Gamson's Law & Government Dissolution
An Experimental Analysis

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Abstract

The standard models of coalition formation have a hard time accounting for the well-document empirical regularity of coalition parties being allocated cabinet portfolios in proportion to their size. Game theoretic models of government formation typically assume that the game ends with the formation of a coalition. A more realistic assumption is that the parties accrue payoffs over the lifetime of the coalition, which introduces concerns for government survival. This introduces incentives to form stable coalitions that can explain why bargaining outcome are more proportional than the standard Baron-Ferejohn model predicts. In this manuscript we examine the prediction of a simple model of government formation that allows for government dissolution in an experimental setting.

1 Introduction

The formation of a government coalition is one of the most significant political processes in multiparty parliamentary systems. Parliamentary executives typically wield significant influence of the direction of government policy and membership in the government coalition is, therefore, an important step in gaining policy influence. Within the cabinet, policy influence is in part influenced by the allocation of ministerial portfolios. At one extreme ministers are considered to be portfolio dictators (Laver & Shepsle, 1996) while at the other extreme political power is considered to be concentrated within the core executive, which consists of the prime minister and ministers of a few of the major portfolios and/or party leaders. The truth lies somewhere between those two extremes. Ministers are not autonomous as they generally owe their positions to the leaders of the coalition or their parties. Ministers are also not without influence. At minimum, they head a government department that gives them privileged access to information that they can use to their advantaged. Whatever influence ministers actually have on policy, it is clear that politicians view ministerial portfolios as one of the main prizes in politics. The formation of a coalition cabinet can involve protracted negotiations over government policy as well as over the division and allocation of ministerial portfolios.

Early on Gamson (1961) noted that the division of ministerial portfolios closely resembled the relative vote shares of the government parties — so closely that the empirical relationship was soon dubbed 'Gamson's Law'. While the relationship is indeed very strong, even when taking account of portfolios differing in importance (see, e.g. Warwick & Druckman, 2006), scholars have demonstrated that there are systematic deviations from the perfectly proportional allocation of portfolios (Bäck et al., 2009; Indridason, 2013). Browne & Frendreis (1980), e.g., show that smaller parties are receive a disproportionally large share of the portfolios, Carroll & Cox (2007) find a higher degree of proportionality where pre-electoral coalitions are formed, and Falcó-Gimeno & Indridason (2013) find that greater uncertainty is associated with more proportional outcomes. Notwithstanding these deviations from Gamson's Law, the observed divisions of portfolios among coalition parties are far more proportional than bargaining models of government formation would lead one to expect.

Baron & Ferejohn's (1989) model of coalition bargaining, as well as other models building on the Rubinstein (1982) bargaining model, find that in equilibrium the formateur is expected to receive a disproportionally large share of the portfolios. In Rubinstein's bargaining model the formateur derives this advantage from bargaining delays being costly whereas in Baron & Ferejohn's (1989) model the formateurs is able to extract additional portfolios as the recipients of the formateur's offer are neither certain to be selected formateur next nor being included

in the next formateur's proposal if they reject the offer. There is little evidence for such a formateur advantage in the empirical literature (see, e.g., Schofield & Laver, 1985; Warwick & Druckman, 2006).[1]

Models of coalition bargaining typically share the basic assumption that payoffs are realized once a coalition forms. This is a reasonable assumption in many bargaining situations, e.g., when bargaining over the price of car. The formation of a government is, however, fundamentally different in that the value of government participation derives from the ability to influence government policy. The government's policy is not made at its formation but is, rather, developed and implemented over the lifetime of the government coalition.[2] While the benefits of a new car are similarly realized over a longer period of time such contracts are typically not subject to renegotiation as is the case with government coalitions that can dissolved if some of its partners decide they have better options available to them. Indridason (2013) proposes a simple model of coalition bargaining that allows for government dissolution that we subject to an experimental test. The possibility of dissolution has the effect of reducing the formateur advantage and increasing the share of portfolios allocated to the minor coalition partner.[3] The logic underlying the result is particularly simple. Formateurs that do not moderate their demands may be able to form a coalition but the coalition will be unstable — dissatisfied with its share of the spoils, the minor coalition partner will opt to dissolve the coalition and form a new one. Faced with these prospects, the formateurs will seek to offer their coalition partners a large enough share of the portfolios to match their expected benefit of dissolving the coalition.

The next section describes a simple model of government formation in which the minor party can dissolve the coalition and negotiate with an opposition party to form a new government coalition. We derive the subgame perfect Nash equilibria in the game with and without dissolution that form the expectations for the outcome of the experiment. The section that follows describes the experimental protocol. We then present the results of the experiment and close with a summary and a discussion of our results.

[1] See, however, Ansolabehere et al. (2005) who argue convincingly that the focus should be on voting weights rather than seat shares.

[2] The same argument applies to politicians that are motivated by the non-policy related benefits of office.

[3] Note that other types of equilibria can exist for certain distributions of party size. For the purposes of our experiment we focus, however, on a parametrization of the model that gives rise to an equilibrium in which formateurs moderate their demands.

2 Coalition Bargaining & Dissolution

We consider bargaining games involving three parties, $I = \{1, 2, 3\}$. The share of parliamentary seats party i controls, s_i, is such that $s_i < .5, \forall i \in I$, implying that any two parties hold a majority of the seats but no party has an outright majority by itself. We assume there are 99 seats and consider two distributions of seats. An 'equal' distributions of 34, 33, and 32 seats and an 'unequal' distribution of 40, 39, and 20 seats.

As we are interested in examining the effects the possibility of government dissolution has on bargaining over the portfolios, we compare two models; one which allows for government dissolution and one that does not. Consider first a game that allows for the possibility of government dissolution. Assume the electoral term is split into two time periods and that the parties bargain to determine the division of ministerial portfolios. We normalize the number of portfolios to one so that a division of the portfolios is represented as a proportion of the total number of portfolios.

At the beginning of the game a player is selected as a formateur. The formateur proposes a division of the portfolios, (x_1^1, x_2^1, x_3^1) where $m_i^1 \geq 0$ and $\sum_{i \in I} m_i^1 \leq 1$, that the other players must either accept or reject. If the offer is not accepted by a majority a caretaker government takes office and the portfolios are divided equally among the three parties in both periods.[4] If the proposal is accepted, the parties that were offered a positive share of the pie are in government coalition in the first period. Before the beginning of the second period, the minor coalition partner, i.e., the formateur party's partner, decides whether dissolve the government.[5] If the party chooses to maintain the coalition then the government survives the portfolios are distributed in the second period as they were in the first period. However, if the minor coalition partner decides to dissolve the government coalition then the minor coalition partner enters into bargaining with the opposition partner to form a new coalition. In the bargaining between the two parties, a formateur is selected at random with the probability of each party being selected being equal to their relative seat share or $\frac{s_i}{s_i + s_j}$. The formateur proposes a division of the portfolios. If accepted, the portfolios are divided according to the proposal but otherwise a caretaker government takes office and the portfolios are divided equally among all three parties. The parties' payoffs in the game is the sum of the share of the portfolios in the two time periods: $u_i = x_i^1 + x_i^2$, where x_i^1 denotes party i's share of portfolios in the first period, x_i^2 its share of portfolios in the second period.

[4] The simplifying assumption that the portfolios are divided equally is adopted to mimic the equilibrium payoff in Baron & Ferejohn's (1989) model. Note that this differs from Indridason (2013) who assumes that bargaining resumes at the beginning of the second time period.

[5] It is easy to verify that in this model there can only be two government partners, the formateur and the minor partner, in a Subgame Perfect Equilibrium.

Solving for the subgame perfect Nash equilibria, consider first the parties' decisions to accept or reject an offer in the second period. Proceeding by backwards induction, each parties' payoff equals $\frac{1}{3}$ in each period if an offer does not gain majority support. Thus, an optimal voting strategy in the second period is to accept any offer if the party receives at least $\frac{1}{3}$ of the portfolios.[6]It follows that an optimal proposal in the second period involves offering the bargaining partner $\frac{1}{3}$ of the portfolios. Thus, the expected payoff to the minor coalition party, i, from dissolving and entering negotiations in the second period equals

$$\frac{s_i}{s_i+s_j}\frac{2}{3}+\frac{s_j}{s_i+s_j}\frac{1}{3}=\frac{2s_i+s_j}{3(s_i+s_j)}, \tag{1}$$

where j indicates the opposition party.

Wrong place? A formateur will never optimally propose a three way split and will only offer one party a share. Any two parties can form a majority coalition and adding a third would only serve to reduce the formateur's payoff.

Now consider a party's decision to join a coalition in the first round having received an offer of m_i^1. If it rejects the proposal then caretaker coalition forms resulting in a total payoff of $\frac{2}{3}$ ($\frac{1}{3}$ in each period). Accepting the proposal yields a payoff m_i^1 in the first period. The party prefers to maintain the coalition only if $m_i^1 \geq \frac{2s_i+s_j}{3(s_i+s_j)}$ which is at least as much as the expected payoff from dissolving the coalition. The minor party may, however, be willing to vote to accept an offer $m_1^i < \frac{2s_i+s_j}{3(s_i+s_j)}$ in the first period with the intent of dissolving the coalition and earning a larger share of the portfolios in the second period. Accepting a proposal with dissolution in mind yields the subject an expected payoff of $m_i^1 + \frac{2s_i+s_j}{3(s_i+s_j)}$. Thus, it is optimal for i to vote to accept as long as

$$\begin{aligned} m_1^i + \frac{2s_i+s_j}{3(s_i+s_j)} &\geq \frac{2}{3} \\ m_1^i &\geq \frac{s_j}{3(s_i+s_j)}. \end{aligned} \tag{2}$$

This implies that a proposer can always offer its potential partner less than $\frac{1}{3}$, a limit offer that decreases in the seat share of the smaller potential coalition partner.

Although offering $\frac{s_i}{3(s_i+s_j)}$ to party i is enough to form a coalition, the formateur is always better off in a stable coalition, i.e., to offer its prospective coalition partner a sufficiently large share of the portfolios to make continued participation in government equally attractive to the option of dissolving the coalition. It can

[6]As in many voting games there also exist equilibria in all parties vote either 'Accept' or 'Reject'. Focusing on weakly dominated strategies would eliminate such equilibria here but in the experimental protocol we get around the issue of multiple equilibria by requiring that the formateur votes for her own proposal.

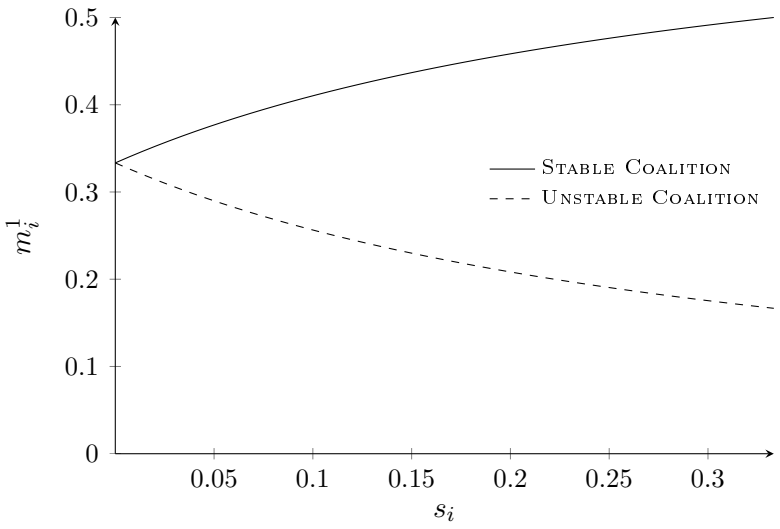


Figure 1: Minimum Offer to Form a Coalition
— when seat share of party not receiving offer is $\frac{1}{3}$ —

be seen from (1) that the smaller of the two potential coalition partners will be satisfied with a lower share of portfolios. Hence, in the subgame-equilibrium the first period formateur offers exactly $\frac{2s_i+s_j}{3(s_i+s_j)}$ to the smaller of the two other parties and nothing to the other party, the offer is accepted and the coalition is maintained in period 2.[7] When a stable coalition forms, the equilibrium offer will lie in the interval $(\frac{1}{3}, \frac{2}{3})$. Figure 1 gives an example of the conditions for stable (1) and unstable (2) coalitions when $s_j = \frac{1}{3}$. The solid line depicts the formateur's equilibrium offer to its coalition partner as an increasing function of the minor partner's share of votes. In contrast, the lowest offer acceptable to a coalition partner, shown be the dashed line, is decreasing in the minor partner's share of votes.

The second model we consider serves as the baseline for comparison against which we can examine the effects of dissolution being possible. This version of the game is essentially a shortened version of the model described above, i.e., the game simply ends after a coalition or a caretaker government has been formed in the first period. Briefly, the game begins by a randomly chosen formateur proposing a division of the portfolios that is followed by each player voting to accept or to reject the proposal. If the proposal receives a majority (i.e., two parties vote to accept) the portfolios are divided according to the proposal. Otherwise a caretaker

[7]Note that the formateur prefers a stable coalition to an unstable one if $2(1 - \frac{2s_i+s_j}{3(s_i+s_j)}) > 1 - \frac{s_j}{3(s_i+s_j)}$. The inequality reduces to $3s_j > 2s_j$, which is always true by $s_j \in (0, .5)$, and a stable coalition is, therefore, always preferred.

government forms and the portfolios are divided equally among the three players. As the formation of caretaker government results in a payoff of $\frac{1}{3}$ for each player the optimal proposal is characterized by the formateur keeping $\frac{2}{3}$ for herself while offering $\frac{1}{3}$ to either one of the other players. The equilibrium proposal neither depends on the share of seats held by the formateur nor the overall distributions of seats. Thus, as in the Baron & Ferejohn (1989) model, there is a substantial formateur advantage.

The two games yield several predictions about the equilibrium strategies of the actors as well as the equilibrium outcome. Considering first the actors' proposal strategies, in equilibrium in both models the actors' proposals aim at forming a minimum winning coalitions but in the model where dissolution is possible the proposals are also minimal winning, i.e., the formateur proposes a coalition with the smaller of the two potential coalition partners.

Implication 1 *Proposed coalitions are minimum winning.*

Implication 2 *When dissolution is possible the formateur proposes a minimal winning coalition with the smaller of her two potential coalition partners in the first period. When dissolution is not possible the formateur is indifferent about who she forms a coalition with.*

In the baseline model, where dissolution is not possible, the equilibrium offer equals the payoff associated with a caretaker coalition, i.e., $\frac{1}{3}$. When dissolution is possible on the other hand, the optimal strategy is to form a stable coalition and offer $\frac{2s_i+s_j}{3(s+_i+s_j)}$ (where i is the smaller of the two potential partners and j is the larger), which exceeds both the payoff needed to form an unstable coalition and the payoff from a caretaker coalition. Thus, the offer made in the model with dissolution exceeds the offer in the baseline model where government dissolution is not an option.

Implication 3 *When dissolution is possible the formateur's offer will exceed both that necessary to form an unstable coalition and the payoff from caretaker coalition. That is, the formateur offers $\frac{2s_i+s_j}{3(s_i+s_j)}$ to its chosen coalition partner i in order to form a stable coalition.*

Thus, the formateur makes a more generous offer when dissolution is an option.

Implication 4 *The formateur's offer to her potential coalition partner is more generous when dissolution is possible.*

When dissolution is an option, the equilibrium offer, $\frac{2s_i+s_j}{3(s_i+s_j)}$ (where $s_i < s_j$), depends on the relative vote shares of the two non-formateur parties. The formateur's offer becomes less generous as the the disparity between the two parties' vote shares increases but is bounded below by $\frac{1}{3}$.

Implication 5 *The formateur's offer declines as the difference in the size of the two potential coalition partners increases.*

Turning to the acceptance strategies, the optimal strategy in the first period is to accept any offer that is at least $\frac{s_i}{3(s_i+s_j)}$ when dissolution is an option and any offer $\frac{1}{3}$ or higher when dissolution is not possible.

Implication 6 *Recipients of an offer are willing to accept lower offers when dissolution is possible.*

In the following section, we examine these implication using a laboratory experiment. The prediction above assume that the players understand the game, are fully rational, and are mutually aware of other players' understanding and rationality. These assumptions may be unrealistic or too demanding. Nevertheless, it is of considerable interest to examine the degree to which the experimental subjects's behavior conforms to the implications listed above as they can be seen to vary greatly in complexity. The first implication, that a minimum winning coalition should be formed, ought to be relatively intuitive whereas figuring out what the smallest offer sufficient enough to form a stable coalition is not a trivial task.

3 Experimental Design and Procedure

The implications of the formal model were evaluated in an experiment conducted at the University of Reykjavik using a subject pool of primarily undergraduate students from the University of Reykjavik and University of Iceland. The experiments were conducted on networked computers using z-Tree (Fischbacher, 2007) in a lab in which subjects were separated by dividers. The subjects received copies of the instructions, which were also read out loud along while screenshots from the experiment were shown.[8] Questions about the procedure were answered in public prior to starting the experiment. Subjects were provided with a paper and pencil to take notes during the experiment but were neither required nor instructed about what information they might want to record. At the beginning of each session, the respondents participated in two trial bargaining rounds, that did not affect their payoff in order to give them an opportunity to familiarize themselves with the computer interface.

The experiment consisted of three treatments:[9]

[8] All offers and votes were removed from the screenshots to avoid priming the subjects.

[9] The letters E and U refer to whether the distribution of votes is [E]qual or [U]nequal and 1 and 2 refer to whether each bargaining round consisted of one or two (as is in the case when dissolving a coalition is possible) bargaining periods.

E2 *Bargaining with the possibility of dissolution with an equal distribution of seats*

U2 *Bargaining with the possibility of dissolution with an unequal distribution of seats*

U1 *Bargaining without dissolution and an unequal distribution of seats*

The fourth possible treatment where there is no possibility of dissolution and the seats are equally distributed was left out.[10] There were two session for each treatment with 18 subjects in each session (for a total of 36 subjects per treatment). Subjects were randomly assigned to groups of three. Each groups' members, labeled X, Y, and Z were then assigned a different number of votes. The total number of votes was 99 in all cases. In treatments U1 and U2 the distribution of votes within each group was 'unequal' (40, 39, and 20) for types X, Y and Z respectively, while in treatment E2 the vote distribution was 'equal' (34, 33, and 32).

Treatment U1 represents the baseline model in which dissolution of the coalition was not possible. Each session of this treatment consisted of 20 bargaining rounds and a single period in each round. In treatments E2 and U2 the experimental protocol allowed for dissolution and each session consisted of 10 bargaining rounds and potentially two bargaining periods within each round. In these cases a second coalition could form if the minor coalition partner opted to dissolve the initial coalition.[11]

At the start of the session participants observed the vote shares of each member of their group. Each subject was then asked to propose a division of 3000 Icelandic krona (kr.).[12] One proposal was then selected at random with the probability of a subject's proposal being chosen equaling their vote share. This procedure allows all the subjects play the role of a potential formateur, thus tripling the number of observations observed. The subjects were then shown the selected proposal and the subjects whose proposals were not selected were asked to vote to accept or reject the proposal. The subjects did not receive any information about proposals that were not selected. If the proposal was rejected by both subjects the pie was divided equally among the participants. In all treatments a rejection meant the end of the bargaining round. In the dissolution treatments (E2 and U2), in which each

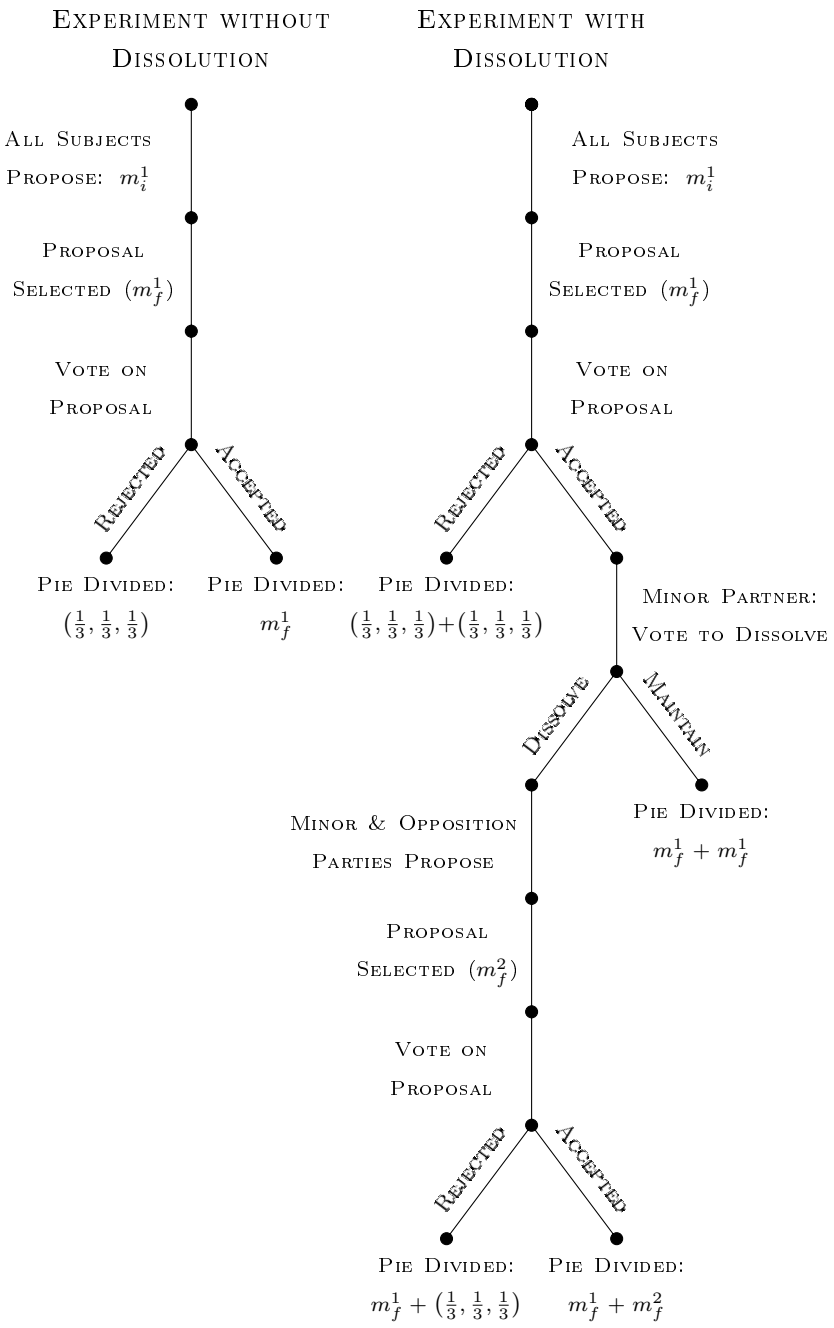
[10] These three treatments are sufficient to test the hypotheses about i) the effects of dissolution and ii) whether the subjects respond in the predicted manner to the change in seat distribution when dissolution is possible. The effect of unequal distribution alone, in absence of the possibility of dissolution is not the focus of this experiment and is not particularly interesting from a theoretical point of view.

[11] XX subjects participating in treatments E2 and U2 participated for a second time which allows for further analysis of the effects of experience.

[12] Roughly equivalent to 25 US dollars or 20 Euros.

bargaining round consists of two periods, this meant that 3000 kr. were divided equally in each period. If the proposal was accepted, the pie was divided according to the proposal. In the no-dissolution treatment (U1) that also marked the end of the bargaining round with the experiment moving on to the next round. In the dissolution treatments, the subjects that agreed to the original proposal (excluding the formateur) were asked if they wished to maintain the first-period division of the pie in the second period or, alternatively, to bargain over the division again in the second period. If the current division of the pie retained majority support (including the assumed support of the formateur) then the pie was divided in the second period in the same way as in the first period. If, on the other hand, the original proposal lost support then the subjects whose proposals were not selected in the first period proposed how to divide the pie in the second time period. After the subjects have made their proposals in the second time period, one proposal was selected at random with the probability of a proposal being selected being proportional to the subjects' vote shares, i.e., the probability that i's proposal is selected equals $\frac{s_i}{s_i+s_j}$ where i and j denote the subjects that participated in the bargaining in the second time period. The subject whose proposal was not selected then votes to accept or reject the proposal. As before, the pie is divided according to the proposal if it has majority support but otherwise the pie is split evenly between all three subjects.

Figure 2: Sketch of Experimental Protocols



Each participant had the same number of votes in all the bargaining rounds but were randomly matched with new bargaining partners in each round. Each

session took about sixty minutes and subjects received an average payoff of 3500 kr. (ca. $29) including a 1500 kr. show-up fee. Subjects participating in the dissolution treatments were invited to participate a second time a week later, one session for each treatment U2 and E2, with 18 subjects in each case. This was done in order to consider the effects of experience.[13] Repeating the U1 treatment was not considered necessary as the subjects played 20 rounds each (as opposed to ten in the other treatments, this version of the game was less demanding, and initial results suggested convergence in behavior in the initial sessions.

Before moving on to the results of the experiment it is useful to summarize the equilibrium predictions given the specific experimental protocols. The equilibrium under the U1 treatment is simple — the proposer retains $\frac{2}{3}$ of the pot for herself and it is optimal to accept any offer that is at least $\frac{1}{3}$. Table 1 shows the equilibrium offers when dissolution is possible (treatments U2 and E2) as well as the acceptance threshold.[14]

Table 1: Equilibrium Offers under the Dissolution Protocol

Treatment	Formateur's Seat Share	Equilibrium Offer	Acceptance Threshold
Equal	32	.498	.164
	33	.495	.162
	34	.497	.164
Unequal	20	.498	.165
	39	.444	.111
	40	.446	.113

In analyzing the results of the experiment, we seek to evaluate how closely the participants' behavior conforms to the equilibrium predictions and — when they don't — what heuristics are employed. In particular, we consider the following aspects of the participants' strategies:

1. Whether proposed coalitions are minimum winning or whether the players tend to divide the pie between more than two players.
2. Whether subjects tend to accept offers which are:
   (a) above the acceptance threshold for a stable coalition (2).

[13] See, e.g., Fréchette et al. (2005) who employ a similar design.

[14] If the proposer wants to maximize her first period payoff then she should seek to form a coalition with the larger of her two bargaining partners as their expected payoff following a dissolution is higher.

(b) [ihi]above acceptance threshold for which joining an unstable coalition is beneficial.

(c) above the more simple reference $\frac{1}{3}$.[15]

Of even greater interest, as relating to Gamson's Law and the question of a formateur advantage, are the implication of the models that concern the effect of the possibility of dissolving coalitions:

1. The possibility of dissolution results in a larger offer and consequently a lower share of the pie for the formateur.
2. The possibility of dissolution makes the offer more sensitive to the distribution of votes, in particular:
   (a) more unequal distribution makes the bargaining partner with the smaller vote share a more attractive coalition partner.
   (b) compared with an equal distribution of votes an unequal distribution will result in a smaller share of the pie offered.

4 Results

The results of our experiment allow us to consider whether the subjects' behavior conforms to the equilibrium predictions in several ways. In particular, the game yields predictions about the size of equilibrium offers (in periods 1 and 2), which subjects receive offers, which proposals should be accepted, the choice to maintain the coalition in the second time period (in treatments E2 and U2), and the overall outcome of the game. We consider each of these in turn. Our primary interest is, of course, in examining how the subjects' behavior varies across treatments but given the strong empirical evidence for Gamson's Law — both in terms of the formation of government coalitions and in other experimental studies — it is also interesting to consider the degree to which the division of the pie is proportional.

4.1 First Period Offers

Consider first the initial offer of splitting the pie. Recall that all subjects make an offer and then one is selected randomly. The share offered is indicated by the variable m_i^j, where i refers to the period within the round and j to refers to the recipient of the offer. For instance m_1^f stands for a subject's offer to herself (i.e., as a potential formateur) in period 1. For each potential formateur, the superscript l refers to the larger of the other group members and s to the smaller member. As

[15]Note that in a treatment with no dissolution case a) does not apply.

it may take the subjects a little while to become familiar with the experiment and figure out what strategy to adopt the first six bargaining periods from the analysis for now but we return to the question of learning below. Figure 3 summarizes the different types of offers in terms of which subjects received a positive share of the pie.

The first implication of the bargaining model was that an optimal offer allocates a positive share of the pie to a minimal winning coalition that includes the formateur, i.e., the proposal should allocate nothing to one member of the group.[16] Overall 74.6% of the subjects' proposals aimed to form a minimal winning coalition. A great majority (23.8%) of those that did not propose a minimal winning coalition offered both the other subjects a share of the pie. When the subjects proposed a minimal winning coalition they were more likely to offer the subject with more votes a positive share of the pie. While the model doesn't generate any expectations about the choice between a smaller or a larger partner in treatment U1, it is optimal to form a coalition with the smaller partner in treatments U2 and E2. While the larger partner was chosen at least as frequently as the smaller ones in those treatments, the formateurs were significantly more likely, in line with the model's predictions, to choose the smaller partner when dissolution was possible (U2 or E2) than in treatment U1. The difference is most clear when comparing treatments U1 and U2 but the effect is also evident when comparing with treatment E2 where the subjects' vote shares differ at most by two votes.

In order to test whether it matters how the subjects and their shares are displayed on the screen, in particular in which order choice of label, the order of subjects was changed between the first and second set of sessions. In the first sessions votes were decreasing in order from left to right and alphabetically (x,y,z). In the second session the display order was unrelated to the number of votes. While there is clearly a higher propensity to choose the subject with more votes as partner in a minimum winning coalition in the first set of sessions, it is still the more frequent choice in all treatments before and after the shuffling of the ordering and labels. It is only in the third set of sessions where subjects with previous experience of the game participated where we observe a higher propensity to propose a minimum winning coalition with a subject with smaller number of votes in the treatment with unequal number of votes.

The formateur advantage is expected to be large in treatment U1 — in equilibrium the formateur keeps $\frac{2}{3}$ for herself. As we saw in table 1, in equilibrium, the formateur advantaged is largely wiped out when dissolution is possible (treatments E2 and U2). The formateur, depending on her vote share and distribution of the

[16] Where necessary, we exclude a few bargaining rounds for one subject from our analysis as the subject clearly misunderstood the instructions and proposed a percentage division instead of an actual division of the pie.

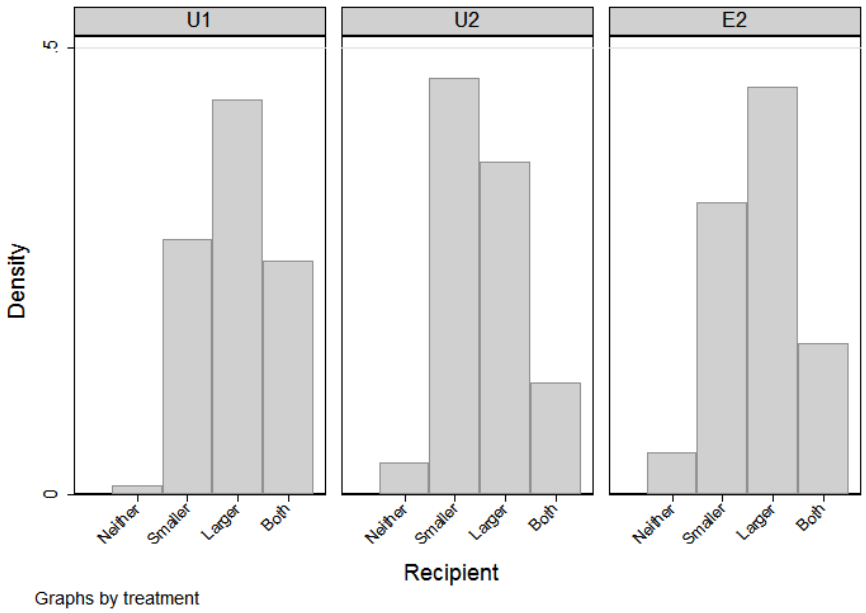


Figure 3: Recipients of offers
— By Treatment (Periods 7-20) —

vote, can only retain about 50-55% of the pie for herself if she hopes to maintain a stable coalition. Figures 4 and 5 shows the distribution of the proposals in a ternary plot (plotted with a jitter to give a better sense of the distribution). While there is considerable variance in the proposals made, most of the proposals are minimum winning (falling on the left and right sides of the triangle) as discussed above. The proposals in treatment U1 appear more clustered than in the other treatments, which is likely a function of the experimental protocol being considerably simpler and the participants playing more bargaining rounds. Focusing on those that are minimum winning, the formateur's share in the proposals is close to 60%, i.e., relatively close to the predictions of the model. In comparison, the formateur is more generous in treatments E2 and U2. It is difficult to tell from the figure whether there is a difference between treatments E2 and U2, which is not surprising since the difference in the formateur's share for the two largest parties in the equilibrium proposal is only 5% points.

We examine the proposals in more detail using linear regression models. The subject's proposes share for herself is the dependent variable with the characteristics of the treatments As shown in table 1, an optimal offers in treatment E2 and U2 is 49.7%($\pm$0.2% depending on subject's vote share) except if the proposer is one of the two larger parties in treatment U2 (44.5%$\pm$0.1%). As the optimal pro-

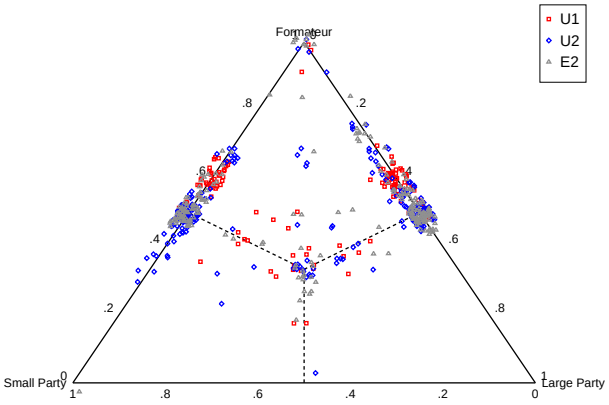


Figure 4: Ternary Plot: Proposals
— By Treatment (Last Four Periods) —

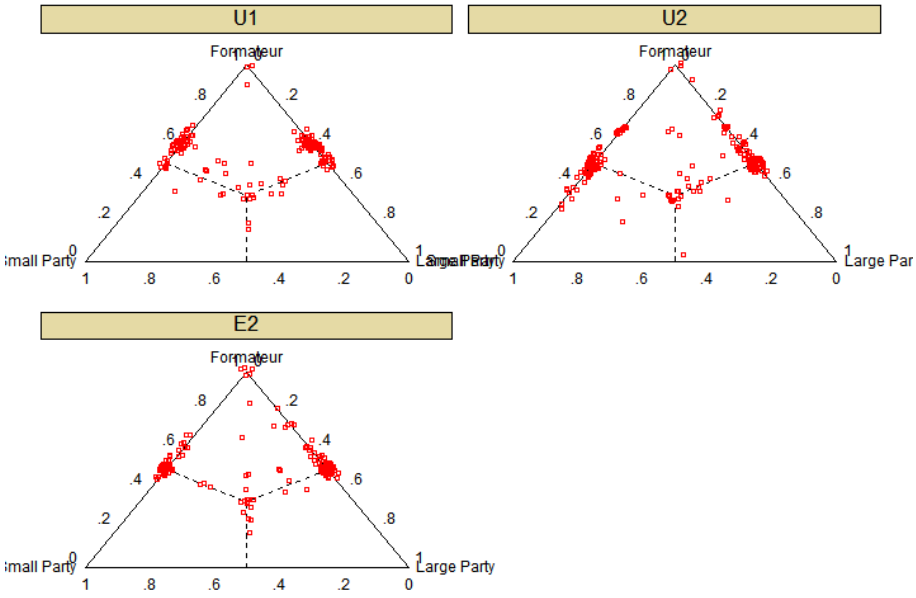


Figure 5: Ternary Plot: Proposal
— By Treatment (Last Four Periods) —

posals are essentially either around 50% or 45%, we test this directly by including a dummy variable that takes the value one if the subject is is in treatment U2 and is not the smallest party. Table 2 shows the results of four regression models. Whether a subject proposed a minimum winning coalition provides an indication of how sophisticated the subjects' strategies were — our expectations is that subjects that are able to figure out that it is optimal to propose a minimal winning coalition are also more likely to reason that the generosity of their offers will affect the stability of the coalition. Thus, the first two models consider any proposal, whether minimum winning or not, while the latter two are restricted to subjects that proposed minimum winning coalitions. Columns 1 and 3 focus on the last four bargaining rounds in each session while columns 2 and 4 focus on 'experienced' subjects, i.e., the last four periods in the sessions with one time period (U1) and the two session that were conducted with subjects that were participating in their second session.

Table 2: [IHI]Proposed Own Share
—Errors Clustered by Subject—

			Minimum Winning Coalition	
		Experienced		Experienced
No. Rounds	-2.53	-2.55	-4.36***	-5.04***
	(0.17)	(0.31)	(0.00025)	(0.0062)
U2 & vote> 39	-0.79	-0.60	-1.48	-3.05
	(0.65)	(0.86)	(0.29)	(0.21)
Constant	57.5***	57.5***	62.2***	62.9***
	(1.9e-38)	(5.1e-25)	(1.5e-70)	(4.0e-39)
Observations	569	287	451	235
R^2	0.010	0.013	0.087	0.203

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The first thing to note is that the possibility of dissolution does have the hypothesized effect, i.e., proposers are more generous when dissolution is possible. However, the effect also appears to vary in strength across the population of subjects. While the presence of a second bargaining round is always estimated to lead to more generous offers, the effect is only statistically significant when the sample is restricted to those proposing minimum winning coalitions. Having a larger vote share in the treatment with an unequal vote distribution does, however, not appear to affect the subjects' behavior. Thus, with regard to the first period proposals,

the hypotheses are only partially supported — there are clear indications that subjects are more generous when faced with the threat of dissolution but they do not appear to appreciate how the vote shares of their bargaining partners affect their propensity to dissolve the coalition in the second period.

How the subjects view their potential bargaining partners in this regard can be addressed more directly by considering the question whether they seek to form a coalition with the larger or smaller (in terms of vote shares) of the two potential bargaining partners. To address that question we estimate logit models where the dependent variable is coded 1 if the smaller of the potential bargaining partners receives the offer and 0 else. The independent variables are dummy variables for two period treatments. While it is optimal to target the smaller party in both treatment U2 and E2, the incentive to do so is clearly much smaller in treatment E2 where all the parties are roughly equal size. The first column, which analyzes the last four periods of each session, indicates that the treatment are estimated to have the expected effect but with a large degree of uncertainty. When the analysis is restricted to experienced subjects (column 2), i.e., only includes those that returned to participate in the experiment a week later, the results indicate that there is a strong tendency to target the smaller party. Compared with treatment U1, the probability of the smaller party being the recipient of the offer increases by 40.3% points when the treatment is U2. The corresponding change for E2 is 10.3% points but is not significant at the conventional levels of statistical significance.

Table 3: [iii]Probability of Small Party Receiving Offer
—Errors Clustered by Subject, Col 2 = Experienced—

	(1)	(2)
U2	0.44	1.71***
	(0.22)	(0.0013)
E2	0.20	0.45
	(0.56)	(0.33)
Constant	-0.82***	-0.82***
	(0.0015)	(0.0016)
Observations	569	287
Log likelihood	-369.4	-180.1

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

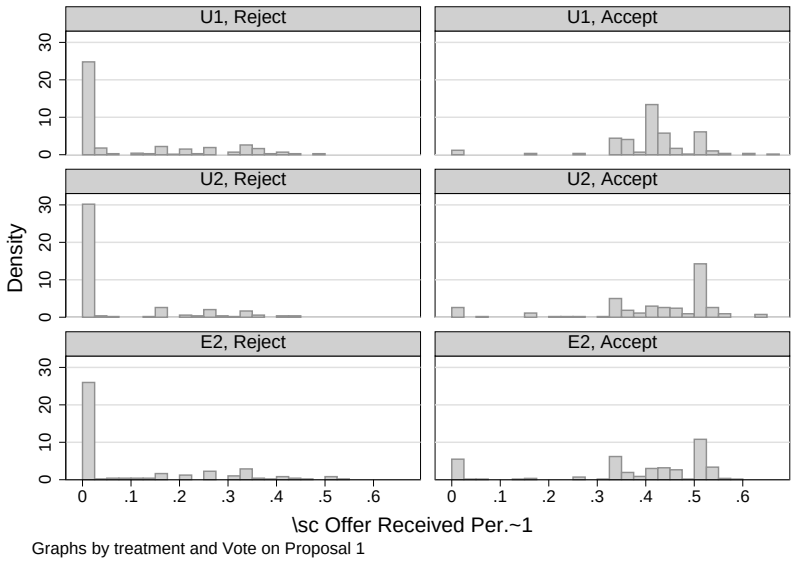


Figure 6: Vote to Accept or Reject
— Period 1, By Treatment —

4.2 Vote on First Period Offer

In equilibrium an optimal proposal offers one bargaining partner at least $\frac{1}{3}$ in all the treatments. However, as we showed above, it is optimal for the recipients of an offer to accept lower offers in treatments E2 and U2. Figure 6 shows histograms of the first period offers by treatment and whether the recipient accepted or rejected the offer. Visual inspection of the histograms does not reveal any stark differences. Regardless of treatment it is unusual for the subjects to accept offers smaller than $\frac{1}{3}$. There is perhaps a slight indication that the subjects are less willing to reject offers that are slightly better than $\frac{1}{3}$ when dissolution is possible, which can be interpreted to be in line with the model's predictions.

To further explore the decision to accept or reject a proposal we model the decision to accept using a logit model, which we can then use to estimate the subjects' acceptance threshold. For simplicity, in table 4 we show the results of separate logit models for each treatment for subjects that received positive offers. The size of the offer has a clear impact as expected. To estimate the threshold of indifference between accepting and rejecting an offer, we take advantage of the fact that a subject is indifferent between voting for or against a proposal when the linear predictor equals 0. The estimated threshold is 34.8% in treatment U1, 30.1% in treatment U2, and 29.1% in treatment E2. On average, the subjects behave almost exactly as expected in the protocol without the possibility of dissolution. When

dissolution is possible, the estimated acceptance threshold is lower as expected but not quite as low as the equilibrium predictions suggest — thus, there are slight indications that the subjects understood that the opportunity to dissolve a coalition was valuable.

Table 4: Accepting a First Period Offer

	Treatment					
	U1	U1	U2	U2	E2	E2
Offer Rec.	0.336**	0.336**	0.196***	0.194***	0.152***	0.161***
	(0.003)	(0.003)	(<.001)	(<.001)	(<.001)	(<.001)
No. Seats		0.0320		-0.0336		0.681
		(0.46)		(0.49)		(0.15)
Constant	-11.69**	-12.70**	-5.895**	-4.701	-4.428**	-27.27
	(0.0067)	(0.0064)	(0.0011)	(0.054)	(0.0011)	(0.093)
Observations	58	58	78	78	83	83
Log Likelihood	-18.23	-17.96	-18.33	-18.09	-27.20	-26.13

p-values in parentheses

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

The model also suggests that the subject's number of votes should affect her willingness to accept offers, i.e., the subject has a greater probability of being chosen formateur following a dissolution the bigger her vote share is. As shown in table 4 controlling for the subjects' vote share appears not to affect the subjects' vote decision.

4.3 To Dissolve or not to Dissolve

A rational decision to accept or reject a proposal depends on correctly evaluating the value of dissolving the coalition at the end of the first period and enter bargaining with the subject outside of the coalition. The expected value of dissolving the coalition depends on the vote shares of the two subjects whose proposals were not selected in the first period. Subjects may find themselves in what are essentially one of three bargaining situations in the second period. First, and most commonly, the subjects encounter a bargaining partner that has roughly the same number of votes in which case the expected payoff from bargaining in the second period is approximately .5. Second, in treatment U2, a subject with 20 votes encounters a subject approximately twice as many votes in which case the expected payoff is .444. Finally, in treatment U2, a subject with 39 or 40 votes encounters the

subject with 20 votes in which case the subjects expected payoff is approximately .55.

The decision to dissolve is examined with a logit model where the dependent variable is the decision to dissolve the coalition. The key independent variables are the subject's obtained share in the first period and the subject's probability of being selected formateur if the coalition is dissolved, i.e., $\frac{s_i}{s_i+s_j}$, as well as an interaction between the two variables. The results (see table 5) are in line with the findings above in the sense that the subjects are clearly responsive to the basic incentive offered by coalition dissolution, i.e., they are less likely to dissolve the larger their current share is, but their is not strong evidence to suggest that they grasp the finer details of those incentives. That is, the subjects' seat shares do not have a noticeable effect on the willingness to dissolve. That said, the subjects appear to do a fairly good job on average — the point at which the subjects are indifferent between dissolving or not is .483.[17] When the logit models are run separately for the three bargaining situations detailed above the points of indifference are, respectively, .445, .493, and .474.[18] The points of indifference for the first two bargaining situation are remarkably close to the model's equilibrium predictions — only the subjects whose vote share are about twice as big as that of their potential bargaining partner are more reluctant to dissolve than expected.

4.4 Second Period Offers

Considering the offers made in the second period following a dissolution of the first period coalition we find that the subjects proposed to keep 57.7% for themselves on average — somewhat less than the $\frac{2}{3}$ predicted by the formal model. The distribution of the proposed share to oneself is shown in figure 7. The expectations about the proposal are constant across treatments but in table 6 we regress the proposer's share on a dummy for whether the distribution of votes was equal or unequal and the difference in the vote share of the two subjects involved in the bargaining in the second period. The results suggest that the proposer keeps a larger share for herself when the distribution of votes are unequal and when she has more votes but the results also suggest that the subjects learn over the course — when all the bargaining sessions are included the difference is statistically significant at the conventional levels but its magnitude and significance drops when the analysis is restricted to the last four periods of each session. Neither the distribution of votes nor difference in vote shares has a clear effect when the analysis is restricted to those subjects that returned for a second session.

[17] The point of indifference is calculated from the first logit model in the same manner as in the previous session.

[18] The three logit models are reported in the appendix.

Table 5: [IHI]Vote to Dissolve
—Errors Clustered by Subject—

	(1)	(2)	(3)
1^{st} Period Share	-0.10***	-0.10***	0.00076
	(<.001)	(<.001)	(0.99)
Weighted Vote$_{t=2}$		0.0083	0.11
		(0.61)	(0.29)
1^{st} Period Share×Weighted Vote$_{t=2}$			-0.0022
			(0.33)
Constant	5.05***	4.64***	-0.31
	(<.001)	(<.001)	(0.95)
Observations	392	392	392
Log Likelihood	-236.5	-236.2	-235.2

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

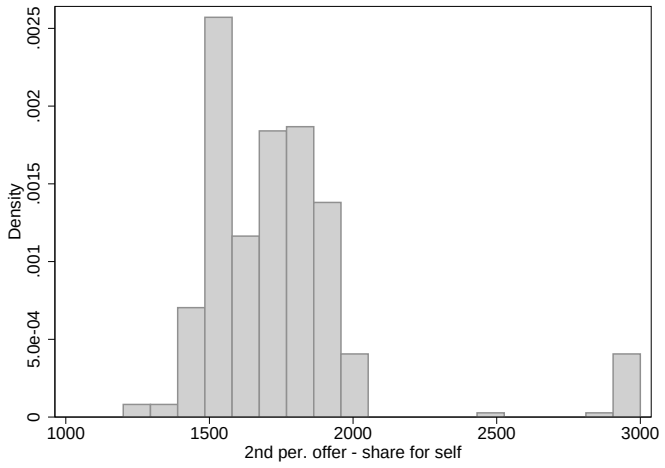


Figure 7: Suggests Share for Self
— Second Period —

Table 6: Suggested Own Share in Second Time Period
—1,2=all,3,4=periods>6,5,6=experienced sessions—

	All		t>6		Experienced	
	(1)	(2)	(3)	(4)	(5)	(6)
Uneq. Vote Distrib.	2.45*	2.45*	1.81	1.87	2.14	2.14
	(0.083)	(0.055)	(0.341)	(0.300)	(0.271)	(0.271)
ΔVote Share		0.27***		0.19**		0.067
		(0.000)		(0.018)		(0.433)
Constant	56.5***	56.5***	56.5***	56.5***	57.2***	57.2***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	388	388	129	129	132	132
R^2	0.013	0.105	0.009	0.068	0.020	0.031

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.5 Vote on Second Period Offer

In the second period it is optimal to accept any offer equal or greater than $\frac{1}{3}$. Figure 8 shows histograms of the proposals made in the second period with those that were accepted on the left and those rejected on the right. In a few cases the subjects reject offers in excess of 40% despite being made worse off by doing so. They, however, hardly ever (and likely only by mistake) vote for a proposal that gives them less than $\frac{1}{3}$ of the pie. To estimate the threshold of indifference between accepting and rejecting an offer, we estimate a logit model with the vote on the proposal as a dependent variable and the size of the offer as the dependent variable that is shown in table 7. In the logit model, a subject is indifferent, i.e., is estimated to vote for or against the proposal with probability one-half, when the linear predictor equals 0. Thus, it is straightforward to see that the offer estimated to leave the subject indifferent equals $\frac{10.41}{29.82} = 34.9\%$, which is very close to the theoretical threshold. Out of curiosity, we examine whether receiving an offer lower than the subject offered affects the subject's vote decision. That appears to be the case, receiving a less generous offer than the subject made reduces the probability of accepting the offer.

4.6 Gamson's Law & Dissolution

The motivation for the experiment was to examine whether the possibility of dissolution can help account for anomalies encountered in the empirical literature on

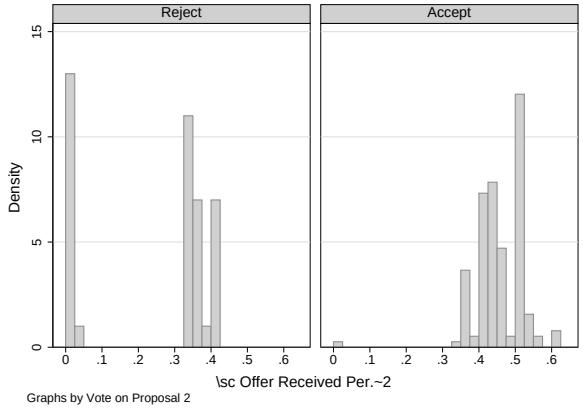


Figure 8: Vote to Accept or Reject
— Period 2 —

Table 7: Accepting a Second Period Offer

	(1)	(2)
Offer Received Per. 2	29.8***	22.5***
	(6.09)	(6.61)
Subject more generous		-1.97*
		(0.81)
Constant	-10.4***	-6.05*
	(2.38)	(2.86)
Observations	193	193
Log Likelihood	-52.3	-48.3

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

portfolio allocation. First, smaller parties are systematically observed to obtain a larger share of portfolios than suggested by Gamson's Law. Second, the evidence for the formateur advantage hypothesized in the formal literature on coalition bargaining has proven to be less than conclusive. Here we focus on the division obtained in the first period of the game, which is a function of both the proposed allocation and the subjects' votes to accept or reject the proposal, to examine the effect of dissolution and formateur status.

In treatment U1, the formateur should be able to reap a substantial formateur advantage by simply offering one of the other group members $\frac{1}{3}$ — the share of the pie each group member receives if the proposal is rejected by a majority vote. In treatments E2 and U2 the formateur advantage is expected to be reduced as shown in table 1. The analysis of the subjects' decisions at the various stages shows that the subjects are responsive to some of the basic incentives created by the game form but also suggest a failure to fully comprehend some of what might be considered the more subtle complexities of the game.

Table 8: Share of Portfolios

	(1)	(2)	(3)
Share of Coalition Votes	0.146**	0.135**	0.0273
	(0.029)	(0.031)	(0.758)
Formateur	4.871***	12.54***	13.37***
	(0.000)	(0.000)	(0.000)
Two Rounds		4.180***	-2.119
		(0.000)	(0.707)
Formateur×Two Rounds		-10.05***	-11.06***
		(0.000)	(0.000)
Two Rounds×Share of Coalition Votes			0.137
			(0.240)
Constant	38.32***	35.61***	40.58***
	(0.000)	(0.000)	(0.000)
Observations	321	321	321
R^2	0.147	0.213	0.217

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Linear regression models are used to assess the effects of dissolution on the outcome of the bargaining. The dependent variable is the share of the pie obtained

by each member of the coalition that forms in the first (and sometimes only) period of the game. The key explanatory variables are the vote share of each coalition partner (as a share of the votes held by members of the coalition) as well as whether the subject was the formateur. We present two sets of results. In table 8 both variables are interacted with the number of rounds as the effect of formateur status should decline when dissolution is possible and the subject's vote share should not be important in the one period treatment (U1). The results in column 1, without the interactions, indicate that the subjects' vote shares have a moderate effect on their share of the pie and that there is evidence of a formateur advantage. The introduction of the interaction terms indicates, however, that the formateur advantage is due to the allocation in the one period treatment and it is largely absent when there are two bargaining periods. Similarly, the vote share only affects the allocation in the two period treatments.[19]

Table 9 presents the results in a slightly more intuitive manner by estimating a separate model for each of the three treatments. The results for treatment U1 are largely in line with expectations — there is a significant formateur advantage and the subject's vote share does not affect the outcome.[20] The formateur advantage drops sharply in treatments U2 and E2. Once we control for whether a grand coalition was formed, the subject's vote share does not affect the subject's outcome.[21] The subjects appear to appreciate the value of being a formateur — and how it is limited by the possibility of the minor party dissolving the coalition — but not how the value of the proposal power varies with vote share.

5 Conclusions

The allocation of ministerial portfolios in parliamentary cabinets has long been recognized as being of considerable importance. Since Gamson (1961), the allocation of cabinet portfolios has generally been considered as being proportional to the size of the coalition parties although a tendency to overcompensate smaller parties was soon noted (Browne & Franklin, 1973). The emergence of a formal literature on coalition bargaining provided some new insights and hypotheses about the patterns of portfolio allocation but more than anything it helped highlight that we lacked a robust theory of portfolio allocation to match the strong empirical patterns. To put it more plainly, our ability to predict how many portfolios each party receives has been far greater than our ability to explain why portfolios

[19] The marginal effect is .1643 (s.e.=.075, p=.029).

[20] Note, however, that the formateur advantage is smaller than expected. The formateur advantage is larger when the sample is restricted to minimum winning coalitions and increased towards the end of each session as the subjects gained experience.

[21] Similar obtain result when controlling for grand coalition in the models in table 8.

Table 9: Realized Shares

	(1) U1	(2) U2	(3) E2
Share of Coalition Votes	0.0273	-0.0810	-0.0569
	(0.764)	(0.177)	(0.931)
Formateur	13.37***	3.661***	1.922**
	(0.000)	(0.004)	(0.042)
Grand Coalition		-14.84***	-16.48
		(0.000)	(0.140)
Constant	40.58***	51.31***	51.07
	(0.000)	(0.000)	(0.123)
Observations	78	124	119
R^2	0.546	0.161	0.540

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

are divided in a particular manner.

It is important to note that the value of formal models, or theories more generally, does not rest entirely on their ability to provide 'point predictions'. Most theories, formal or not, focus on the effect of changes of one factor on another or on comparative statics. The formal literature on coalition formation provided some such hypothesis. In particular, formal models of coalition formation predicted that the formateur should be able to use her position to her advantage and obtain a larger share of cabinet portfolios. Empirical tests of this hypothesis have, however, failed to find conclusive evidence for the formateur advantage.

Here we have examined a simple model of coalition formation that suggests an explanation for i) why smaller parties tend to be reap more than their proportional share of cabinet portfolios and ii) why the formateur advantage has proven to be so elusive. The logic underlying the model is simple — coalition payoffs are realized over time and formateurs, thus, have an incentive to form stable coalitions. Doing so requires them to 'sacrifice' some of their formateur advantage and to make more generous offers to their coalition partners whose willingness to dissolve the government coalition is subsequently reduced.

The model's implications are tested in a laboratory setting that allows us to manipulate the subject's ability to dissolve coalitions as well as their vote shares. Our findings lend some support to the expectations that are derived from the model. In particular, we find that subjects in their formateur roles behave largely

in line with expectations, i.e., their offers become more generous and the formateur advantage decreases when we move from the treatment where there is not possibility of dissolution to those where dissolution was possible. This effect became more pronounced as the subjects gained experience. The results with regard to the subjects' vote shares were less clear cut — overall the subjects were not responsive to their own or their bargaining partners' vote shares. The one exception is that the subjects learned to favor the smaller of the two possible coalition partners when the difference in their vote shares was large.

The findings here, thus, provide some support for the idea that the power of dissolution reduces the magnitude of the formateur advantage. Empirically, this also tends to advantage smaller coalition parties as small parties are less likely to be appointed formateurs. The experiment, of course, takes place in a laboratory setting with college students as subjects, which naturally leads to question regarding the external validity of the experiments as we are interested in making inferences about the behavior of seasoned politicians who have climbed to leadership positions within their parties. It is quite evident that these two populations are quite different and that the stakes in the experiment are far lower than when it comes to the formation of a government coalition. Yet, we do find that the college students in our experiment were able to figure out the basic incentives presented in the game in a space of 60 minutes — and the performance of those invited to return a day later was further improved — although the failed to act on some of the more subtle incentives embedded in the game. It seems plausible that experienced politicians who engage in coalition negotiations over several days or weeks would at least not be less able to figure out the strategic incentives facing them. Of course, there is no systematic evidence to back such an assertion up but there is anecdotal evidence that considerations such as those incorporated into the experiment influence coalition formation.[22] Furthermore, Indridason (2013) provides evidence of patterns of portfolio allocation consistent with the model's implications.

[22]See, e.g., **?** on coalitions between the CDU and the FDP in Germany.

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