# The Impact of Group Identity on Coalition Building

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## Abstract

Bargaining and coalition building is a central part of modern politics. Typically, game-theoretic models cannot predict a unique equilibrium. One possibility is that coalitions are formed on the basis of social identity —loyalty to, say, a gender or ethnic group. We test this by measuring the effect of gender, race and ideological distances, using a randomized lab experiment. As a complement to previous research, this experiment uses the participants natural social–identity characteristics and allows the individual to choose whether to use it as a relevant feature to form coalitions (or not). Empirical analysis on the decisions made in the Baron and Ferejohn model indicate a significant and robust impact of ideology on who is selected as partner and the amounts offered to other group–members. From this we conclude that social identity considerations can determine equilibria in coalition formation.

***Keywords***— Laboratory Experiments, Baron and Ferejohn Model, Legislative Bargaining, Social Identity

1

## Introduction

Coalitions constitute an integral part of modern politics. They play a fundamental role in government formation as well as enactment of legislation, and more generally form the basis under which negotiations, of any kind, take place. Thus, the game theoretic literature on coalition building not surprisingly is large. One of the problems of purely 'office seeking' models which predict minimal/minimum winning coalitions (von Neumann and Morgenstern, 1953; Gamson, 1961; Riker, 1962; Baron and Ferejohn, 1989, among others) is that multiple equilibria are endemic. Therefore such models have low predictive power over what coalitions will emerge. The main alternative to these models are 'policy–seeking' models, that include pay-offs linked to the policy outputs the coalition would potentially enact (Axelrod, 1970; de Swann, 1973; Austen-Smith and Banks, 1988; Baron and Diermeier, 2001, among others). This, however, comes at a cost of added complexity, beliefs about policy commitments, assumptions about the divisibility between office and policy benefits, intractability in more than three-player games, dealing with an $n$-dimensional policy space and/or multiplicity of equilibria (cf. McKelvey and Schofield, 1986; Laver and Schofield, 1990; Laver and Budge, 1992; Laver, 1997; Bandyopadhyay and Chatterjee, 2006).

An alternative approach is to introduce ideas from psychology to 'office seeking' models and use that information to select among potential coalitions. If actors care about who they are forming a coalition with, was well as getting into office, information that is irrelevant to the material pay-off structure of the negotiation – such as the identity of participants – may nevertheless affect outcomes. Thus, information about actors' social identity can better help us predict which groups form majorities, without making assumptions about post-agreement outputs. We show this in a controlled lab experiment.

Our laboratory experiment uses the structure of the Baron and Ferejohn (1989) model of legislative bargaining to test the effect of naturally occurring social identity characteristics – gender, race and political ideology – on coalition building behavior and to identify intrinsic human biases in coalition formation. The gender and race treatments were included because they represent classical social-identity traits. Also, there is observational evidence suggesting that for instance, in the United States, Women, Latino and African American legislators behave different from white males and have unequal probabilities of getting legislation approved (Barrett, 1997; Bratton, 2006). Ideological self-placement, on the other hand, is a prominent aspect of politics, yet, has the advantage of a lower social-desirability bias, as people are not ashamed to discriminate against political out-groups. Furthermore, real political bargaining is between parties which are indeed ideologically

distinct and, even if party leaders are purely office-seeking, they must cater to their selectorate, who hold more extreme ideological positions (May's Rule) and may have strong group-based emotions (May, 1973; Laver, 1997, among many others). With the exception of Tremewan (Working Paper), who uses exogenous stimuli to induce group identity following the example of Chen and Li (2009), there is no other research known to us on this topic.

This paper makes a contribution to the literature on coalition building by demonstrating the effect of social identity cues, particularly political self-placement, in the coalition formation stage, even if there are no post-coalition policy consequences. Concretely, our results suggest there is a strong and robust negative effect of the distance in ideological self-placement on who is selected and how much is offered to group-members. Substantively, this implies that in the context of coalition-building, which is intrinsically discontinuous and all-or-nothing, small biases can lead to large changes in equilibrium outcomes. As participants care about who they are going into alliance with, we believe that similarly, game-theory derived predictions about real world coalition formation (e.g. in parliaments) could be improved by using information on actors' social identities.

As we use participants' real identity instead of artificially assigned identity we believe our results have greater bearing on real world politics. Research on social-identity that uses subject's natural identities is still limited (see Huettel and Kranton, 2012).[1]

## Literature and Hypotheses

Much of the experimental literature – our work is no exception in that regard – is based on the seminal Baron and Ferejohn (1989) model. The model is composed of:

  i) a 'pie' to be divided among an $n$ members 'legislature',

 ii) a recognition rule determining who makes the first proposal (with probability $p(i)$),

iii) a proposal amendment rule (which can open or closed), and

iv) a voting rule.

We use a simple version of the game with a closed amendment rule, equal probabilities of being a proposer and majority voting (as the one used in this experiment). The natural, symmetric equilibrium and the one focused on

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[1]Noteworthy exceptions include Goette, Huffman and Meier (2012, 2006); Fershtman and Gneezy (2001); Michelitch (2015)

by Baron and Ferejohn (1989) results in symmetric continuation values of a proposer offering

$$\frac{\delta * pie}{n}$$

(the continuation value) to $(n-1)/2$ group members, and keeping

$$1 - \frac{\delta * pie(n-1)}{2n}$$

to herself, the proposal is accepted by a majority and the game ends in the first round.[2]

Previous experimental research using this model confirms the general intuitions of its institutional incentives, especially as subjects gain more experience, but display a smaller than expected proposer advantage with a relevant proportion of equal splits among all participants or 'coalition partners' (cf. McKelvey, 1991; Drouvelis, Montero and Sefton, 2010; Tsai, 2009; Fréchette, Kagel and Lehrer, 2003; Fréchette, Kagel and Morelli, 2005; Diermeier and Morton, 2005).

Predictions made by office-seeking models, though better than random, have not performed well empirically (Laver and Schofield, 1990). One of the problems is that they include, among their predicted coalitions, agreements between parties at different extremes of the policy space, which are not observed empirically. Models that include policy-seeking assumptions have not done much better in empirical tests (Laver and Schofield, 1990) and include strong assumptions about the credibility of coalition agreements. Models such as Austen-Smith and Banks (1988) or Baron and Diermeier (2001), dissociate office from policy benefits, making the implicit assumption that the larger coalition partner can credibly commit to the implementation of the negotiated policies, despite holding the lion's share of the government portfolios and caring about their re-election. This separation of benefits leads the authors to predict coalitions between the largest and the cheapest party, independent of the ideological distance between the partners.[3]

We believe that coalition models would benefit from including group–identity concerns in the pay–off structure of office–seeking partners; This would allow the model to include ideological (and other in-group concerns) into the equation, without the need to make assumptions about the policy outputs of the coalition. Though policy concerns are, indeed, a realistic

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[2]This assumes risk neutral players and players voting in favor if indifferent between accepting and rejecting a proposal.

[3]Another, well documented, problem is that the coalition models, in general, under–predict the formation of minority governments, though this interpretation depends on the definition of coalition being used, whether it is expressed as participation in the Executive or simply as agreements to maintain legislative support (see Laver and Budge, 1992).

assumption, their inclusion has added complexity to the models, without delivering too much in terms of their predictive power.

Experimental research has found that social identity is relevant for individuals' decision making processes, including effects on preferences for social outcomes, policy and re-distribution (Chen and Li, 2009; Cohen, 2003; Akerlof and Kranton, 2010; Kranton et al., Working Paper, 2012), cooperation and punishment (Tajfel et al., 1971; Tajfel and Turner, 1986; Goette, Huffman and Meier, 2006), as well as trust and discrimination (Charness, Rigotti and Rustichini, 2007; Fershtman and Gneezy, 2001; Hargreaves Heap and Zizzo, 2009). As these papers indicate, the main problem with measuring the effect of social identity is that expressed identities are created by group members in reaction to what they can *observe* about others and within existing political environments (cf. Michelitch, 2015; Posner, 2004; Jenkins, 1996). This makes it impossible to disentangle the effect of identity using conventional observational data approaches. In an experimental setting we can manipulate whether group-identity is available as a decision heuristic.

Given the impact of social identity on other aspects of human behavior we expect that, *ceteris paribus*, in treatment sessions:

H1 Offers to same gender and/or race group–members will be higher than the offers made to group–members of different gender and/or race.

H2 Offers to other group members will be lower as the ideological distance between the proposer and each group member increase.

H3 Proposers are more likely to select as a coalition partner the group-member that is more similar to him/herself.

H4 Group members with same gender, race and/or low ideological distance will be more likely to accept offers from each other.

## Experimental Design

All experimental sessions were conducted at the University of Essex Social Science Experimental Laboratory (ESSEXLab) in Dec 2014 and Feb 2015. Participants were randomly allocated a seat in the lab by having subjects pick a table tennis ball (identifying a seat number) out of a sack. Once seated, each computer was associated with a subject ID number. Participants were then randomly assigned into a matching group of 6 subjects. Experiments start with a short questionnaire on demographics and political identity and then participants play a series of in total ten negotiation periods where they decide how to split a £17.00 pie. Each negotiation group is composed of three participants and subjects are re-grouped in every period

with players from their matching group, in a stranger design.[4] There was no manipulation of group composition, all variation is produced by random allocation of group-members. The experiment was coded using the `betr` package for R.[5] In each period, a simple game is played where three people have to divide seventeen pounds (£17.00) by majority rule.

The experiment instructions were read out loud (and printed on-screen) and questions were answered in private. This process took no more than ten minutes. There were no trial periods, but the empirical analysis omits the first two periods because of the learning process.[6]

In treatment sessions participants were informed of the gender, race, and ideological positions of their group members. The gender and race data was shown by giving each participant an on-screen avatar that matched the data they provided in a pre-coalition game survey.[7] Subjects were asked what race and gender they identified with, the alternatives are, for gender were "Male" and "Female", for race were "White Caucasian", "Black", "Latin American" and "South Asian".[8] After the survey, the participants were shown the complete set of avatars (Fig. 1) and informed that each participant would be allocated one based on what they stated in the survey. Participants who indicated they were "Latin American" or "South Asian" both got the same 'brown' skinned avatar, as it was not possible to create specific avatars what were sufficiently different from each other to produce meaningful treatments.

The ideological position of each group–member was provided by showing a graph with the relative positions of participants on a left–right scale (Fig. 1)). The information was also taken from the survey, where subjects were asked to place themselves on a scale from 0 (left) to 10 (right).[9] We also ran control sessions where participants did not have any information about the other group–members. The data from these sessions is used for conducting placebo tests in the empirical analysis.

Each period is composed of a maximum of five rounds, in the first round

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[4]Subjects are informed that in each period they would be rematched into a different group, but the size of the matching group was not mentioned. Instructions in on–line appendix.

[5]`betr` is an R package developed by David Hugh-Jones for conducting social science experiments (https://github.com/hughjonesd/betr). All code is available for replication.

[6]This decision does not alter in any, substantive or significant, way the results presented in the following section. Code available upon request.

[7]The avatars were created by the authors using https://www.bitstrips.com/create/comic/

[8]Other races were excluded from the sample by limiting the nationalities of the eligible participants from the subject pool. The wording of the survey can be found in the on-line appendix.

[9]Research by Kroh (2007) suggests that using an 11-point scale with natural mid-point is superior to using less fine-grained measures as common five-point scales or overly accurate measures as a 0-100 range.
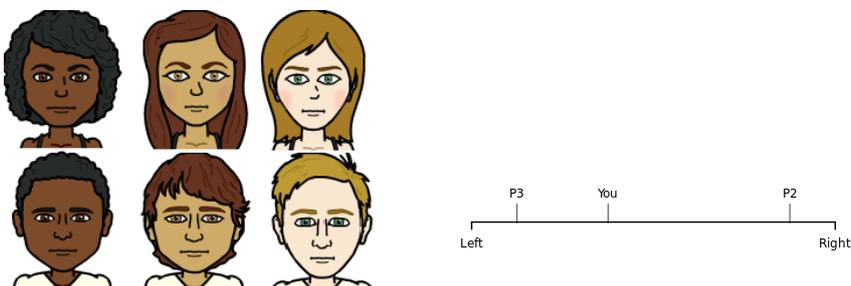
**Figure 1:** Avatar set and political self-placement scale as used in the experiment. A screen-shot of the treatment is available in the on–line appendix.

all group members submit a proposal of how to split the pie. After all proposals are submitted one is randomly selected and presented to all group members as the 'offer' and participants vote to accept or reject it. If the offer is accepted participants go on to the next period. However, if it is rejected, members go onto a second round (within the same period) and must re–submit a proposal, but this time the pie is discounted by a factor of $\delta = 0.7$. If the offer is rejected a second time they go onto a third round, with a discount of $\delta^2$.[10] The procedure is repeated until a fifth round where, if the offer is rejected, every player in the group gets zero and a new negotiation period begins. Subjects are informed of the results at the end of each negotiation period.

This set-up is based on the design used by (Drouvelis, Montero and Sefton, 2010) and it allows us to collect data on proposal behavior for all participants in each of the ten negotiation periods. Furthermore, the simplicity and visual elements of the design require little effort from the subjects and, hence, small assumptions about compliance to treatment.

After completing the negotiations we measure participants' pro-social orientation using a three-person dictator game where participants divide £3.00 between themselves and the other two group-members. In the dictator game the subjects are not provided with any information about the other group members, each subject is solely identified by a participant number.

At the end of the session each subject filled out a short survey with questions regarding their overall experience of the experiment and what they thought it was about. The participants were then paid in private the result of one, randomly selected, negotiation period, plus what they kept and what they received from others in the dictator game and a £2.50 show-up fee. Subjects are informed about what period was chosen for payment

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[10]To make it easier for the participants, the discounted pies were rounded to the nearest ten pence and subjects were provided with pen, paper and a calculator.

and given a detailed account of their earnings.[11]

# Data

The data derive from four control group sessions and ten treatment group sessions. Each session consisted of 18 individuals. The participants were recruited using the ESSEXLab subject pool and consisted of students and six non–student participants, who declared their nationality to be of a stable democracy (Marshall and Cole, 2014), and who have never played bargaining games before and participated in less than four experiments overall.[12]

| Session Type | # Sessions | Indiv Obs per session | Total Indiv Obs | Participants per session | Total Participants |
|---|---|---|---|---|---|
| Control | 4 | 3 | 12 | 18 | 72 |
| Treatment | 10 | 3 | 30 | 18 | 180 |
| Total | 14 | | 42 | | 252 |

**Table 1:** Summary of Experimental Sessions

The experimental sessions lasted between 50-80 minutes, depending on the level of rejection. Subjects were paid a mean of £11.20, with a minimum of £4.50 and maximum of £17.40.[13]

The subjects in the experimental sessions were predominately female (119 participants, 66% of all participants) and white (124, 68%). Nevertheless, all of the combinations of gender and race were represented. However, due to the small number of cases in the 'race-brown' category the statistical models only compare 'race–white' to 'race–other' conditions, aggregating 'race–black' and 'race–brown' avatars. Ideological dispersion is equivalent between female and male participants, with no major differences except in the extremes of the self-placement options where there are only male participants. As can be observed in Fig. 2 there is a predominance of participants in the center of the ideological spectrum, which implies more combinations of lower ideological distance, however, there is still sufficient variation for substantive statistical analysis.

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[11]The ethical approval for the experimental design was obtained from the Department of Government at the University of Essex, in accordance with the protocols of the Essex Social Science Experimental Laboratory (ESSEXLab), where the sessions were conducted. The experiment does not use any form of deception, there are no moral or sensitive issues and no personal data was requested.

[12]East Asian nationalities were excluded from the sample as there are very few countries within the stable democracy category and, consequently, low numbers of subjects in the pool.

[13]In sessions that lasted more than 70 minutes (three cases) subjects were paid an extra pound for their time.
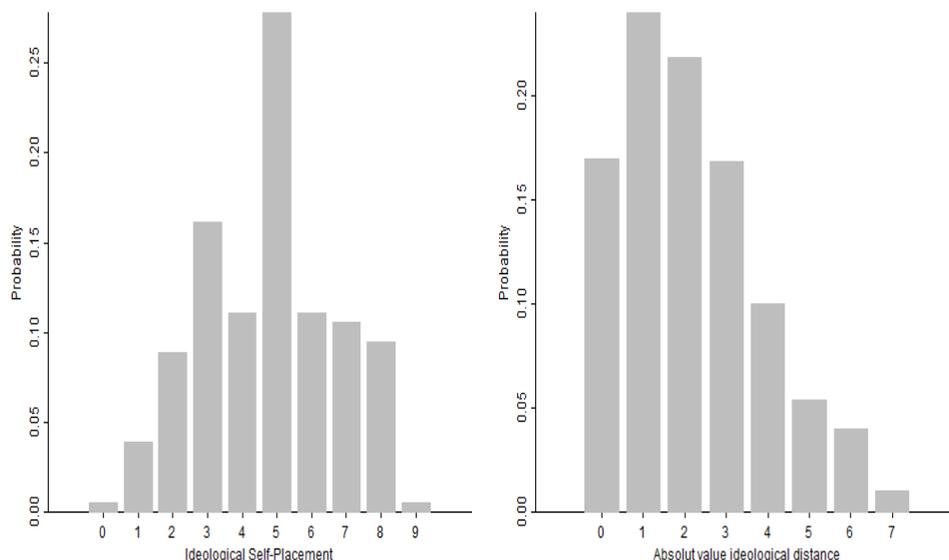
**Figure 2:** Self-placement and ideological distance in treatment

## Empirical Analysis

In our empirical analysis we focus on 'Proposal Behavior' and 'Voting Behavior.' To analyze the former we looked at the amounts offered to other group–members.[14] As can be seen in Fig. 3 a majority of the offers are between £5.00–6.00, corresponding with the closest three way equal split possible (£5.70, £5.70, £5.60, as the minimum divisibility was in 10 pence). However, there is also a large proportion of offers between £7.00–9.00, corresponding to values near a two-way equal split and (£8.50).[15] We also analyzed who was selected as partner. As can be expected, given other experimental results, there is a lower than predicted number of £0.00 offers, however, it is still a substantial proportion of the cases. Lastly, 'voting' behavior was measured as a dummy variable indicating whether the group-member accepted (1) or rejected (0) the division of the pie. Nearly one third of the offers in the first round got rejected.

The independent variables of interest are as follows. Firstly, 'Same Gender' and 'Same Race' dummies, indicating whether the receiver had the same characteristics as the proposer Secondly, the absolute value of the

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[14]The data include first round offers, for comparability across groups and balance in the panel, made by all participants

[15]This interpretation is corroborated by an analysis of the maximum offers made to other participants available in the on-line appendix, figure 13.
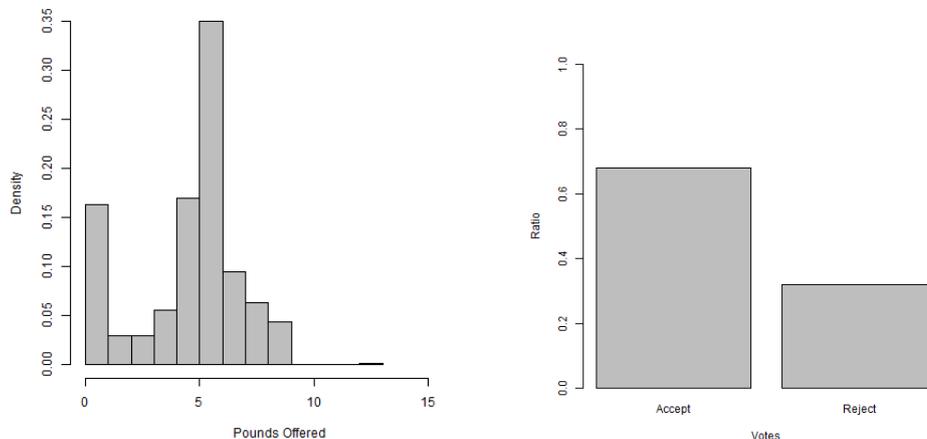
**Figure 3:** Distribution of offers and votes.

difference in self-placement of the proposer and receiver, denoted 'Diff SP P–R.' Thirdly, the absolute value of the distance between the proposer and the third group-member 'Diff SP P–3rd.' As control variables we included the gender, race and self-placement of the proposer.[16]

The results of 'Proposal Behavior' are presented in models M1–M3 in Tab. 2. They indicate a strong negative effect of proposer-receiver ideological distance ('Diff SP P–R') on how much money is offered and who is selected. M1 is a linear model on the amount offered to other participants. As can be observed, there is a negative effect on the ideological distance between the proposer and the receiver. That negative effect is complemented by a positive effect of the distance between the proposer and the third group-member. In other words proposers, on average, offer less to those who are further away in the ideological spectrum, but, other things equal, also offer the receivers more as the ideological distance to the third person increases. In practice, this produces an intercept shift where predicted offers to another group-member can vary up to a pound, depending on the ideological distance of the third person.[17]

The effects of M1 are robust to estimation as fixed and random–effects panel estimations, bootstrapped coefficients and other models. (See on-line

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[16]Excluding the controls does not alter, significantly or substantively, the results.

[17]Figures showing this results in on-line appendix. For robustness we also interacted the effect of ideological distance with the proposer's self-placement, this does not produce a significant effect, however higher levels of self-placement (people more to the right) are associated with lowers offers. The appendix also includes figures for the interaction between same gender and the number of female group members, and same race with the number of white group members.

|  | M1 | M2 | M3 | M4 |
|  | Offer | Offer | Partner | Vote |
| --- | --- | --- | --- | --- |
| Intercept | 5.08*** | 3.91*** | −0.03 | −3.02*** |
|  | (0.14) | (0.56) | (0.18) | (0.75) |
| Diff SP P-R | −0.15*** | −0.45*** | −0.27*** | −0.04 |
|  | (0.02) | (0.08) | (0.05) | (0.07) |
| Diff SP P-3rd | 0.12*** | 0.40*** | 0.23*** | |
|  | (0.02) | (0.08) | (0.06) | |
| Same Gender | 0.12 | 0.60 | 0.33 | −0.30 |
|  | (0.08) | (0.32) | (0.22) | (0.28) |
| Same Race | −0.14 | −0.92** | −0.46** | 0.20 |
|  | (0.08) | (0.33) | (0.17) | (0.19) |
| Proposer-White | 0.09 | 0.32 | 0.22* | −0.17 |
|  | (0.09) | (0.38) | (0.10) | (0.33) |
| Proposer-Male | 0.01 | 0.51 | 0.25 | −0.08 |
|  | (0.08) | (0.33) | (0.14) | (0.37) |
| Self-Placement | −0.04* | −0.03 | −0.01 | −0.08 |
|  | (0.02) | (0.07) | (0.02) | (0.08) |
| Amount Offered | | | | 1.00*** |
|  | | | | (0.12) |
| Num. obs. | 3600 | 626 | 626 | 1200 |
| $R^2$ | 0.02 | 0.09 | | |
| Adj. $R^2$ | 0.02 | 0.08 | | |
| L.R. | 70.83 | 56.93 | 58.05 | 634.57 |
| Pseudo $R^2$ | | | 0.12 | 0.58 |

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

**Table 2:** Statistical models on Proposal and Voting Behavior

appendix.). Statistical analysis conducted at a matching group level also indicate a significant effect for ideological distance. Fig. 4 displays the coefficients for 'Diff SP P–R' for each individual matching group regression. There is visible dispersion in the results, however the mean is -0.17 and has a Wilcoxon test p-value of 0.01454. A comparison between treatment a baseline samples produce a Wilcoxon p-value of 0.03952.

The finding that proposals to group–members who are ideologically closer to the proposer are more generous is visualized in Fig. 5. The graph presents, on the x-axis, the group–member who the proposer is ideologically closest to (identified as A and B on the graph); on the y-axis is the share of times the proposers offers more to A, more to B or equal to the other two group-members. Proposers who are ideologically closer to A, offer more to A 45% of the time. When the proposer is closer to B, she offers
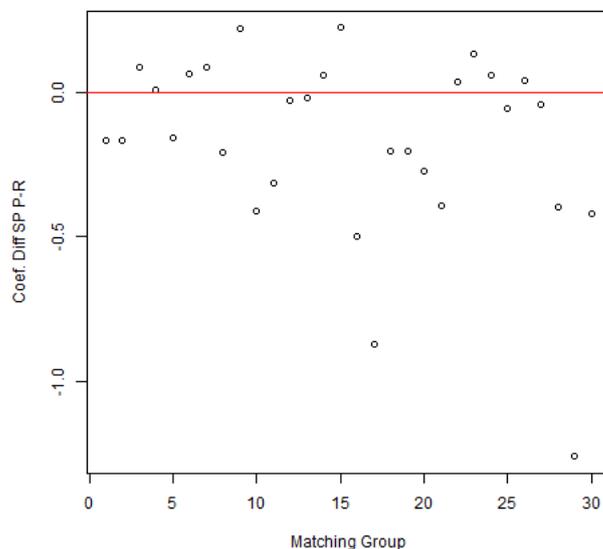
**Figure 4:** Coefficients for P-R Ideological Distance in matching group level regressions

more to B 48% of the time and when the proposer is indifferent, she offers to either without any strong preferences.

Model M2 presents the same analysis as M1, but uses only the cases in which the proposers explicitly exclude one group–member from the coalition (by offering them zero pounds). As expected, the results are equivalent to the ones in M1, but with a larger magnitude given that it excludes all the cases with three–way equal splits. This subset of the data allows us to evaluate cases where participants made a clear choice regarding their coalition partner (defined as the person that receives a non–zero offer). Model M3 presents a Logit estimation on the probability of being selected as 'partner', the results show the same patterns as models M1 and M2, with decreasing odds of being selected as partner as ideological distance grows, but an increase in those odds as the distance to the third group-member gets larger. The predicted probabilities of the model are presented in Fig. 6.[18]

The empirical analysis does not present systematic and consistent effects for proposer–receiver 'Same Gender' and 'Same Race'. The coefficients for 'Same Gender' reach standard levels of statistical significance in M1, but the effect is not sustained in the sub–sample of cases where one group–member is excluded from the coalition. On the other hand, 'Same Race' only reaches

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[18]Fig. 6 is estimated fixing gender at 'female', race as 'white' and self-placement at it's mean
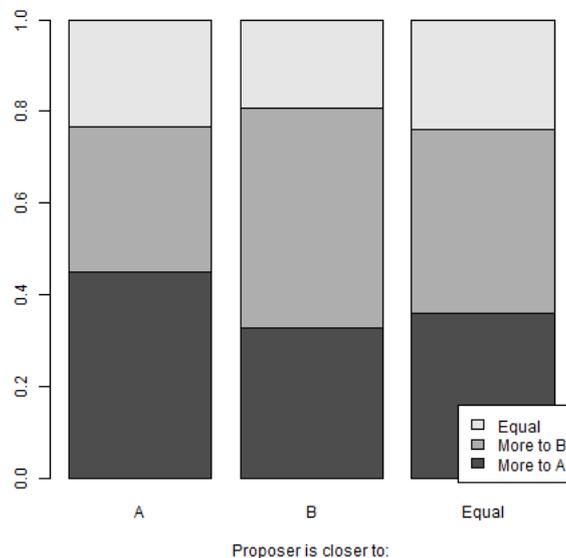
**Figure 5:** Share of offers that allocate more money to a group membe, by ideological distance to the proposer

significant levels in the sub–sample, but the direction of the association is inverted, with participants offering less to other group-members of the same race. This result could be a consequence of social desirability bias, but further research is required to test this explanation.

The analysis of 'Voting Behavior' was conducted using logistic regression on the vote decisions on the offers that were effectively presented to the group (Tab. 2, M4). The sample omits the votes of the person who made the offer, as it would over-estimate the coefficients of the variables of interest.[19] The main explanatory variable is the amount of money offered, with all offers above the two–way equal split (£8.50) accepted. This result is fairly obvious and consistent with other literature. Social identity traits do not systematically achieve standard levels of statistical significance. Analysis conducted on votes using only social identity characteristics and excluding the amount offered, produce a statistically significant (negative) effect of proposer–receiver ideological distance on approval, but this is likely to be caused by lower offers to people that are ideologically further away (results not shown). Robustness analysis indicate that the inequality of proposals is not a statistically significant predictor of voting and political self-placement does not correlate with inequality of proposals. This reduces any concerns

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[19]We also conducted analysis using all the votes, but accounting for who had made the offer, the results are equivalent to the ones presented in Tab. 2
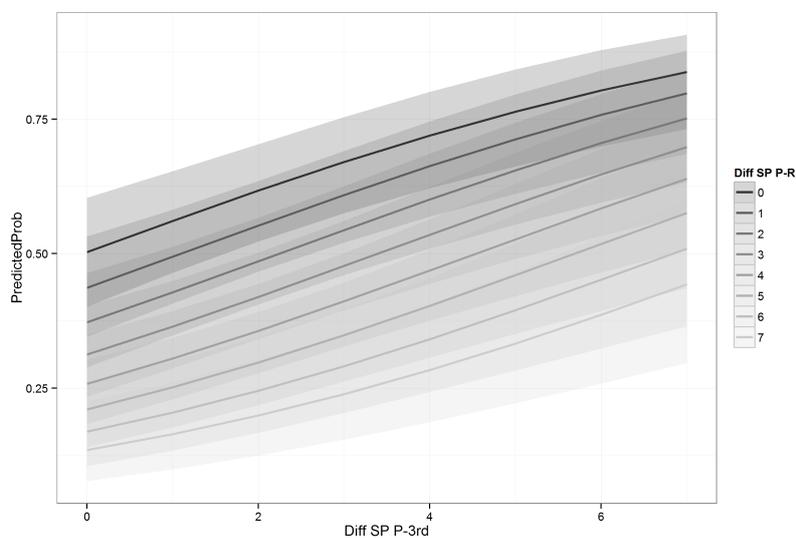
**Figure 6:** Predicted probabilities of selecting a partner by ideological distance

about participant's taking into account the outputs of the coalition in their voting behavior.

## Conclusion

Coalition theories have a long history in political science. Yet, experimental research addressing the social dynamics involved in coalition building is still relatively scarce. In this paper we aimed at contributing to the understanding of the coalition building process by testing for the effect of social identity factors on who is selected as a coalition partner. To do this we conducted a laboratory experiment based on the Baron and Ferejohn (1989) legislative bargaining model providing the participants with simple visual cues regarding the gender, race and ideological position of their potential coalition partners.

The results of the experiment show that participants systematically favor group–members that are closer to them ideologically. That amount varies depending on how distant the proposer is to the ideological location of the third player.

This pattern is also present in partner selection. In the subset of cases where proposers leave one person out of the coalition (by offering them a payment of zero), the probabilities of being the selected partner increase as ideological distance decreases and, again, the choice also depends on the

14

location of the third person. The conditionality of offers to one participant, based on the location of the third, displays consistency in in–group biased behavior. The empirical evidence is robust to multiple methods of estimation and placebo tests.

There is no conclusive evidence for in–group out–group bias based on race or gender, in this institutional setting. One reason could be social desirability bias for the same–race condition, but it can also be a function of the low salience of other participant's characteristics on the outcomes of the negotiation. Even so, ideology does not appear to be affected by social desirability, or if it is, the downwards bias it generates is not strong enough to eliminate statistical significance. Regarding voting behavior, none of the social identity traits appears to have an significant effect on voting behavior. Subject's decisions about accepting or rejecting the offer depend on the amounts that were offered to them, hence, if social identity does have an effect it is generated through the allocation of funds.

The experimental design explicitly avoids any consequences regarding which coalition is formed. Participants do not have any incentives to chose partners of their same type and whoever they select has no effect over the following periods. Any predisposition for forming a coalition with a person closer to them is simply a reflection of their intrinsic preferences. Hence, the empirical results, lead us to conclude that self–placement can help select between multiple equilibria, without a need to include assumptions about 'policy' concerns. Although preferences over policy outputs are a realistic assumption, they add a lot of complexity to the models and are not, given our results, absolutely necessary to distinguish among multiple 'office-seeking' equilibria.

In conclusion, our results lead us to believe that ideological in–group bias can help select among office-seeking equilibria. There is empirical evidences to suggest that coalition behavior is affected by the ideological distance of the potential partners. Participants select more often as partners, and offered more to, people that are closer to them on the ideological scale. Furthermore, this effect is independent of the outputs of the coalition or the level of inequality of the proposals.

An avenue for further research is extending the group sizes as games with more than three players have proved particularly difficult for theoretical models that include policy–seeking benefits as their is no core (cf. Laver, 1998; McKelvey, 1976; McKelvey and Schofield, 1986). Possible changes in coalition dynamics over time, as small in–group biases in early periods can produce large effects over time, also merit further research. The world of politics is not necessarily a place of strangers and understanding the consequences of biases in repeated interaction can shed some light over the dynamics that occur within the long term political game.

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# 1 On-line Appendix

## 1.1 Data

**Table 3:** Frequences of Gender and Race in treatment sample

|        | black | brown | white |
|--------|-------|-------|-------|
| female | 27    | 14    | 78    |
| male   | 12    | 3     | 46    |

**Table 4:** Percentage ideological self-placement in treatment, by gender

| Ideology | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    |
|----------|------|------|------|------|------|------|------|------|------|------|
| female   | 0.00 | 0.05 | 0.09 | 0.15 | 0.13 | 0.29 | 0.12 | 0.08 | 0.08 | 0.00 |
| male     | 0.02 | 0.02 | 0.08 | 0.18 | 0.07 | 0.26 | 0.10 | 0.15 | 0.11 | 0.02 |

## 1.2 Robustness Tests

|              | RE        | FE        |
|--------------|-----------|-----------|
| Intercept    | 4.90***   |           |
|              | (0.11)    |           |
| Diff SP P-R  | $-0.14$***| $-0.13$***|
|              | (0.04)    | (0.03)    |
| Diff SP P-3rd| 0.12***   | 0.14***   |
|              | (0.03)    | (0.03)    |
| Same Gender  | 0.15      | 0.19      |
|              | (0.11)    | (0.13)    |
| Same Race    | $-0.15$   | $-0.20$   |
|              | (0.11)    | (0.13)    |

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

Arellano-Bond standard errors

**Table 5:** Random and Fixed Effects models

|                 | Treatment    | Control      |
|-----------------|:------------:|:------------:|
| Intercept       | 5.08***      | 4.46***      |
|                 | (0.16)       | (0.43)       |
| Diff SP P-R     | −0.15***     | 0.09         |
|                 | (0.05)       | (0.06)       |
| Diff SP P-3rd   | 0.12**       | −0.08        |
|                 | (0.04)       | (0.09)       |
| Same Gender     | 0.12         | 0.21         |
|                 | (0.12)       | (0.14)       |
| Same Race       | −0.14        | −0.10        |
|                 | (0.12)       | (0.16)       |
| Proposer-White  | 0.09         | 0.02         |
|                 | (0.08)       | (0.18)       |
| Proposer-Male   | 0.01         | 0.16         |
|                 | (0.12)       | (0.34)       |
| SP              | −0.04*       | 0.04         |
|                 | (0.02)       | (0.08)       |
| Num. obs.       | 3600         | 1440         |
| $R^2$           | 0.02         | 0.01         |
| Adj. $R^2$      | 0.02         | 0.00         |
| L.R.            | 70.83        | 9.96         |

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

**Table 6:** Placebo test with matching group standard errors

|                | Poisson | Neg Binomial |
|----------------|---------|--------------|
| Intercept      | 6.23*** | 6.23*** |
|                | (0.00)  | (0.00) |
| Diff SP P-R    | −0.03*** | −0.03*** |
|                | (0.00)  | (0.00) |
| Diff SP P-3rd  | 0.02*** | 0.02*** |
|                | (0.00)  | (0.00) |
| Same Gender    | 0.02*** | 0.02*** |
|                | (0.00)  | (0.00) |
| Same Race      | −0.03*** | −0.03*** |
|                | (0.00)  | (0.00) |
| Proposer-White | 0.02*** | 0.02*** |
|                | (0.00)  | (0.00) |
| Proposer-Male  | 0.00    | 0.00 |
|                | (0.00)  | (0.00) |
| SP             | −0.01*** | −0.01*** |
|                | (0.00)  | (0.00) |
| AIC            | 582524.07 | 582481.73 |
| BIC            | 582573.58 | 582537.43 |
| Log Likelihood | -291254.04 | -291231.87 |
| Deviance       | 556200.60 | 556155.83 |
| Num. obs.      | 3600    | 3600 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

**Table 7:** Count MLE models using hundreds of pence as the dependent variable
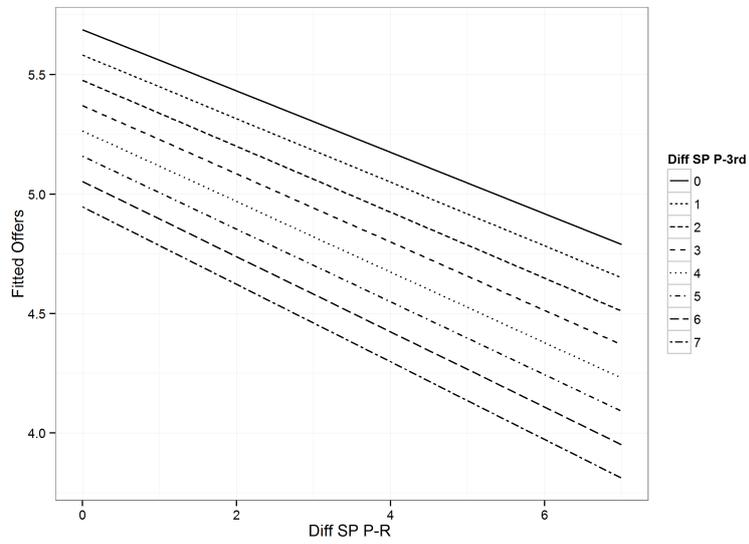
**Figure 7:** Offers to other group-members as Diff SP P-R increases, by Diff SP P-3rd
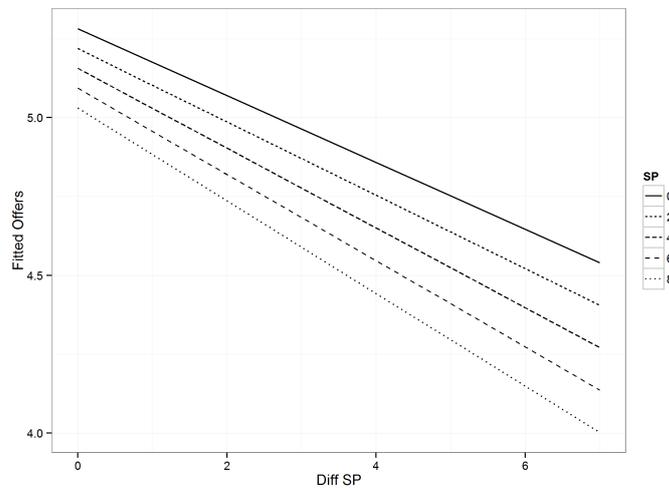


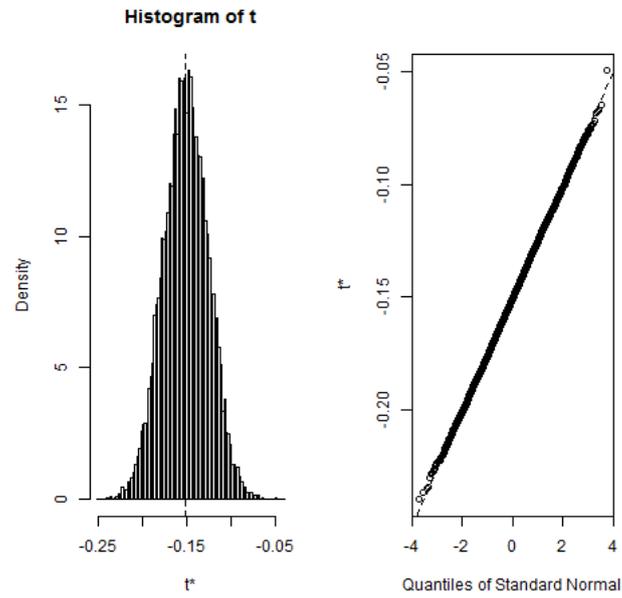**Figure 8:** Interaction of distance in self-placement and self-placement

**Histogram of t**



**Figure 9:** M1 Bootstrapped coefficients of 'Diff SP P-R'
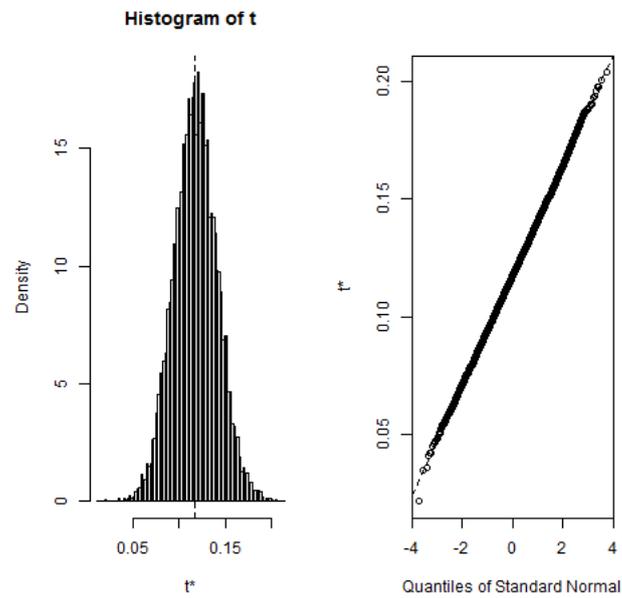
**Histogram of t**



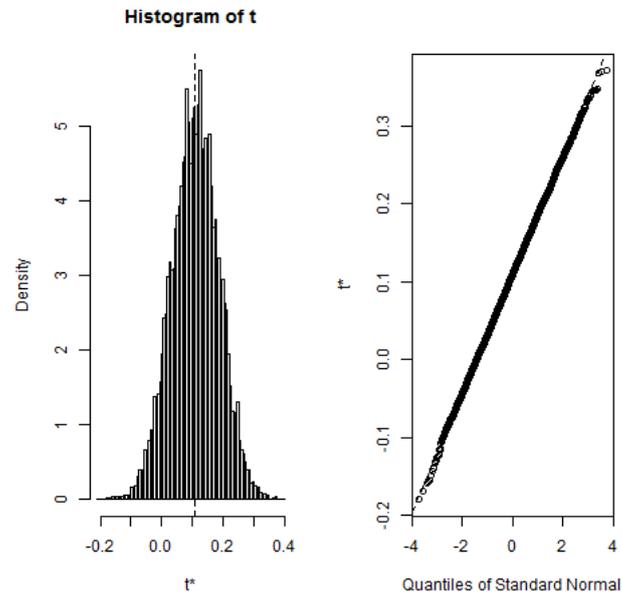**Figure 10:** M1 Bootstrapped coefficients of 'Diff SP P-3rd'

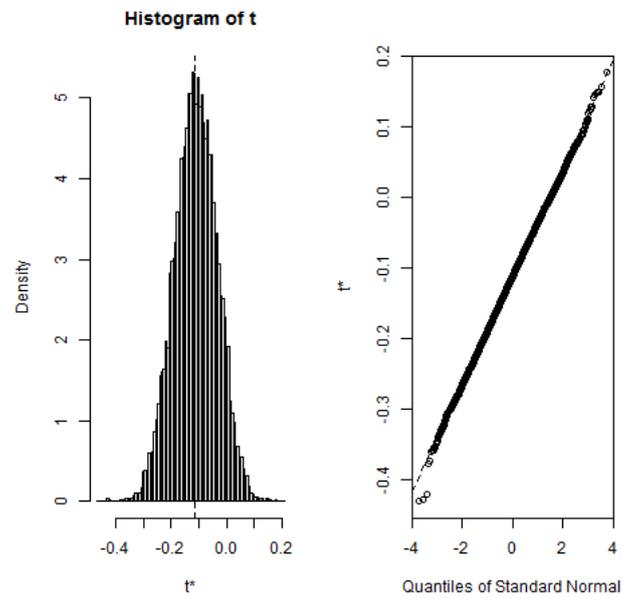**Figure 11:** M1 Bootstrapped coefficients of 'Same Gender'



**Figure 12:** M1 Bootstrapped coefficients of 'Same Race'
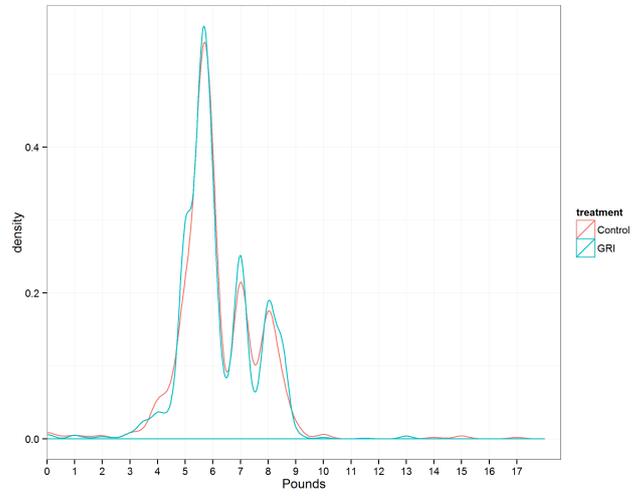
**Figure 13:** Maximum offers made to another participant by Treatment
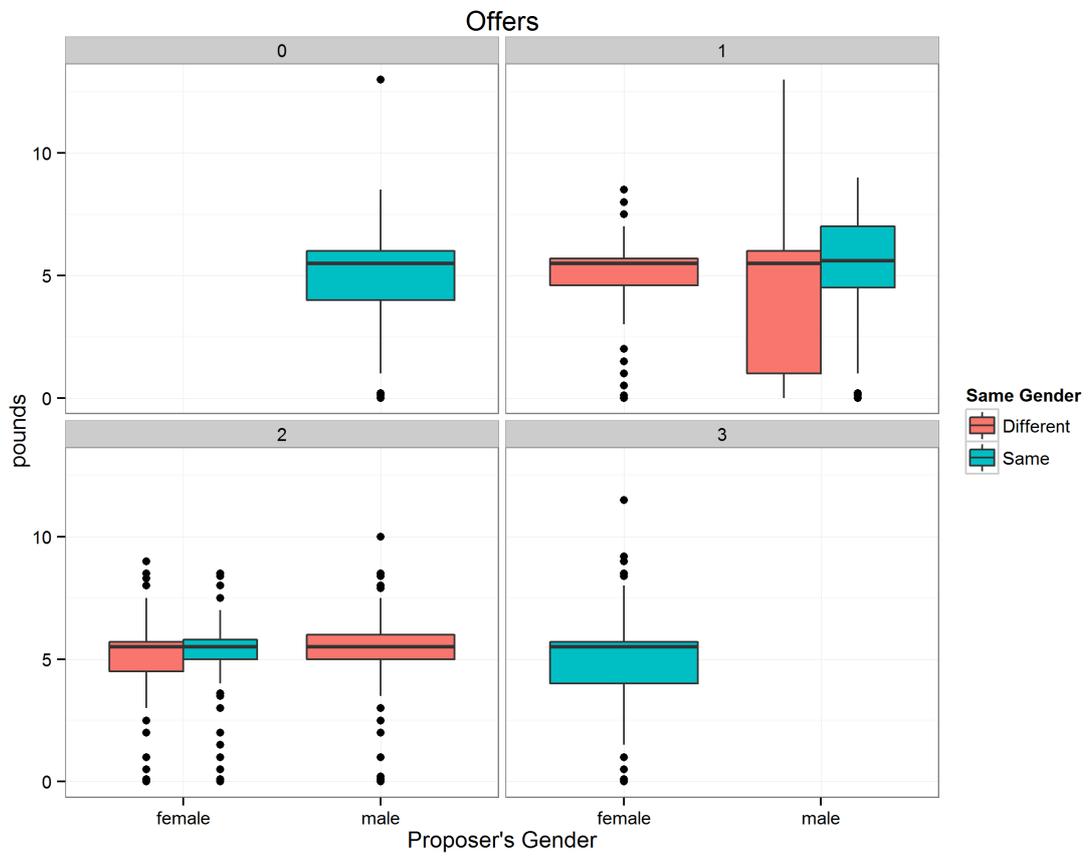
**Figure 14:** Offer to same gender, by gender composition of group. Number indicates # of female group members.
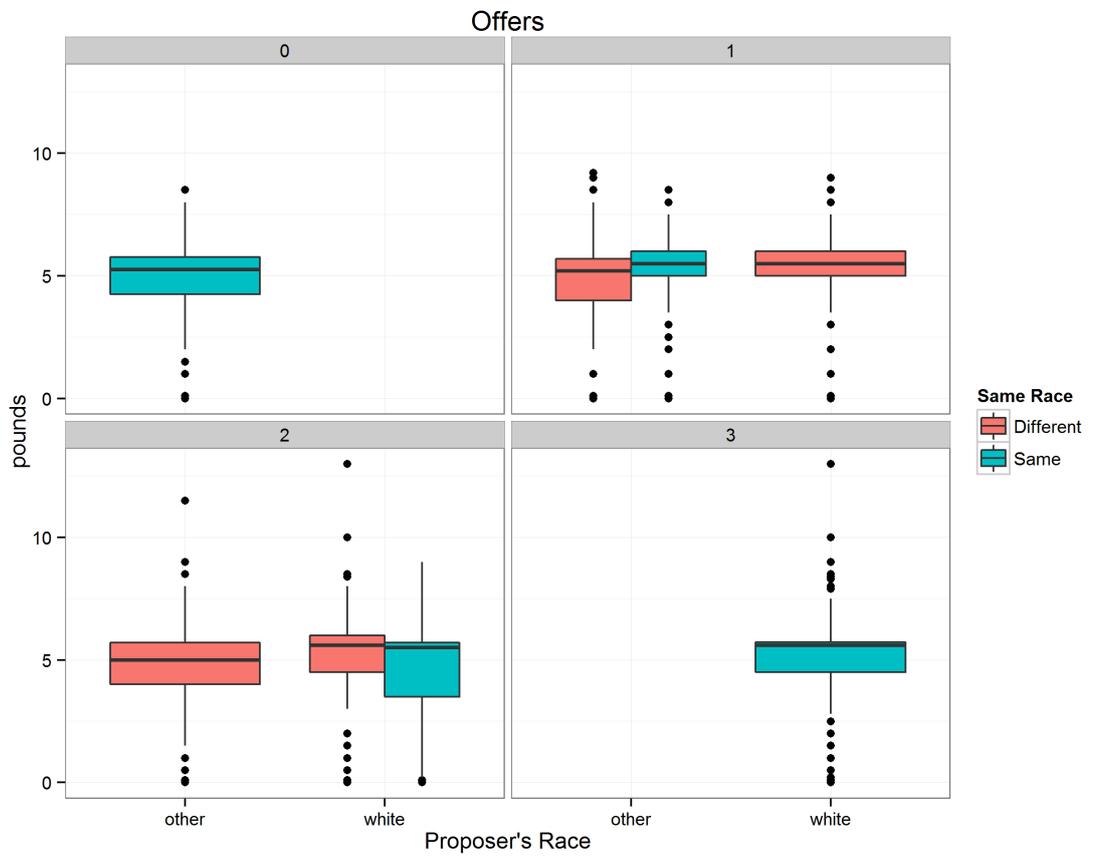
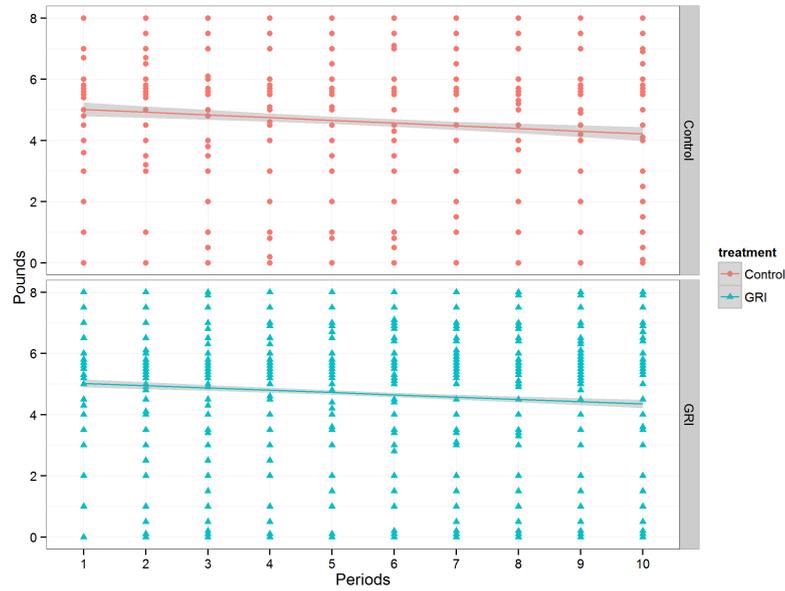**Figure 15:** Offer to same race, by racial composition of group. Number indicates # of white group members.

**Figure 16:** Offers made to another participant over time, by treatment

## 1.3   Experiment materials
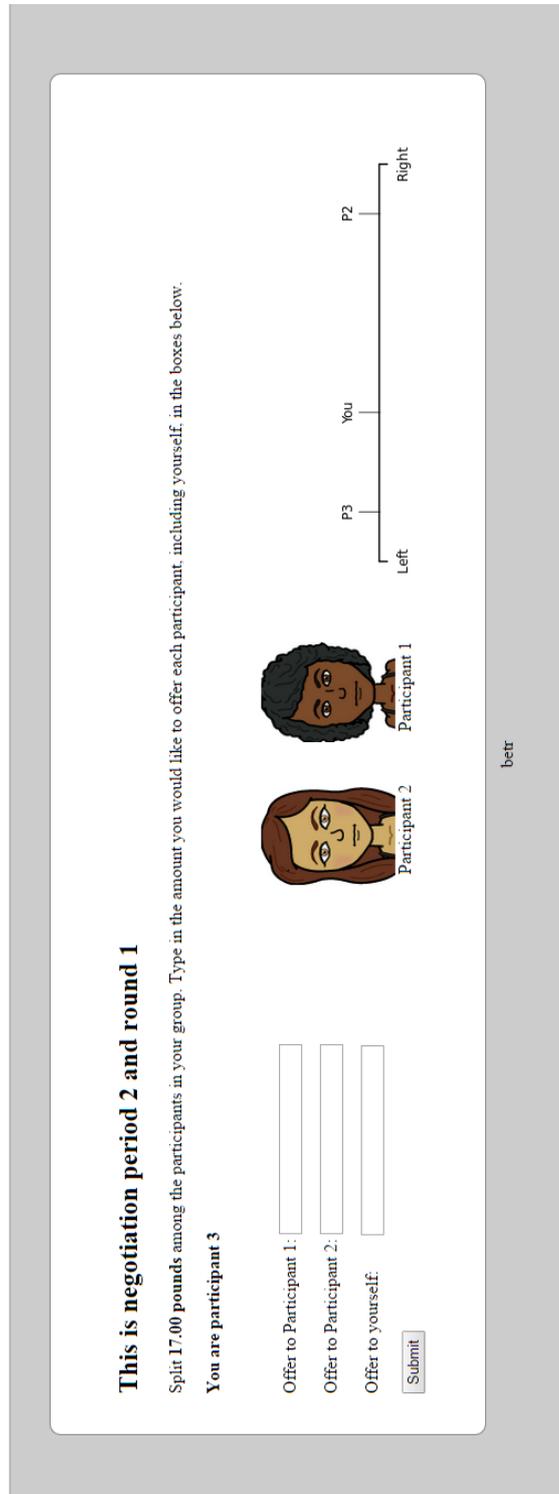
**Figure 17:** Screen shot of treatment sessions

# Experimenter Instructions

## On the day of the experiment

1. Open two screens of putty, one for the expt and another to watch the cpu (access it typing *top*)

2. Open each computer on the right kiosk mode

3. Adjust code to match the right number of people. **MAKE SURE YOU ARE USING THE RIGHT CODE,** $N = 18, T = 10$

4. Upload the code to putty and run it.

5. Make sure all the computers have

   * paper
   * pencil
   * calculator
   * instructions
   * consent form
   * information sheet
   * Receipt

## Experimenter instructions

**Bring to the lab:**

1. Instructions, consent forms, info sheets, receipts, calculators.

2. Signed up subjects sheet

Come to the lab. Distribute consent forms/information sheets receipts and calculators to all seats. Open putty and winscp. `source(R script)` and `ready(expt)`. Then open Chrome Kiosk windows on computers 1-N. When everyone is seated `start(expt)`.

### At experiment time

At the door ask *"Has everyone got university ID or another form of ID?"* Those who haven't will only be used if we have insufficient of those who have; warn them, in future bring ID.

Randomize over subjects using the lab tokens (Sara knows where these are). Surplus subjects given £2.50 and sent off.

You need 18 participants. (The can only run using 18 participants, on the Factor Analysis won't work and matching groups are of size 6). Only use the chrome kiosk pages for the 18 people

*If you get number 1-18, come in and sit quietly at that desk. Please do not talk or communicate with other participants while you are in the room. Keep mobile phones and other communication devices silent, and do not use them while in the room. If you get a 13 or higher, wait outside.*

Subjects 1-18 come in with ID checked at the door.

**When everyone is seated, say**

*"Welcome to this experimental session.*

*Your behaviour in this experiment will be confidential. Data is collected based on your computer number, which was assigned randomly. Personally identifying information about you will never be linked to this computer number. At the end of the experiment, you will be paid privately, so that no other participants will know how much you have earned.*

*You may have heard about experiments in which participants were deceived. Experiments in ESSEXLab never involve deception by the experimenters. That is, everything the experimenter tells you, and all on-screen instructions, are true and accurate. If you have any questions about this, please email essexlab@essex.ac.uk.*

*Fire exits are here and here [point them out]. Is there anyone who will have difficulty exiting the lab in an emergency? If so, please put your hand up."* [If so, ask if they have a Personal Emergency Plan; if they do not, use your judgement as to whether it is safe for them.]

*"On your desk there is a consent form for this experiment, as well as an information sheet. There is also a receipt. At the end of the experiment you will be asked to fill it out with the amount you have won, and return it with the signed consent form to the experimenter. You may keep the information sheet if you wish. Lastly there are experiment instructions and a number of blank papers for you to take notes on during the experiment.*

*I will now read out experiment instructions. At the end you will have an opportunity to ask questions. If at any time you have a question or a problem with your computer, please put your hand up, and an experimenter will help you privately."*

Start the corresponding treatment on putty using `start(expt)`. The participants will see the instructions screen.

**Read the instructions**

When you finish reading the instructions, *"Once you finish reading the instructions please press the 'Continue' button to start the experiment"*

**When the experiment is over:**
*"Please sign and date your receipts with the amount shown on your screen, and then click "Payment" on screen to show that you have done so."*

While this is happening prepare payment envelopes.

*"The experiment is now over. I will come round to each of you in turn with your payment in an envelope. Check that you have received the correct payment. Note that amounts have been rounded to the nearest 10 pence. Please hand over your receipt and consent form when I do so. After you have received payment, please quietly leave the laboratory."*

*"Please check the amount and if it's wrong, raise your hand."*

Go round swapping envelopes for receipts. To each individual:

Email the results to me and store them safely somewhere, then delete them from the server.

# Instructions

Welcome to the experiment.

During this experiment, please follow the instructions of the experimenters at all times. Please do not communicate with any other participants or anyone outside the lab, either directly or via mobile devices. If you do not follow these rules, you may be removed from the experiment without payment and you may not be allowed to participate in future experiments.

Please switch off your mobile phones and other electronic devices.

Once you have finished reading the instructions, please sign the **consent form** on your desk.

## Experiment

The experiment starts with a short survey on general demographics and your views about some political topics. All the data that you enter are completely anonymous and no personal information will be recorded.

Later on, you will take part in a series of group decision-making periods in which each of you will propose how to divide £17.00 amongst the members of your group. Participants will be randomly allocated to groups of 3 by the computer. You will complete 10 periods and in each period you will be rematched into a different group. All of the interaction with your group will be conducted via your computer.

Each period will happen as follows:

1. In the **Proposal Stage** you will make an offer to each participant in your group. You can offer any quantity, by increments of 10 pence, to each player. The offers must add up to a 'pie' of £17.00.

2. Once all offers have been made, the computer will choose **one** of the proposals randomly and present it to all of the group members. If you **accept** the offer, then press the 'Accept' button. If you do not want to accept the offer, then **reject** it by pressing the 'Reject' button.

3. If more than half of the group members 'Accept' the offer it will be approved and each group member will be allocated that amount for the current period. If more than half of the group members 'Reject' the offer, it will be rejected by the group and all group members will be asked to propose a new division of the 'pie', but this time you will only

have £11.90 to divide. Again, one proposal will be chosen randomly and presented to all group members. If the new proposal is rejected you will repeat the process, but the 'pie' will again be reduced, this time to £8.30. Each of these steps is called a 'round' and you can play up to 5 rounds per period, but in each round the 'pie' will get smaller. If the proposal is rejected in the fifth round, all group members will be allocated £0.00 for that period and you will all pass on to a new negotiation with a new group.

4. When you finish the 10 periods, you will be asked to complete a final decision making process. This time you will have to divide £3.00 amongst three group members and, in this section, whatever you allocate to each person is what they will get. In this section there will be **no voting**.

5. At the end of the experiment we will ask you to fill in a few questions regarding your experience in the lab. Once again, all the data that you enter are completely anonymous and no personal information will be recorded. After you finish the survey, a screen will appear indicating which period was chosen for payment and how much you will be paid.

**Payment**

In this experiment you will be paid according to the decisions that you have made. One of the ten negotiation periods will be chosen at random, and each will have a 1/10 chance of being chosen. You will also be paid for the decisions you make in the 'decision' section and a £2.50 show-up fee. At the end of the experiment you will be informed of how much you have earned in each section and your total payment.

## Treatment Information - Provided after the survey

The information you have provided has been used to allocate each participant one of the following avatars.



There are only 6 avatars, so more than one participant will be allocated the same image, based on the race and gender each person stated in the survey.

The survey data has also been used to calculate a score that places each participant and their political views on the left right political spectrum.

## Information Sheet

The current experiment aims to analyse how people make decisions in different situations. On-screen instructions will explain exactly how the experiment works.

This is a voluntary experiment. You may withdraw at any time without any penalty. If you withdraw you may lose the possibility to gain cash rewards from parts of the experiment in which you do not participate.

You will be paid a £2.50 show-up fee. In addition, you will be paid based on the choices made by you and others during the experiment. Details will be given in the on-screen instructions.

The experiment will last about 1 hour.

Data collected during the experiment will be linked only to your seat number, which was assigned randomly. It will not be linked to your name. Therefore, your behaviour during this experiment is completely anonymous. The anonymous data will be analysed by the researchers, and will be stored afterwards at the Economic and Social Data Service, where it may be downloaded by other researchers for reanalysis.

You have signed an attendance sheet and after the experiment you will sign a receipt for the money you receive. Your attendance will be recorded in the ESSEXLab On-line Recruitment System and the receipt will be stored at ESSEXLab.

You may have heard about experiments in which participants are deceived. This is an economic experiment. Economic experiments do not involve deception by the experimenters. That is, everything the experimenters tell you, and all on-screen instructions, are true and accurate. If you have any questions about this, please email essexlab@essex.ac.uk.

If you wish to know more about the research behind this experiment, or if you have any questions or complaints about the experiment, please contact dalaro@essex.ac.uk.

## Consent Form

I confirm that I have read and understood the information sheet which I may keep for my records.

I agree to take part in the experimental session by undertaking a number of computer-based tasks.

I understand that the data generated during the session will be entirely anonymous, so that my name and university ID will not be linked to the data that is generated. The anonymous data will be analysed by the researchers and subsequently stored by the Economic and Social Data Service, where it may be downloaded by other researchers.

I understand that my participation is voluntary and that I am free to withdraw at any time.

| | | |
|---|---|---|
| Name of Participant | Date | Signature |

**Bargaining Experiment Survey**

# Survey Questions

Please answer the following questions. As indicated in the instructions, personal data will not be disclosed and all information you provide is anonymous.

- What year were you born? ⬚ Year

- What gender do you identify with?
    Male
    Female

- What is your nationality? ⬚ Country ⬚ *(Drop-down menu with all countries accepted in the sample plus and 'other' option)*

- What race to you identify with? If you are mixed race, please state the one you feel closest to.

    White Caucasian
    Black
    Latin American
    South Asian

- Are you a student at the University of Essex?
    Yes
    No

- If Yes, are you an undergraduate or graduate student?
    Undergraduate
    Graduate
    Does not apply

- If you are a student, in what academic year did you start your course/degree?
  ⬚ Academic Years ⬚ *(Drop-down menu with a list of academic years)*

- If you are a student, what is the name of your course/degree?
  ⬚ *Empty for participants to fill in* ⬚

———- Next Screen ———-

# Survey Questions Continued

**Could you please state how strongly you agree or disagree with the following statements**

- There is one law for the rich and one law for the poor.

  Strongly Disagree                              Disagree

- There is no need for strong trade unions to protect employees' working conditions and wages.

  Strongly Disagree                              Disagree

- Major public services and industries ought to be in state ownership.

  Strongly Disagree                              Disagree

- Ordinary people get their fair share of the nation's wealth.

  Strongly Disagree                              Disagree

- Government should reduce the taxes paid by higher-income citizens.

  Strongly Disagree                              Disagree

- Same sex couples should enjoy the same rights as heterosexual couples to marry.

  Strongly Disagree                              Disagree

- Women should be free to decide on matters of abortion.

  Strongly Disagree                              Disagree

- The government should try to reduce the income differences between rich and poor citizens.

  Strongly Disagree                              Disagree

- The UK should be allowed to set quotas on the number of EU immigrants entering the country.

  Strongly Disagree                          Disagree


- Free market competition makes the health care system function better.


  Strongly Disagree                          Disagree


- An Orange is orange.

  Strongly Disagree                          Disagree


- Have you ever participated in any economics, government or psychology experimental studies before?
      Yes
      No


- Please specify the number of times. If you have not participated in any experiment please indicate it with a zero. | number |



——— - Next Screen ———-



# Survey Questions Continued

In politics people sometimes talk of 'left' and 'right'. Where would you place yourself on a scale from 0 to 10 where 0 means extreme left and 10 means extreme right?


Extreme Left 0 | ————————◯——— | 10 Extreme Right

You have selected: | number selected |

———- At the End of the Experiment ————-

Please take a few minutes and to answer the following questions

- From your experience, what did you think the experiment was about?

| *Empty for participants to fill in* |
|---|

- What was your overall impression of the experiment?

| *Empty for participants to fill in* |
|---|

## 1.4  Countries of Origin

The sample was restricted to participants who were in the ESSEXLab subject pool and stated their country of origin as one of the following 42: Albania, Argentina, Australia, Austria, Belgium, Botswana, Bulgaria, Canada, Chile, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Jamaica, Latvia, Lithuania, Luxembourg, Macedonia, Mauritius, Montenegro, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States, Uruguay.  Checks were included in the experiment and only two participants in treatment sessions indicate they came from a country that was not in this original list.