	6.75
IN	0	OUT	0	IN	0	IN	0	OUT	0
OUT	0	IN	0	IN	0	IN	0	OUT	0
IN	1.5	IN	1.5	OUT	7.5	OUT	6	OUT	4.5
IN	0	OUT	0	OUT	0	OUT	0	IN	0
OUT	0	IN	0	OUT	0	OUT	0	IN	0
OUT	0	OUT	0	IN	0	OUT	0	IN	0
OUT	0	OUT	0	OUT	0	IN	0	IN	0

Q3) Given the payoff table, Players 1 and 2 decide to join, and Player 4 and 5 decide not to join. How much you get if you choose 'YES'? (Note: Given you are Player 3)

Q4) Given the payoff table, Players 4 decides to join, and Player 1, 2 and 5 decide not to join. How much you get if you choose 'NO'? (Note: Given you are Player 3)

Table 1. Payoff Table in Trial Round and Rounds 1 to 15									
PLAYER 1		PLAYER 2		PLAYER 3		PLAYER 4		PLAYER 5	
IN	10.5	IN	10.5	IN	10.5	IN	10.5	IN	10.5
IN	8.25	IN	8.25	IN	8.25	IN	8.25	OUT	9
IN	7.5	IN	7.5	IN	7.5	OUT	12	IN	7.5
IN	6.75	IN	6.75	OUT	15	IN	6.75	IN	6.75
IN	0	OUT	0	IN	0	IN	0	IN	0
OUT	0	IN	0	IN	0	IN	0	IN	0
IN	5.25	IN	5.25	IN	5.25	OUT	9	OUT	6.75
IN	4.5	IN	4.5	OUT	11.25	IN	4.5	OUT	6.75
IN	0	OUT	0	IN	0	IN	0	OUT	0
OUT	0	IN	0	IN	0	IN	0	OUT	0
IN	3.75	IN	3.75	OUT	11.25	OUT	9	IN	3.75
IN	0	OUT	0	IN	0	OUT	0	IN	0
OUT	0	IN	0	IN	0	OUT	0	IN	0
IN	0	OUT	0	OUT	0	IN	0	IN	0
OUT	0	IN	0	OUT	0	IN	0	IN	0
OUT	0	OUT	0	IN	0	IN	0	IN	0
IN	1.5	IN	1.5	OUT	7.5	OUT	6	OUT	4.5
IN	0	OUT	0	IN	0	OUT	0	OUT	0
OUT	0	IN	0	IN	0	OUT	0	OUT	0
IN	0	OUT	0	OUT	0	IN	0	OUT	0
OUT	0	IN	0	OUT	0	IN	0	OUT	0
OUT	0	OUT	0	IN	0	IN	0	OUT	0
IN	0	OUT	0	OUT	0	OUT	0	IN	0
OUT	0	IN	0	OUT	0	OUT	0	IN	0
OUT	0	OUT	0	IN	0	OUT	0	IN	0
OUT	0	OUT	0	OUT	0	IN	0	IN	0
Every player gets "0 " for any other combination									

Table 2. Payoff Table in Rounds 16 to 30									
PLAYER 1		PLAYER 2		PLAYER 3		PLAYER 4		PLAYER 5	
IN	6	IN	6	IN	6	IN	6	IN	6
IN	4.5	IN	4.5	IN	4.5	IN	4.5	OUT	6
IN	3	IN	3	IN	3	OUT	12	IN	3
IN	0	IN	0	OUT	0	IN	0	IN	0
IN	0	OUT	0	IN	0	IN	0	IN	0
OUT	0	IN	0	IN	0	IN	0	IN	0
IN	1.5	IN	1.5	IN	1.5	OUT	9	OUT	4.5
IN	0	IN	0	OUT	0	IN	0	OUT	0
IN	0	OUT	0	IN	0	IN	0	OUT	0
OUT	0	IN	0	IN	0	IN	0	OUT	0
IN	0	IN	0	OUT	0	OUT	0	IN	0
IN	0	OUT	0	IN	0	OUT	0	IN	0
OUT	0	IN	0	IN	0	OUT	0	IN	0
IN	0	OUT	0	OUT	0	IN	0	IN	0
OUT	0	IN	0	OUT	0	IN	0	IN	0
OUT	0	OUT	0	IN	0	IN	0	IN	0
IN	0	IN	0	OUT	0	OUT	0	OUT	0
IN	0	OUT	0	IN	0	OUT	0	OUT	0
OUT	0	IN	0	IN	0	OUT	0	OUT	0
IN	0	OUT	0	OUT	0	IN	0	OUT	0
OUT	0	IN	0	OUT	0	IN	0	OUT	0
OUT	0	OUT	0	IN	0	IN	0	OUT	0
IN	0	OUT	0	OUT	0	OUT	0	IN	0
OUT	0	IN	0	OUT	0	OUT	0	IN	0
OUT	0	OUT	0	IN	0	OUT	0	IN	0
OUT	0	OUT	0	OUT	0	IN	0	IN	0
Every player gets “0 ” for any other combination									

Table 3. Payoff Table in Rounds 31 to 45									
PLAYER 1		PLAYER 2		PLAYER 3		PLAYER 4		PLAYER 5	
IN	12.75	IN	12.75	IN	12.75	IN	12.75	IN	12.75
IN	10.5	IN	10.5	IN	10.5	IN	10.5	OUT	9
IN	9.75	IN	9.75	IN	9.75	OUT	12	IN	9.75
IN	6.75	IN	6.75	OUT	24	IN	6.75	IN	6.75
IN	0	OUT	0	IN	0	IN	0	IN	0
OUT	0	IN	0	IN	0	IN	0	IN	0
IN	7.5	IN	7.5	IN	7.5	OUT	9	OUT	6.75
IN	4.5	IN	4.5	OUT	18	IN	4.5	OUT	6.75
IN	0	OUT	0	IN	0	IN	0	OUT	0
OUT	0	IN	0	IN	0	IN	0	OUT	0
IN	3.75	IN	3.75	OUT	18	OUT	9	IN	3.75
IN	0	OUT	0	IN	0	OUT	0	IN	0
OUT	0	IN	0	IN	0	OUT	0	IN	0
IN	0	OUT	0	OUT	0	IN	0	IN	0
OUT	0	IN	0	OUT	0	IN	0	IN	0
OUT	0	OUT	0	IN	0	IN	0	IN	0
IN	1.5	IN	1.5	OUT	12	OUT	6	OUT	4.5
IN	0	OUT	0	IN	0	OUT	0	OUT	0
OUT	0	IN	0	IN	0	OUT	0	OUT	0
IN	0	OUT	0	OUT	0	IN	0	OUT	0
OUT	0	IN	0	OUT	0	IN	0	OUT	0
OUT	0	OUT	0	IN	0	IN	0	OUT	0
IN	0	OUT	0	OUT	0	OUT	0	IN	0
OUT	0	IN	0	OUT	0	OUT	0	IN	0
OUT	0	OUT	0	IN	0	OUT	0	IN	0
OUT	0	OUT	0	OUT	0	IN	0	IN	0
Every player gets "0 " for any other combination									

Table 4. Payoff Table in Rounds 46 to 60									
PLAYER 1		**PLAYER 2**		**PLAYER 3**		**PLAYER 4**		**PLAYER 5**	
IN	3	IN	3	IN	3	IN	3	IN	3
IN	1.5	IN	1.5	IN	1.5	IN	1.5	OUT	6
IN	0	IN	0	IN	0	OUT	0	IN	0
IN	0	IN	0	OUT	0	IN	0	IN	0
IN	0	OUT	0	IN	0	IN	0	IN	0
OUT	0	IN	0	IN	0	IN	0	IN	0
IN	0	IN	0	IN	0	OUT	0	OUT	0
IN	0	IN	0	OUT	0	IN	0	OUT	0
IN	0	OUT	0	IN	0	IN	0	OUT	0
OUT	0	IN	0	IN	0	IN	0	OUT	0
IN	0	IN	0	OUT	0	OUT	0	IN	0
IN	0	OUT	0	IN	0	OUT	0	IN	0
OUT	0	IN	0	IN	0	OUT	0	IN	0
IN	0	OUT	0	OUT	0	IN	0	IN	0
OUT	0	IN	0	OUT	0	IN	0	IN	0
OUT	0	OUT	0	IN	0	IN	0	IN	0
IN	0	IN	0	OUT	0	OUT	0	OUT	0
IN	0	OUT	0	IN	0	OUT	0	OUT	0
OUT	0	IN	0	IN	0	OUT	0	OUT	0
IN	0	OUT	0	OUT	0	IN	0	OUT	0
OUT	0	IN	0	OUT	0	IN	0	OUT	0
OUT	0	OUT	0	IN	0	IN	0	OUT	0
IN	0	OUT	0	OUT	0	OUT	0	IN	0
OUT	0	IN	0	OUT	0	OUT	0	IN	0
OUT	0	OUT	0	IN	0	OUT	0	IN	0
OUT	0	OUT	0	OUT	0	IN	0	IN	0
Every player gets "0 " for any other combination									