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Power and preferences: an experimental approach

Fuad Aleskerov
University "Higher School of Economics", Institute of Control Science

Alexis Belianin
University "Higher School of Economics",Institute for World Economy and International Relations

Kirill Pogorelskiy
University "Higher School of Economics"

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Power and preferences: an experimental approach

Fuad Aleskerov, Alexis Belianin, Kirill Pogorelskiy[1]
University - Higher School of Economics,
Moscow, Russia

alesk@hse.ru, icef-research@hse.ru, kpogorelskiy@hse.ru

Abstract

The paper uses an experimental approach to study the voting power distribution. Using Montero, Sefton & Zhang (2008), we confirm their basic findings and explain some of their empirical paradoxes. Our main contribution deals with the question of how voters' preferences to coalesce influence their behaviour and payoffs. We extend the basic design to allow for asymmetric voters' preferences depending on the coalitions they take part in. The results show that even small modifications of preferences lead to statistically significant differences in players' shares, justifying the use of generalized power indices over classical ones.

Keywords: voting power, preferences, experiments
JEL codes: C71, C92, D72

1 Introduction

Voting power studies have evolved considerably since the first classic papers were published in the 1950-70s (see Penrose (1946); Shapley&Shubik (1954); Banzhaf (1965); Coleman (1971)). However, the central question - that of the power possessed by members of a voting body, remains unsettled. In the present paper we explore experimentally the predictive power of voting power indices in different contexts and two generically different settings. The first is a classical coalitional game with or without veto power (see Montero, Sefton & Zhang (2008), henceforth referred to as MSZ) together with the enlarged treatment in which the addition of an extra player changes the voting power indices of the original members notwithstanding the same weights and the decision rule (Brams&Affuso (1976)). The second and

[1] Corresponding author. The research was carried out within the framework of the fundamental research program of the University - Higher School of Economics in 2008-09.

novel part of the experiment measures predictive power of the generalized power indices, which incorporates into the model a possibility that players have asymmetric preferences towards each other, and thus may be more inclined to form some coalitions rather than others. We confirm experimentally that these preferences, however small, may have large effects and change the likelihood of observing different coalitions and different gains accrued to the players.

The remainder of the paper is organized as follows. Section 2 describes the main theoretical notions and voting indices in both classical and preference-adjusted cases. Section 3 outlines the hypotheses to be checked experimentally and the description of experiment. Section 4 deals with the experimental design and procedures. Section 5 contains our main results. Section 6 concludes.

2 Main notions

A *coalition* S is any subset of N players, $|N| = n$. The set of all possible coalitions is denoted by 2^N. Each player $i \in N$ has a certain number of votes w_i she may use to support a decision. A *quota* q is the least number of votes required to pass a bill. A coalition $S \subseteq 2^N$ is *winning* iff $\sum_{i \in S} w_i \geq q$. Similarly, a *losing* coalition is the one that lacks enough votes for a bill to pass. A player $i \in S$ is said to be *pivotal* in a coalition S if S is winning while $S \backslash \{i\}$ is losing. Let the payoff of a coalition S be $v(S)$; define $v(S) = 1$ iff S is winning and $v(S) = 0$ iff S is losing. A dual notion of *swing* is also useful: a coalition $S: i \notin S$ is a swing for player i if S is losing, while $S \cup \{i\}$ is winning[2] . We denote the set of coalitions in which player i is pivotal (resp., swing) by $\mathcal{P}_i$ (resp., $\mathcal{S}_i$).

To quantify somehow the power the players possess, several power indices have been proposed, of which the Banzhaf index β (Banzhaf (1965)) is perhaps the most intuitive. This (normalized) index shows the relative proportion of winning coalitions in which player i is pivotal with regards to all other players, or

$$\beta_i = \frac{\sum_S (v(S) - v(S \backslash \{i\})}{\sum_{i=1}^{N} \sum_S (v(S) - v(S \backslash \{i\})} \quad (1)$$

A family of preference-based power indices introduced in Aleskerov (2006) can be defined in a similar manner. Let the function $f_i(S)$ be the *intensity of connections* between a player $i \in N$ and a coalition $S \subseteq N$, $f_i(S): N \times 2^N \to \mathbb{R}$. For each player i, let $\chi_i = \sum_{S \in \mathcal{S}_i} f_i(S)$ be the sum of intensities of connections of player i over all those losing coalitions which are swings for i

[2] Note that for a pivotal player $i \in S$, $v(S) - v(S \backslash \{i\}) = 1$. Alternatively, if a coalition S is a swing for i, $v(S \cup \{i\}) - v(S) = 1$.

(alternatively, this definition may be stated in terms of coalitions in which i is pivotal). Then define the voting power index of the agent i as

$$\alpha_i = \frac{\chi_i}{\sum_{j\in N}\chi_j} = \frac{\sum_{S\in\mathcal{S}_i} f_i(S)}{\sum_{j\in N}\sum_{S\in\mathcal{S}_j} f_j(S)} \tag{2}$$

The very idea of α_i is similar to that of the Banzhaf index, the difference being that in the definition of the latter we evaluate the number of coalitions which are swings for i, and not the intensity of i's connections within such coalitions. An analogous definition can be stated in terms of pivotal players, with an obvious renormalization. The main question remaining is how to construct intensity functions $f_i(S)$.

Assume that the desire of the agent i to coalesce with j is given by a real number $p_{ij}, i,j = 1,\dots,n$, which we refer to as *modifiers*. The following forms of intensity functions may be defined:

a. Mean intensity of i's connection with other members of S:

$$f_i^+(S) = \frac{\sum_{j\in S\setminus\{i\}} p_{ij}}{|S|-1} \tag{3}$$

b. Mean intensity of connection of other members of $S$with i:

$$f_i^-(S) = \frac{\sum_{j\in S\setminus\{i\}} p_{ji}}{|S|-1} \tag{4}$$

Naturally, other forms of intensity functions are possible (see Aleskerov (2006)).

As one can see, in general, $\alpha_i \neq \beta_i$. Thus the following questions may be addressed. First, although the generalized power indices α are intuitively quite compelling, it should be checked whether they can be validated experimentally; and if confirmed, how robust is their influence on the players' behaviour in different contexts where the players' number of votes and the quota are varied. Then, it is interesting to see which of the numerous ways to define the intensity functions is justified in practice; and whether the scale of intensities matters. Finally, some quantitative estimates of the effects of modifiers on the outcomes of the votes and players' payoffs are worth investigating.

To address these questions, we use laboratory experiments in collective decision-making because this approach 1) is based on empirical data, 2) is analytically tractable and 3) allows for direct control over the relevant aspects of a decision-making process in the theoretically unambiguous circumstances.

3 Experimental setup

The starting point for this paper was the experimental setup by MSZ, although the main emphasis of their work was somewhat different[3]. In the experiment carried out by MSZ, participants were able to propose and vote on how to distribute a fixed budget among them; the average share of the budget accrued to each voter was then used as a proxy of their voting power.

MSZ have considered three treatments, corresponding to the examples of Brams and Affuso (see Table 1).

VETO treatment				SYMMETRIC treatment				ENLARGED treatment				
Player#	1	2	3	Player#	1	2	3	Player#	1	2	3	4
Votes#	3	2	2	Votes#	3	2	2	Votes#	3	2	2	1
Quota	5			Quota	4			Quota	5			

Table 1. Three treatments studied by MSZ: veto, symmetric, and enlarged.

In all treatments there is a “strong” player (with 3 votes) and two “weak” players (with 2 votes). In addition, in the enlarged game there is also a newcomer – player 4 with 1 vote. Whether the game is VETO or SYMMETRIC is defined by the quota value: in the VETO game it is set at 5 votes meaning that player 1 has veto power, whereas in the SYMMETRIC game the power of each player is a priori equal. In the ENLARGED game a new member is added and this setting was used to test against the paradox occurrence with regards to the VETO and SYMMETRIC games. We will refer to these treatments for short as V-game, S-game and E-game, respectively.

Let is compare this case with a situation where players have different preferences to coalesce, i.e., introduce modifiers p_{ij}. Assuming cardinal preference model, if the modifiers are set to 1 for all players, everyone has equal preferences to coalesce with all other players, and the generalized power index α clearly coincides with the Banzhaf index β. This is our control setting for the three games studied in MSZ, which we use as a benchmark case. In other settings we assume that the modifiers can be different for the players, depending on other players they are in coalition with. In particular, the payoff a player receives is multiplied by her aggregate preference[4] towards other players of her coalition.

Below we state the *a priori* conjectures to be verified by our experiments.

[3] MSZ studied the *paradox of the new members*: when a new member is added to a voting body, the power indices of some original members may increase even if their weights and the decision rule remain the same. Brams&Affuso (1976) argued that this is a paradox related to voting power rather than to the mathematical properties of the power index chosen. This conclusion, however, was questioned in the literature (Barry (1980)).

[4] We used here the multiplicative aggregation: a player's share specified by a proposal is multiplied by her cardinal preferences towards each of those players she is in coalition with. Of course, other aggregation procedures could have been used as well.

3.1. Symmetric game

In the symmetric case (see Table 1), the Banzhaf index, which treats all coalitions as equiprobable, predicts that payoffs will be equal to 40 (out of 120 points) for each player. Now consider the S-game with the modifiers as defined in Table 2. These modifiers define our treatment condition, which we refer to as the 1-game.

Preferences of player *i* \ towards *j*	Player 1	Player 2	Player 3
Player 1	-	1	1
Player 2	1	-	1.01
Player 3	1	1	-

Table2. Modifiers for the S-game.

If we take into account the voter's preference to coalesce, and measure the intensities by intensity function f^{+}as defined by the swing-based version of (3), we receive the shares, predicted by α power index, as 39.8664 for players 1 and 3, and 40.0668 for player 2. On the other hand, if we measure the intensities by intensity function f^{-} as defined by the swing-based version of (4), the α power index predicts that the pie shares are 39.9334 for players 1 and 2, and 40.1331 for player 3. Arguably, both cases can be viewed as minor changes of payoffs. Yet we *expect the coalition {2, 3} to occur significantly more frequently than other coalitions in the 1-game* (**H1**). In addition, *earnings of players 2 and/or 3 will be higher in the 1-games (with modifiers from Table 2) than in the control S-game* (**H2**).

If either of these hypotheses is correct, we have evidence that preference do matter: small changes in material payoffs make big difference. Moreover, H2 is supported by some recent works in biased preferences, e.g., Ariely (2008); Warber et al (2008). These works imply that small (indeed immaterial) changes in stimuli may have their “symbolic value[5]”, leading to visible and significant differences in the behaviour observed. Drawing on these conjectures, we expect player 1 (the strong player) to receive less than his predicted share in the 1-game treatment. Hence, it is possible that, *upon getting experienced, player 1 will try to 'buy' one of the other players' courtesy, offering them more than in the control S-game*. This is the third hypothesis (**H3**). It is hard to predict on prior grounds whether this will be player 2 or 3, but the size of this payment off player 1's fair share (and the share we observe in the standard game without modifiers) would give us an idea of what the price of preferences is.

[5] We could have used larger modifier values, but deliberately chose very small ones. If our hypotheses hold given 1% change in material payoffs, they will most certainly hold for larger changes.

3.2. Veto game

The veto game differs from its symmetric counterpart in that now 5 votes are needed to pass the proposal (see Table 1). In this case player 1 is the veto player in the sense that no coalition can be winning without him. The Banzhaf index predicts that player 1 gets 60 and 2 and 3 – 20 points each. Now consider the V-game with the modifiers as defined in Table 3 (referred to as the 2-game).

Preferences of *i* \ towards *j*	Player 1	Player 2	Player 3
Player 1	-	1	1
Player 2	0.99	-	1
Player 3	0.99	1	-

Table3. Modifiers for the V-game.

Our first hypothesis here (**H4**) is that *earnings of player 1 will be significantly higher than in S-game*. Furthermore, (**H5**) *as players 2 and 3 dislike player 1 just a bit, the agreements reached (which necessarily involve player 1) will mean significantly higher shares for player 2 and 3 at the expense of player 1 in the 2-games than in the control V-games with the neutral modifiers of 1*. Finally, we may also hypothesize that (**H6**) *bargaining time needed to reach an agreement in the 2-games will be significantly higher than in the control V-games.*

2.3. Enlarged games

Consider an enlarged treatment of MSZ as given in Table 1. The Banzhaf index yields $\beta_1 = \frac{5}{12}, \beta_2 = \beta_3 = \frac{3}{12}, \beta_4 = \frac{1}{12}$. Let the multiplicative modifiers be given by Table 4, which define the 3-game:

Preferences of player *i* \ towards *j*	Player 1	Player 2	Player 3	Player 4
Player 1	-	1	1	1
Player 2	0.99	-	1	1
Player 3	1	1	-	1
Player 4	1	1	1	-

Table4. Modifiers for the E-game.

In this case, player 2 (or, if we switch p_{21} and p_{31}, player 3) just a bit dislikes player 1, hence hypothesis **H7** is that *in the 3-game, the winning coalition* $\{2,3,4\}$ *will be significantly more frequent than the winning coalitions involving player 1 in the E-game*, and (**H8**) *the winning coalitions involving both players 1 and 2 will yield significantly higher gains to player 2 in the 3-game than in the E-game*.

This setup leaves ample room for more treatment options with the E-game, as well as with further games. Consider a slightly different version of an E-game (Table 5), we will refer to as F-game.

ENLARGED treatment: F-game				
Player#	1	2	3	4
Votes#	3	3	2	2
Quota	6			

Table5. F-game.

The Banzhaf index is 4/12 for players 1 and 2, and 2/12 for players 3 and 4. Now let the modifiers be as given by Table 6.

Preferences of player *i* \towards *j*	Player 1	Player 2	Player 3	Player 4
Player 1	-	0.8	1	1.01
Player 2	0.8	-	1	1.1
Player 3	1	1	-	1
Player 4	1	1	1	-

Table6. Modifiers for the F-game.

In this case, players 1 and 2 can share the pie (presumably equally), but both have incentives to build a larger coalition with players 3 and 4, in which the last two players will be "junior" members, and presumably would get lower share of the pie. Hence, (**H9**) is that *both players 1 and 2 will prefer a large coalition of three players to a smaller one, comprising just 1 and 2*. Further, in this large coalition they have different incentives to attract the weak player 4 because of their payoff modifiers. Hence, (**H10**) *escalation of competition among 1 and 2 for player 4's vote in a large coalition might lead to an increase in player 4's gains more than proportionally*, and (**H11**): *given that player 2's modifier is larger than that of player 1, player 2 is expected to be disproportionately (significantly more than in 1.1/1.01=1.089 times) more generous than player 1 with regards to player 4's payoff.*

4 Experimental design

The experiments were conducted in 2008-09 academic year in State University - Higher School of Economics (HSE), using the specially developed experimental software. In each of the S-1 and V-2 session there were 12 participants playing in 4 groups of 3 players. Each game lasted 10 rounds, and all players were mixed in roles and across groups in each round. Six experimental sessions of that kind were conducted, 2 games are played in each experimental session in randomized block order as represented in Table 7. In each of the "enlarged" sessions (two E-3 and two F-4 sessions) there were 16 participants in 4 groups of 4 players; these games lasted for 20 rounds. In the first session, game E (respectively, F) was played first, followed by game 3 (respectively, 4); in the second, the order was the opposite.

In each round of each game all groups have to agree on how to divide a pie of the size 120 points, with a flat exchange rate 1 point = 0.4 Russian rubles (RuR).

Session 1	Session 2
S	1
1	V
2	S
SC	1C
1C	2
V	SC
E	3
3	E
F	4
4	F

Table7. Experimental sessions

Our experimental software and procedures were explicitly aligned with those of MSZ, including the appearance of the game in the screen.

The game proceeded as follows. Participants entered the room, signed the registration forms and logged into the game. Experimental instructions were read aloud and available on the screen should the participant need it at any time. After all questions are answered, the game begins. Each group has to vote for any proposal in no more than 300 seconds[6]; if no agreement is reached, all players in that group receive zero. In the S-1 games, we used the 2 × 2 × 2 design, controlling for the sequence of the games in the session, modifiers and position of players on the screen (C), as will be described shortly. In games V-2, we used the 2 × 2 design, controlling for the sequence of the games and modifiers. In games E-3 and F-4, there was just control for the sequence of the games, which did not result in significant differences for players 2 to 4, and was only marginally significant for player 1 according to Kolmogorov-Smirnov test in all sessions. This fact allowed us to combine the datasets in one.

Participants were 134 BSc and MSc students of the various departments of HSE recruited via university website. Gender composition of the sample was about 50-50. The average gain of participants in the 3-player games was 340 RuR, minimum – 170 RuR, maximum – 610 RuR per

[6] This feature of our design is the only substantial difference from the experiment design by MSZ. The reason for this difference is purely technical; however, as we shall see shortly, it did not cause any significant divergence of our results.

1- to 1.5-hour session[7]. Corresponding figures for longer 4-player sessions were 485 RuR, with a minimum of 240 RuR and a maximum of 750 RuR. The money was paid in cash at the end of each session.

5 Results

5.1. S-1 games

Figure 1 represents average (arithmetic means) of the outcomes of the S-1 sessions.

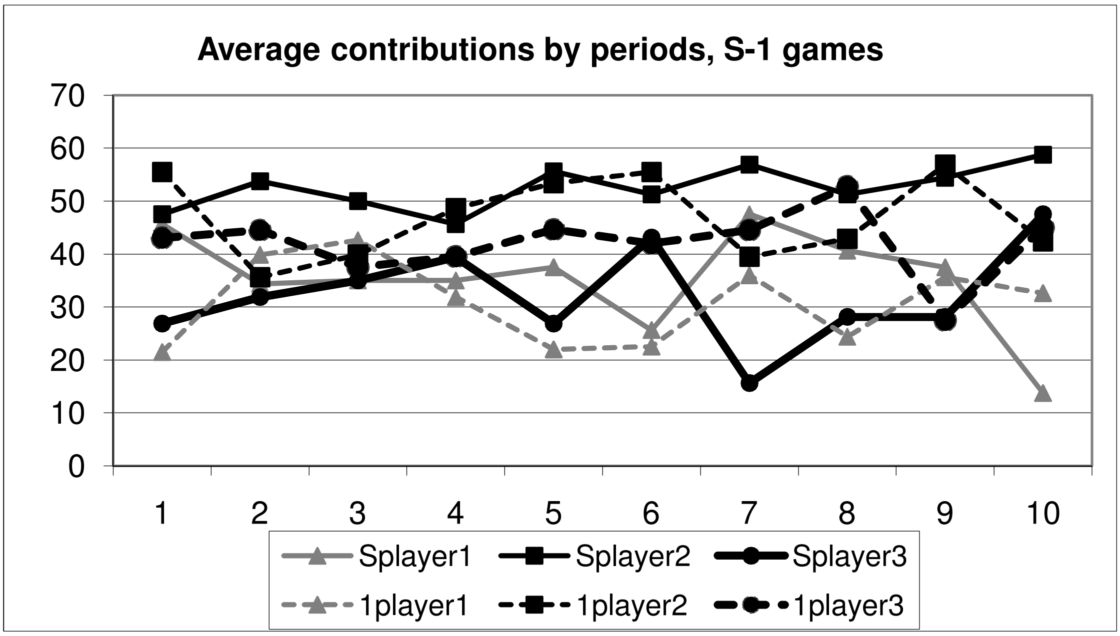

Figure 1. S-1 games, average shares of the players.

As Figure 1 reveals, all players receive about 40 (±5), in line with the Banzhaf index prediction. There are no treatment effects for players 1 and 2. By contrast, player 3 on average receives systematically more in the 1 treatment (42.08) than in S treatment (32.25), which difference is significant (Student t=2.24, Prob<0.0264; Kruskal-Wallis $\chi^2 = 5.89$, Prob<0.0122.). Hence our modifiers do indeed work for player 3: colloquially speaking, “being loved is better than love”. This finding is even more striking given that all games in this treatment were played quite quickly: on average, it took about 30 seconds to complete each session. In their comments, many participants were also saying that they did not pay attention to the modifiers at all; yet summary statistics clearly suggests this feeling is wrong: the psychological 'invisible hand' tends to lead their actions in a regular and predicted way, not rejecting our hypothesis H2; other hypotheses, raised in connection to this game await further research.

One more striking feature follows from Figure 1: player 2 receives systematically more than player 3 in both S and 1 treatments combined (49.89 vs. 37.14), which difference is also

[7] $1 was on average equivalent to 30 RuR at the time of experiment.

significant. This same fact has been observed by MSZ, who attribute it to the "framing effect". In our view, this fact has a more explicit and clear explanation: it is the position of player 2 in the middle of the table. In S-1 games, players quickly realize they all have equal effective bargaining power, and find it more profitable to share the pie with just one of the other players than with two. Given the quick pace, typical for this game, each player seeks one of the neighbours[8] to whom she can offer a coalition. Thus, player 2 has two neighbours (1 and 3), and hence may be offered a coalition by two players, whereas the other two players have just one neighbour (player 2), so their supply of offers is two times less, as is the expected number of coalitions involving the non-central players. In contrast to "explicit modifiers" p_{ij},we call this positioning effect an "implicit modifier" applied to player 2's payoff. To reduce its effect, we introduced a modification to the original setup: instead of player 2, *each* player was shown in the middle of the table, with clockwise displacements of the other two players. We refer to this treatment as the Standard Centered (SC in Table 7) and 1-Centered (1C) games. In the SC-1C games, the difference in the earnings of players 2 and 3 is mitigated (in particular, player 2's share is 43.03 vs. 39.41 of player 3), and becomes insignificant, although it did not disappear altogether, while explicit modifiers persist in these sessions for player 3 as well. We conclude that the effect of an implicit modifier is most likely to fully disappear in a completely symmetric treatment.

Summary statistics of all our S-1 games (both centered and non-centered) are presented in Table 8, which confirms the tendencies described above.

All (N = 320)	mean	s.d.	min	max
Player 1	35.36	29.04	0	80
Player 2	44.53	24.42	0	100
Player 3	40.1	27.56	0	111
Game S (N=160)				
Player 1	37.40	29.44	0	80
Player 2	46.25	23.89	0	100
Player 3	36.34	28.05	0	110
Game 1 (N=160)				
Player 1	33.32	28.57	0	80
Player 2	42.81	24.91	0	99
Player 3	43.85	26.62	0	111

Table8. S-1 games, summary statistics.

In particular, we confirm our main hypothesis (H2): even a very small modifier of 1.01 for the preferences of player 2 to coalesce with player 3 causes substantial change of agreements

[8] By a neighbour here we mean a player who is the closest in the sense of both place and natural order

in favour of players 2 and 3 (the weak players) at the expense of player 1 (the strong player) as compared with the standard S-game. Average payoffs of player 3 went up from 36.34 in the S-game to 43.85 in the 1-game, meaning that 1% of preferential change brings to that player about a fair 20% increase in revenues, which we view as quite substantial. Altogether, this means that if voters have non-uniform preferences towards different coalitions they might be part of (and however small such preferences might be!), preference-based power indices perform better than the standard Banzhaf ones. Moreover, preferences of player 2 in the 1-game treatment significantly affect the payoff of player 3 but neither his own nor that of player 1. This indicates that preferences *towards* the player matter more than preferences *of* the player, suggesting the intensity function of the f^{-}type. By contrast, the effect of player 2 payoff being higher than that of player 3 in non-centred games is largely spurious, and should hardly be important outside of the specific setup of laboratory experiment.

5.2. V-2 games

Results of the veto sessions are presented in Figure 2 and in Table 9.

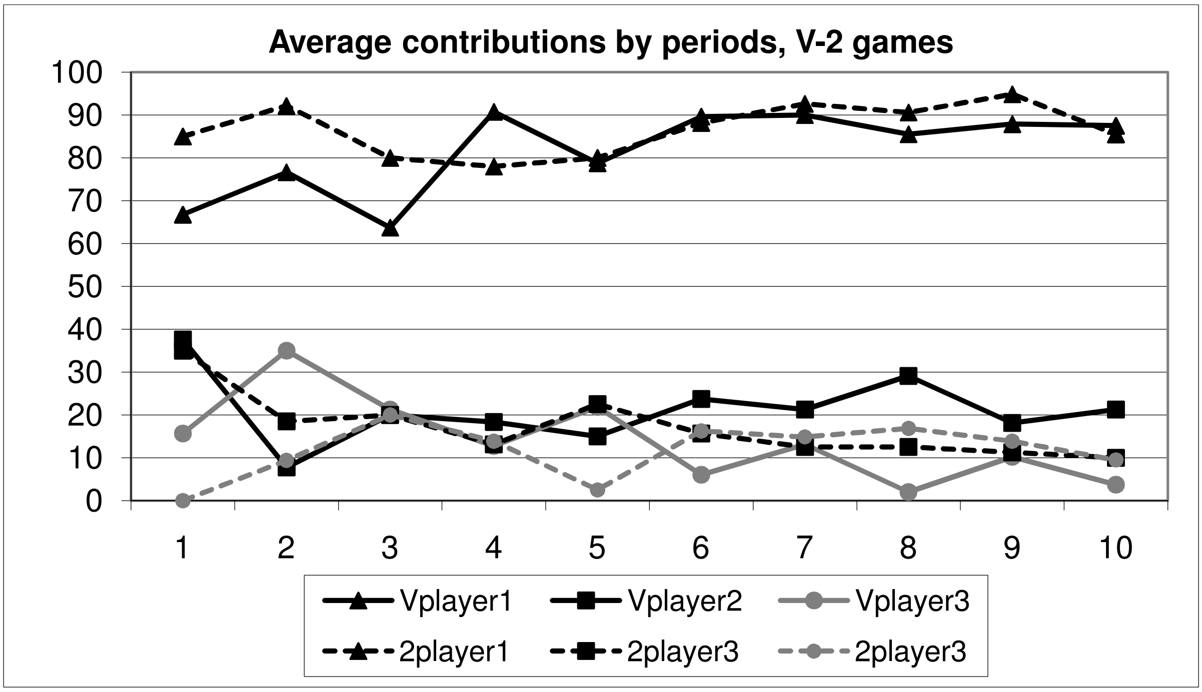

Figure 2. V-2 games, average shares of the players.

Figure 2 is largely self-explanatory: the veto player 1 gets a vast majority of the pie, even more than the Banzhaf index predicts, and statistical tests confirm this at any reasonable degree of confidence. Thus H4 cannot be rejected. As for players 2 and 3, this time, although their gains fall in the 2-treatment wrt the V-treatment, none of the differences is statistically significant.

This means that a small distaste (of 0.99) of players 2 and 3 towards player 1 clearly cannot overturn the fact that this latter player is crucial for any positive gain, and thus rejecting our hypothesis H5 about the role of the modifiers in the veto context. Participants again have quickly realized that: in many games, players 1 were simply asking a bulk of the pie, leaving some bit to one player and nothing to the other – and were waiting for the offered player to accept. Sometimes this strategy failed; yet the typical time to reach an agreement went up significantly, averaging to more than 3 minutes per session. In relation to this, we checked hypothesis H6 by a fit of a duration model on the time of reaching an agreement, but preliminary estimates of this model did not reveal any significant treatment effect, so that H6 was rejected.

All (N = 160)	mean	s.d.	min	max
Player 1	84.29	24.99	0	120
Player 2	19.76	20.97	0	70
Player 3	3.56	18.42	0	60
Game V (N=80)				
Player 1	81.90	24.76	0	119
Player 2	22.56	23.40	0	70
Player 3	15.53	19.99	0	60
Game 2 (N=80)				
Player 1	86.68	25.14	0	120
Player 2	16.96	17.94	0	60
Player 3	11.60	16.59	0	60

Table9. V-2 games, summary statistics.

5.3. E-3 games

Summaries of the E-3 games are presented in Figure 3 and Table 10 below.

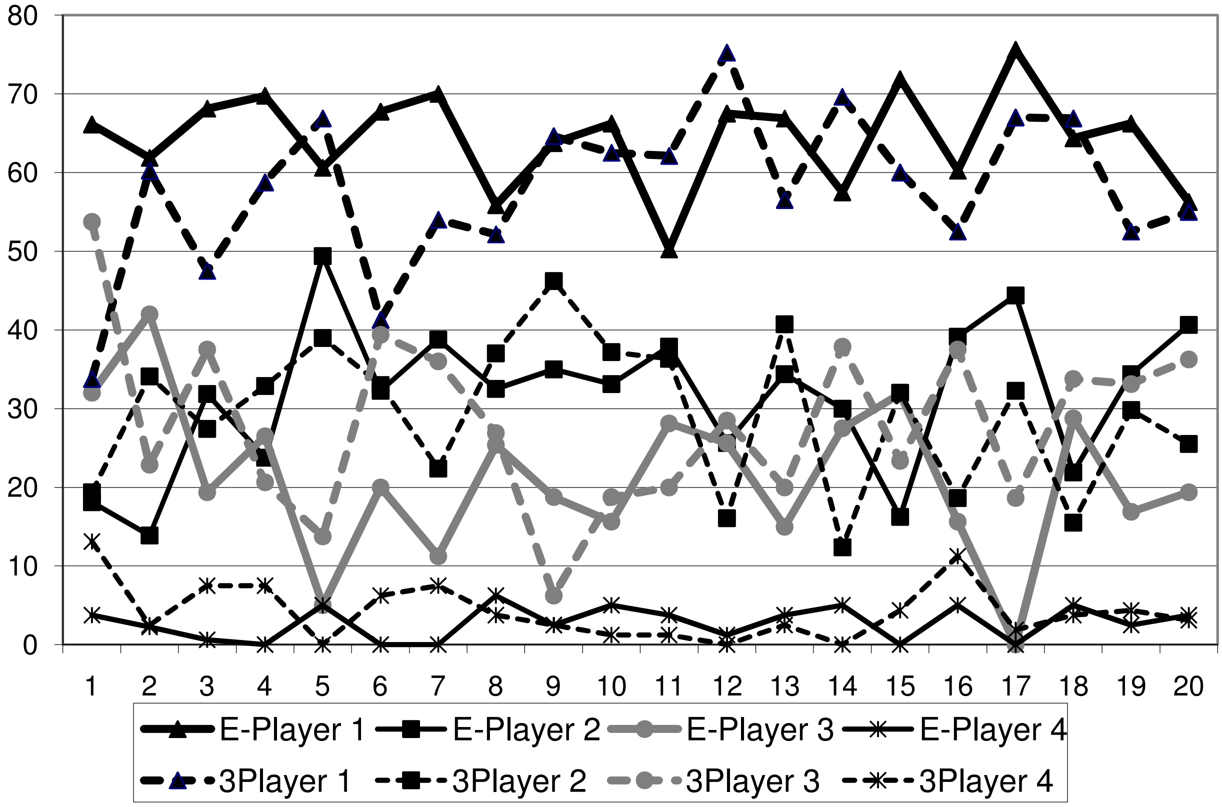

Figure 3. E-3 games, average shares of the players

Player 1 in this game receives systematically more than the Banzhaf index prediction of 50, and clearly does so at the expense of player 4, while gains to players 2 and 3 are basically in line with the index. Payoffs to players 2 and 3 also systematically increase in comparison to the V-2 treatment (cf. Tables 9 and 10). All these facts are in line with MSZ findings. Two more tendencies peculiar for our design extend the above story. As is obvious from Table 10, and confirmed statistically, the share of player 1, who has most of the bargaining power, falls from 64.34 to 57.95, which change is statistically significant (Student t-statistic 2.23, p<0.0262; Kruskal-Wallis $\chi^2 = 3.07$, p<0.073), meaning that player 1 loses in the 3 game as a result of the modifier applied to player 2 payoffs. Player 3 gains most out of it, with average payoff increasing from 21.23 to 28.23, which effect is even stronger (Student t-statistic -2.57, p<0.0104; Kruskal-Wallis $\chi^2 = 6.2$, p<0.0082). Thus, a small negative modifier indirectly benefits player 3, whose gain per session increases by a quarter. Another interesting feature of the E-game compared to the 3-game is that the frequency of coalitions involving three player (2, 3 and 4) is three times higher in the 3-treatment than in the E-treatment, which effect is especially pronounced for the first of these sessions (the E-game followed by the 3-game). This means that players 2, realizing that they dislike player 1, tend to switch to a larger coalition, even though building it is clearly more difficult technically, and probably involves lowering one's share of the pie, which now has to be divided among three players instead of two. Hence our hypothesis H7 is not rejected.

All (N = 320)	mean	s.d.	min	max
Player 1	61.15	25.76	0	10
Player 2	30.63	23.82	0	70
Player 3	24.73	24.54	0	70
Player 4	3.49	9.00	0	70
Game E (N=160)				
Player 1	64.34	22.36	0	95
Player 2	31.65	23.17	0	70
Player 3	21.23	23.72	0	70
Player 4	2.76	7.40	0	40
Game 3 (N=160)				
Player 1	57.95	28.47	0	100
Player 2	29.59	24.48	0	70
Player 3	28.23	24.90	0	65
Player 4	4.21	10.33	0	70

Table10. E-3 games, summary statistics.

5.4. F-4 games

Summaries of the F-4 games are presented in Figure 4 and Table 11 below. As can be seen from Table 11, a relatively large negative modifier for player 1 significantly lowers her earnings from 48.43 to 31.48 on average, paralleled by a uniform shift of gains of players 3 and

4. It might be explained by the fact that player 1's positive modifier toward player 4 is lower than that of player 2, whose payoff on the contrast does not change much in the 4-game compared to the F-game benchmark.

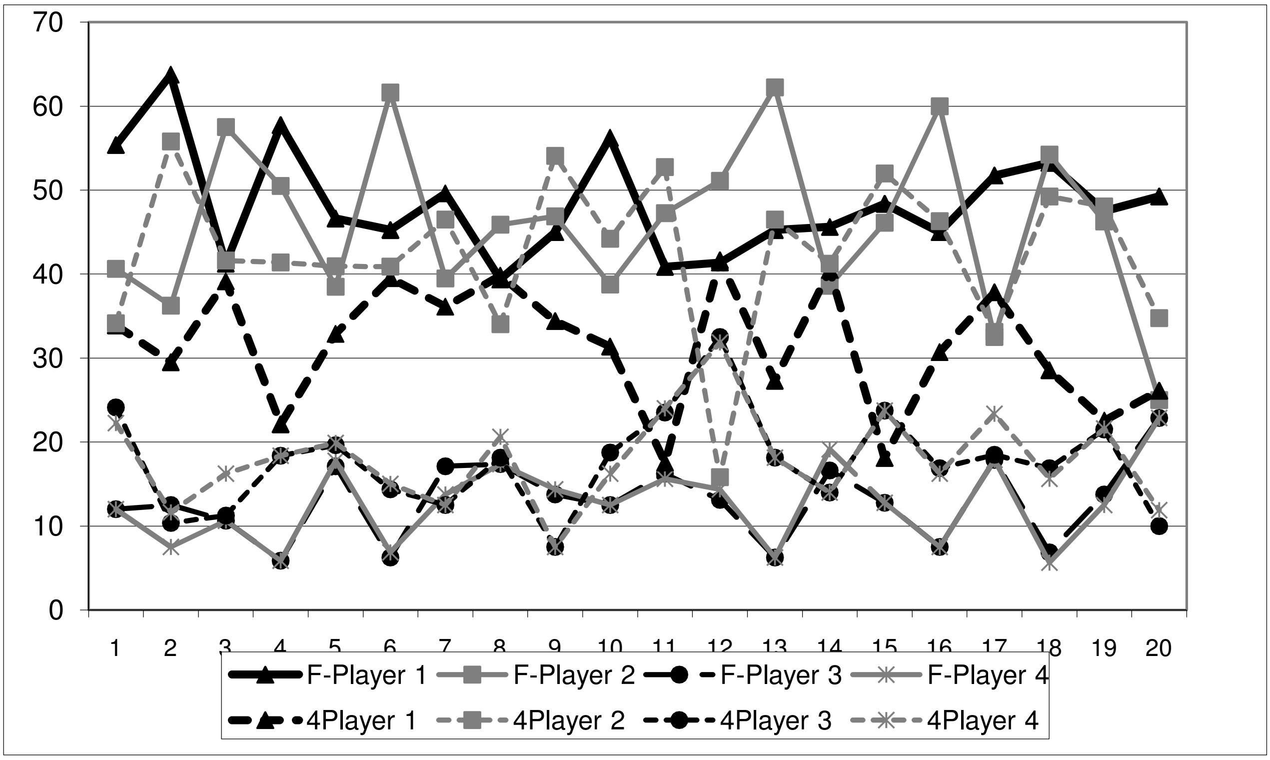

Figure 4. F-4 games, average shares of the players

At the same time, our hypothesis about significantly higher preference towards player 4 from player 2 than from player 1 does not seem to get confirmed. This suggests that the patterns of interactions of multiple modifiers are of rather complex nature: in particular, high "dislike" modifiers of 0.8 tend to neutralize the effect of lower "like" modifiers of players' preferences in that particular respect. Another explanation might be in line with psychological characteristics of the players' personalities – a hypothesis we have investigated, but could not confirm so far.

All (N = 320)	mean	s.d.	min	max
Player 1	39.95	26.70	0.00	80.80
Player 2	44.32	25.79	0.00	80.00
Player 3	15.24	14.94	0.00	45.00
Player 4	15.35	15.25	0.00	50.00
Game F (N=160)				
Player 1	48.43	25.82	0.00	80.00
Player 2	45.97	26.94	0.00	80.00
Player 3	12.95	13.86	0.00	40.00
Player 4	12.66	13.69	0.00	40.00
Game 4 (N=160)				
Player 1	31.48	24.88	0.00	80.80
Player 2	42.67	24.56	0.00	77.0

Player 3	17.53	15.66	0.00	45.00
Player 4	18.04	16.27	0.00	50.00

Table11. F-4 games, summary statistics.

6 Conclusions

The results obtained so far may be summarised as follows. Explicit modifiers work in all treatments of the S-1 games, and increase the payoff of player 3 by about 20%, effects for the other players are not significant. This fact can be interpreted in two ways. Verbally, "*being loved is better than love*", at least in terms of material payoffs. Formally, in terms of the model of Aleskerov (2006), this finding supports the use of f^- intensity function, at least over f^+. We have also found (and ruled out) the nuisance effect of implicit modifiers in the S game, and feel confident to attribute it to the peculiar visual representation of the game. The case of the veto game is different: in this case, explicit modifiers (probably) do not matter at all, and the fact that one player has veto power overrules personal attitudes. This implies that the effect of modifiers (preferences) is of secondary importance to a player's number of votes and the quota.

In the E- and F-games, negative modifiers significantly affect the frequency of the respective coalitions: benefits from a smaller coalition are seen by players as being less, compared to a larger coalition comprising the players the neutral modifiers. Other effects await further data analysis and (possibly) further games – e.g., E-3 and F-4 treatments are still under exploration.

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