

BUYING SUPERMAJORITIES IN THE LAB*

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Abstract

Many political decisions taken in legislatures or committees are subject to lobbying efforts. A seminal contribution to the literature on vote-buying is the legislative lobbying model pioneered by Groseclose and Snyder (1996), which predicts that lobbies will optimally form supermajorities in many cases. Providing the first empirical assessment of this prominent model, we test its central predictions in the laboratory. While the model assumes sequential moves, we relax this assumption in additional treatments with simultaneous moves. We find that lobbies buy supermajorities as predicted by the theory. Our results also provide supporting evidence for most comparative statics predictions of the legislative lobbying model with respect to lobbies' willingness to pay and legislators' preferences. Some of these results carry over to the simultaneous-move set-up but the predictive power of the model declines.

Keywords: legislative lobbying, vote-buying, Colonel Blotto, multi-battlefield contests, experimental public choice.

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1 Introduction

Special-interest groups frequently try to influence political decisions. The Center for Responsive Politics documented that in just the first three quarters of 2017, lobbyists working on tax-related issues donated USD 9.6 million to members of the U.S. Congress.¹ A prominent theoretical approach to analyze how such payments are made to influence political decisions is the legislative lobbying model pioneered by Groseclose and Snyder (1996), henceforth GS. In this model, two opposed lobbies move once and sequentially. A central prediction is that the first-moving lobby will often find it cheaper to bribe a supermajority of legislators rather than a simple majority. Further, the model predicts that the first-moving lobby should leave no soft spots for the opposed second-moving lobby by making payments so that all lobbied legislators are equally expensive to buy out of the coalition.

In this paper, we aim to shed some light on the predictive power of this prominent workhorse model by testing its key predictions in the laboratory. Based on examples given in the original GS paper, we design several scenarios with seven legislators predicting different sizes of lobbied supermajorities and varying distributions of bribe offers. However, even if these predictions were confirmed in our experiment, one of the obstacles to claiming external validity of, and at the same time one of the main points of criticism of, the GS model is the assumption of sequential moves. While it allows for clear predictions regarding the number and level of bribes, this assumption may not hold in reality. Therefore in a next step, we relax it and run treatments in which lobbies move simultaneously. Our study thus combines tests of game-theoretical model predictions with a “stress test”.²

At first sight, it seems that moving from sequential to simultaneous moves could drastically alter the logic of the game, as no lobby enjoys a second-mover advantage anymore. However,

¹We note that the Republican tax reform passed Congress in the fourth quarter. See <https://www.opensecrets.org/news/2017/12/tax-lobbyists-contributions> for more details. Details on many more cases, almost exclusively based on data provided by the U.S. government, are presented on OpenSecrets.org, the Center for Responsive Politics’ website.

²Morton and Williams (2010, p. 204) define a stress test as an investigation that tests “*the predictions of a formal model while explicitly allowing for one or more assumptions underlying the empirical study to be at variance with the theoretical assumptions.*” This approach is not very common in the experimental economics literature. A notable exception is the work on legislative bargaining by Tremewan and Vanberg (2016). We believe that stress tests could yield valuable insights in many more studies.

despite the fact that no analytical predictions are available for the simultaneous case with seven legislators, we argue that the underlying economic logic suggests that we should observe similar comparative statics results as in the sequential case. To be able to make more precise predictions for simultaneous scenarios, we reduce the number of legislators to three in additional treatments. While the computation of all equilibria is unfeasible with normal computing power for the seven-legislators case, we are able to determine all equilibria of the simplified set-up. In fact, for one scenario we obtain the daunting number of 101 different (mixed-strategy) equilibria. However, they share some common properties, which allows for comparative statics predictions regarding the number of bribes and the sum of bribes offered between scenarios and, as conjectured, these predictions go in the same direction as those for the sequential case. While it seems unlikely that these equilibria will be identified by the subjects of the experiment, the comparative statics predictions might, nevertheless, capture the economic intuition of the game. We compare the predictive performance of these equilibria with the GS predictions for the sequential-moves case.

Our experimental results confirm most comparative statics predictions of the GS model for the sequential-moves scenarios, but point predictions regarding the number and level of bribes are not very precise. The explanatory power of the predictions derived in the sequential-move set-up declines for the simultaneous-moves treatments but many comparative statics predictions are, nevertheless, robust to the relaxation of this central model assumption. The simplified scenarios with three legislators confirm this pattern.

Relation to the literature There are several different approaches to theoretically capturing lobbying in the form of vote-buying.³ In the common-agency approach several principals (lobbies) make offer schedules to an agent (politician) specifying for any possible policy choice how many resources they would pay if it was implemented. This model was introduced by Bernheim and Whinston (1986) and it has often been applied since, for example, famously for analyzing the role of special-interest groups in the shaping of trade policies (Grossman and Helpman, 1994, 2001). Kirchsteiger and Prat (2001) test some of the model's key predictions in the lab.

³For brevity we omit a discussion of other forms of lobbying, such as informational lobbying (Crawford and Sobel, 1982) and lobbying in the form of legislative subsidies (Hall and Deardorff, 2006; Ellis and Groll, 2017).

While the common agency approach offers explanations of the lobbying of a single policy-maker, our interest in this paper is in the lobbying of legislatures or committees. We focus on the seminal legislative lobbying model of Groseclose and Snyder (1996). In the original set-up, lobbies move sequentially in making offers to the legislators in favor of their preferred policy choice, which is either an exogenously given policy change or the status quo. As one of the landmarks in the lobbying literature the GS model has triggered interesting variations and extensions (e.g., Diermeier and Myerson, 1999; Banks, 2000; Dekel et al., 2008, 2009; Hummel, 2009; Le Breton and Zaporozhets, 2010; Schneider, 2014, 2017) but surprisingly has not been tested empirically in the laboratory. This is the focus of the present paper. In addition to testing the model’s key predictions, we conduct a stress test by relaxing the central assumption of sequential and publicly visible moves of the two lobbies. These somewhat arbitrary assumptions have been a point for criticism of the sequential legislative lobbying model (e.g., in Grossman and Helpman, 2001). Assuming simultaneous moves instead – an equally arbitrary assumption, proponents of the legislative lobbying model might argue – transforms the game into a Colonel Blotto type of game. This class of games has been studied in another strand of the literature.

The models proposed in this strand of the literature assume simultaneous moves. A contest success function determines who wins the vote of a legislator in a legislature that is deciding on an exogenously given policy proposal. Variations of this approach range from assuming Tullock success functions to different types of auctions (e.g., Szentes and Rosenthal, 2003a,b; Konrad and Kovenock, 2009; Kovenock and Roberson, 2012). The use of all-pay auctions has been very prevalent in the theoretical literature. Various versions of all-pay auction lobbying games have been studied in the laboratory (e.g., Arad and Rubinstein, 2012; Chowdhury and Kovenock, 2013; Dechenaux et al., 2015; Hortala-Vallve and Llorente-Saguer, 2015; Montero et al., 2016; Mago and Sheremeta, 2017). Of particular interest is the classical “Colonel Blotto game”, first analyzed by Borel (1921), where the lobby making the highest payment wins the legislator’s vote. The theoretical solutions to this game are notoriously complicated (Roberson, 2006; Roberson and Kvasov, 2012; Kvasov, 2007). Typically, no pure-strategy equilibria exist in this class of games with the exception of some special cases, for example, with asymmetric battlefield valuations (Hortala-Vallve and Llorente-Saguer, 2012). Casella et al. (2017) show

how decision-making with storable votes can be understood as a decentralized Blotto game – decentralized, as voters with majority and minority preferences make their voting decisions in a decentralized rather than in a coordinated way. The authors show that the economic logic underpinning this game is very similar to that in Blotto games, where players have to mix between the strategies of concentrating their votes on one issue or spreading them out over several or even over all issues.

The simultaneous version of the model in our paper differs from Blotto games in that it is not an all-pay auction. Lobbies make bribe offers that have to be paid only if the legislator votes accordingly: that is, if the battlefield is won. However, our model shares the described economic logic, according to which the weaker lobby tends to concentrate their bids on a few legislators while the stronger lobby is more likely to spread its bids over a large number of legislators. While there is no general theoretical solution of this particular game, we are able to present results for some specific settings that we implement in the lab, and the experiment provides a first idea of how different the results between the simultaneous and sequential model variants are.

It is of general interest how subjects play complex simultaneous-move games. Colman et al. (2014) suggest that subjects might use a heuristic called “Strong Stackelberg Reasoning”, according to which subjects play simultaneous games as if they were sequential. If subjects followed this heuristic, we would not find any differences between the sequential and the simultaneous set-up with respect to behavior of the lobby that moves first in the sequential set-up.

The paper is organized as follows. In Section 2, we introduce the sequential legislative lobbying game and the theoretical reasoning behind its central equilibrium predictions. We then discuss the game with simultaneous moves and explain why some comparative statics in the simultaneous-move game may be similar to those in the sequential set-up. We go on to design the scenarios that we implement in the lab and describe the procedural details of the experiment. We present and discuss our results in Section 3 and we conclude in Section 4. Experimental instructions and additional results are relegated to the Appendix.

2 Theoretical Background and Experimental Design

In this section, we first introduce the legislative lobbying model and its main theoretical predictions. We start with the sequential-move game and then discuss the differences for the simultaneous-move game. Our focus will be on the intuition behind the theoretical results that are important for our experiment.⁴ In the second part of this section, we explain the design of the scenarios that we implement in the lab.

2.1 Theoretical Mechanism

The model set-up considers two lobbies, A and B, that compete by making payment offers to legislators for votes to win a majority in a legislature of size N , which we assume to be an odd number for simplicity. Lobby A prefers a policy change while lobby B supports the status quo. Legislators have preferences regarding the two policy options expressed by a bias v_i in favor of voting for the policy change and against the status quo. The subscript i refers to legislator i . Hence, a positive value of v_i expresses a preference in line with that of lobby A, while a negative one is aligned with the preferences of lobby B.

In the sequential game, lobby A moves first, offering a schedule of bribes $\{b_i^A\}$ to the legislators. Lobby B moves second, with schedule $\{b_i^B\}$ and $b_i^A, b_i^B \geq 0$. Lobbies only pay what they had offered if the legislator voted for their preferred alternative. After observing both lobbies' offer schedules, the legislators vote in favor of policy change if $v_i + b_i^A > b_i^B$ and otherwise they vote for the status quo. The policy alternative that wins a majority will then be implemented. Note that legislators get utility from voting for their preferred policy, irrespective of the legislature's decision to implement either of the two policy options.

As shown in Groseclose and Snyder (1996), there is a unique subgame-perfect equilibrium for this sequential game, with the following property: either the first mover succeeds in forming a majority coalition that preempts the second mover from winning the vote and the first mover will consequently make the corresponding payments; or the first mover has no possibility of keeping the second mover from securing a majority for the status quo and refrains from offering

⁴A detailed analysis can be found in for example, Groseclose and Snyder (1996); Le Breton and Zaporozhets (2010); Schneider (2014).

any payments at all. In the first case, the second mover will not make any payments and in the latter case the second mover will only compensate the pro-change biases of a sufficient number of legislators for a simple majority to vote for the status quo. In fact, in all scenarios that we implement in the lab, a majority of legislators have a (slight) preference bias for the status quo. Consequently, the second mover will never make any payments in equilibrium and only the first mover will form winning coalitions through payments if feasible.

Predictions in the sequential legislative lobbying game and economic intuition

The following equilibrium properties provide four key predictions that we will test in the laboratory. First, **there are no equilibria where both lobbies make payments**. Second, when making payments, the **first-mover lobby will use a leveling strategy**, where every bribed legislator will be equally expensive to buy back for the second mover. The intuition for the optimality of a leveling strategy is that it leaves no “soft spots”. To understand this, suppose that some legislators can be bought back by the second mover at a lower expense than others. Requiring only a simple majority for the status quo to destroy the coalition for a policy change, the most expensive legislators will not be offered any payments – the second mover will instead concentrate his offers on the cheapest set of legislators. In this case, however, it is optimal for the first mover to reduce the offers to the most expensive legislators to increase the offers to the least expensive ones. This logic applies as long as the legislators differ in regard to the cost of securing their vote in the second mover’s favor.

The third central prediction is that the **optimal sizes of the majorities (weakly) decrease with the legislators’ biases in favor of the status quo, v_i , and (weakly) increase with the prize for B**. The central insight advanced by Groseclose and Snyder (1996) is that it is often cheaper to form a supermajority than a simple majority. The key intuition behind this insight is that the amount necessary for the second mover to destroy a majority formed by the first mover must exceed the second mover’s willingness to pay. In the case of a simple majority, the second mover needs to buy back only one legislator. That is, for each legislator in the first-mover’s coalition, the first mover’s offer b_i minus the legislator’s initial bias for the status quo v_i must be larger than the second mover’s willingness to pay. If the first mover increased

the majority by another legislator, the second mover needs to buy back two legislators to break the coalition for a policy change. Consequently, for any two legislators the cost must exceed the second mover's willingness to pay. This allows the first mover to reduce the offers made to each single legislator, thereby saving resources as long as the initial status quo bias of the additional legislator in the coalition is sufficiently small. The trade-off when including another legislator in the coalition is between the resources that can be saved by being able to reduce the bribe offers to all other legislators in the coalition and the extra amount to be paid to neutralize this legislator's initial bias in favor of the status quo. Accordingly, if the legislators do not have any preferential bias towards the status quo, it will be optimal to form a coalition including all legislators. Further, for given preference biases of the legislators, the larger the willingness to pay for B is, the larger will be the reduction in the offers to the legislators in the coalition, when the majority is increased by an additional legislator. Hence, *ceteris paribus*, the larger B's willingness to pay is the (weakly) larger the size of lobby A's majority will be. It follows from this intuition that, *ceteris paribus*, if the legislators' biases in favor of the status quo are smaller or the second mover's willingness to pay is larger, the size of the supermajority formed by the first-mover will be larger.

The fourth central prediction is that, as there is a unique pure-strategy equilibrium in the sequential legislative lobbying game, **either lobby A or lobby B will win the vote for sure.**

We test these predictions in the lab in several scenarios varying the degrees of the status-quo biases of the legislators and the second mover's prize which reflects their maximal willingness to pay to break a pro-change majority by the first-mover lobby. We describe the specific scenarios, with their particular predictions, in the next section.

Predictions in the simultaneous-move game and economic intuition

One of the specific criticisms of the sequential legislative lobbying model is the sequential timing of the lobbies' moves. The direct method of assessing how important the sequential moves are in this set-up is to compare the outcomes with those in the exact same game but with simultaneous moves. Models of this type are often referred to as "Colonel Blotto games",

which are notoriously difficult to solve analytically. Except for trivial cases, for example, when one lobby's willingness to pay is zero, there cannot be any pure-strategy equilibria. The reason for this is the following: in any combination of two pure strategies by lobbies A and B, if one of the lobbies wins there will be a possibility to deviate to win at lower costs given the strategy of the other lobby, or there is a possibility for the other lobby to win the majority given its opponent's offer schedule. While several variants of these "Colonel Blotto games" have been solved, resulting in very complicated mixed-strategy equilibria, there is no general solution in the literature that could be easily adapted to our simultaneous-move set-up because of two particular properties: (1) it is not an all-pay auction: offers do not have to be paid if the legislator does not vote accordingly; and (2) the lobbies' objectives are to win the majority of votes, while the Colonel Blotto game has been solved for lobbies which try to maximize the number of voters voting for their cause (not caring about whether they will win a majority).

Consequently, the only way to obtain theoretical predictions for our experiment is to compute the equilibria for the particular scenarios and parameters that we bring into the laboratory. For the standard legislative lobbying game, as depicted earlier, this is possible for the simplest possible set-up with three legislators and very low willingness to pay on the part of the lobby defending the status quo. Even in this simplest set-up, we obtain a large number of equilibria that can be summarized in several equilibrium types. It is not possible to derive equilibrium predictions in more complicated set-ups, with more than three legislators or higher willingness to pay for the status quo with normal computing power.⁵ While any such set-up can, in principle, be solved with supercomputers, the experimental subjects certainly cannot, and have to rely on some sort of intuitive reasoning. However, it might be interesting to see if the intuitions outlined below also show up in the equilibria for the simple scenarios, and if they add explanatory power in the data analysis. For this reason, we bring two different set-ups, each with sequential and simultaneous moves, into the laboratory: one with seven legislators and one with three. The scenarios with seven legislators allow us to directly connect to the examples given in Groseclose and Snyder (1996) and test how different the outcomes will be if

⁵For example, with seven legislators and a willingness to pay of lobby A of 9, there are roughly 10^7 (not weakly dominated) pure strategies for lobby A. The payoff matrix would be extremely large (many terabytes).

the game is played with simultaneous moves. For the scenarios with the three legislators set-up, we can derive theoretical predictions for both the sequential and simultaneous-move game.

The following intuition suggests that a similar logic regarding supermajorities as in the sequential game holds in the simultaneous-move game as well. In principle, there are two strategy types for winning a majority: (a) offering a large number of legislators a small amount on top of neutralizing the legislators' preference biases and (b), offering a smaller number of legislators a substantial amount on top of preference bias neutralization. Strategy (a) tries to win a majority by winning over those legislators to which the opposed lobby B did not make any offers or offered very little. Overall, the probability of winning the vote of any particular legislator might not be very high but the probability of winning sufficient legislators for a majority is substantial. Strategy (b) seeks to achieve a high probability of winning almost all of the legislators in a small coalition. The mixed strategies of the lobbies in the simultaneous game are probability distributions over the support comprising strategies of type (a) and type (b) as well as hybrid versions of the two. If the preference of the legislators is biased more strongly against the policy change, lobby A needs to pay more to neutralize the preference bias for all legislators in its coalition. This makes strategies of type (a) more costly and we expect that this will reduce the probability weight on such pure strategies in the mixed strategy played in equilibrium. Consequently, as in the sequential game, we predict that the expected size of the majorities formed by lobby A will be smaller if the legislators' preference biases against the policy change are larger. By contrast, if the prize of winning the vote for lobby B increases, securing almost all legislators' votes in a small coalition will become substantially more expensive for A, leading to a reduction in the probability weight on strategies of type (b). Hence, we expect larger expected majority sizes for A if B's willingness to pay is higher.

In summary the depicted intuition suggests that the same comparative statics results with respect to lobby B's willingness to pay and legislators' initial biases as in the sequential game can be found in the simultaneous-move set-up.⁶ However, despite similar comparative statics results we expect higher variation in offer schedules in the simultaneous-move game relative to

⁶For the three-legislators scenarios, we show that the theoretical comparative statics results for the simultaneous set-up are indeed the same as those for the sequential set-up (see subsection 2.2.2).

the sequential-move set-up due to the equilibria being in mixed strategies.

Moreover, while in the sequential game lobbies either win or lose the vote for sure, the simultaneous game allows lobby A to slightly reduce the probability of winning in order to reduce the expected amount of bribes to be paid. Hence, we expect that the winning probability of A will be lower in the simultaneous game than in the sequential legislative lobbying game. Another reason why the results in the simultaneous-move game may be similar to the results in the sequential game could be that in complex games individuals apply a simple heuristic called “Strong Stackelberg Reasoning”, proposed by Colman et al. (2014). This suggests that subjects play simultaneous games as if they were sequential. If subjects followed this heuristic, we should not find any differences between the sequential and the simultaneous set-up with respect to the behavior of the lobby that moves first in the sequential set-up.

2.2 Lab Scenarios

In the experiment we implement seven scenarios for the game with seven legislators and two scenarios for the game with three legislators.

In the first five scenarios with seven legislators, all legislators are identical and between scenarios we vary their preference bias towards the status quo as well as lobby B’s willingness to pay. In the last two scenarios with seven legislators, we slightly increase the complexity by considering differences in the preferences of the legislators and by varying the willingness to pay of the status quo-defending lobby between the two scenarios.

For the set-up with three legislators we consider two scenarios with homogeneous legislators with different status-quo biases between the two specifications. As indicated previously, our focus here is on testing our theoretical predictions for both the simultaneous and the sequential games.

2.2.1 Legislature with Seven Legislators

In all scenarios, Lobby A possesses a maximal willingness to pay of 300 in order to win the vote in favor of a policy change. Lobby B’s willingness to pay to win the vote for preserving the status quo varies between a relatively weak 12, a strong preference of 60, and a very strong

preference of 180. Moreover, the scenarios show different biases of the legislators. In the sequential games, lobby A always moves first, and the defender of the status quo, B, moves second. The budgets are 400 for lobby A and 200 for lobby B.

Scenarios with homogeneous legislator preferences We consider legislators to be either unbiased (more precisely, they have a minimal bias of 0.5 in favor of the status quo as a tie breaker if no payments are made), or to have a strong status quo bias of 19.5. The particular scenarios with their equilibrium predictions in the sequential-move game are summarized in Table 1.

Table 1: Theoretical Predictions for Scenarios with Seven Legislators

	Sc1	Sc2	Sc3	Sc4	Sc5	Sc6	Sc7
Prize B	12	12	60	60	180	12	60
Legislator valuation							
Legislators 1–3	- 0.5	-19.5	-0.5	-19.5	-19.5	12.5	12.5
Legislators 4–7	- 0.5	-19.5	-0.5	-19.5	-19.5	-19.5	-19.5
Equilibrium predictions							
Coalition size A	7	4	7	6	0	4	6
Leveling [%]	100	100	100	100	0	100	100
Total bribes A	25	128	109	238	0	32	142
Total bribes B	0	0	0	0	0	0	0

The idea behind Scenarios 1–4 is to test our hypotheses regarding the predictions on changes in the prize for lobby B and in the legislators’ evaluations. In particular, comparing the results between Scenarios 1 and 2, and between Scenarios 3 and 4, indicates the effects of differences in the legislators’ preference biases towards the status quo. With higher biases the majority is predicted to decline. The majority size declines less if the value of the status quo for lobby B is higher as the latter makes a larger majority more beneficial as explained in Section 2.1.

Comparing the results between Scenarios 1 and 3, and between Scenarios 2 and 4, reveals whether the hypothesis that majority sizes (weakly) increase with higher willingness to pay of the status quo defender holds. As pointed out previously, with neutral bias of the legislators it is always optimal to form a maximal coalition including the entire legislature. However, there

are substantial costs of large majorities when the legislators have strong status-quo biases. In this case, a large coalition is only optimal for the pro-change lobby if the defender of the status quo has a high willingness to pay, thereby increasing the benefits of a large supermajority.

In Scenario 5, we test the case where the willingness to pay by lobby B is so great that there is no profitable way for lobby A to preempt lobby B buying back a sufficient number of legislators to preserve the status quo.

The theory predicts leveling in all cases (except Scenario 5), which theoretically implies that all legislators in the coalition obtain the same offer in the scenarios with homogeneous legislator valuations. As we only allow offers in integers in the experimental scenarios and impose valuations of a half to break ties, the least expensive way to form a majority coalition for lobby A is to pay one unit less to one legislator less the number of legislators in the coalition that the second mover needs to buy back to destroy the majority in favor of policy change. As a consequence of the indivisibility implied by integer offers, leveling in the scenarios we implement in the lab can thus include differences of one between the offers.

Heterogeneous valuations by legislators We also test the situation where the legislators have heterogeneous valuations. Three legislators have valuation 12.5 in favor of policy change and four legislators have -19.5 . The prize of winning for B is again either 12 or 60. In the case where lobby B's willingness to pay is only 12, lobby A does not have to worry about B offering bribes to any of the three legislators with 12.5 valuation of policy change when it forms a winning coalition. Consequently, lobby A will concentrate their offers on the legislators that are biased towards the status quo to form a pro policy change coalition that includes legislators with and without bribe offers. This is referred to as a *non-flooded coalition*. In the second case, where B's willingness to pay is 60 for the status quo, it is necessary to make an offer to a legislator with initial preference bias of 12.5 in favor of policy change. As a consequence of the "leaving no soft spots" logic, lobby A will have to make additional offers to the pro-change legislators as well as to a number of legislators initially leaning towards the status quo. All legislators in the formed coalition will receive payments: a *flooded coalition*.

Scenarios 6 and 7 have been set-up to test whether participants form a non-flooded and a

flooded coalition, respectively. In Scenario 6, it is optimal for lobby A to form a non-flooded coalition of four where only one pro status-quo legislator with valuation -19.5 receives a bribe of 32. In Scenario 7, it is optimal for A to form a flooded coalition with six legislators. To make all legislators in the coalition equally costly to buy back, lobby A offers all pro-change legislators a payment of 8 and among the other three status-quo leaning legislators it offers 39 to two of them and 40 to one. Recall that the latter is due to our design, which allows only integers as payment offers. The minimal total cost for this flooded coalition will be 142.

2.2.2 Legislature with Three Legislators

Both lobbies possess a budget of 30. The maximal willingness to pay for policy change by lobby A is 25 and the maximal willingness to pay to defend the status quo by lobby B is 2. Legislators are homogeneous and we again implement a scenario (Scenario 1) where legislators are unbiased (valuation of -0.5 for tie-break without payments) and one where they relatively strongly lean towards the status quo -4.5 (Scenario 2).

In the sequential game, where lobby A moves first, it is least expensive to buy a supermajority comprising all three voters and to spend 2 on two legislators and offer 1 to the third, summing up to a total cost of 5. In Scenario 2, the costs of a vote in favor of policy change is more expensive, leading to an optimal majority of two legislators formed by paying both 7. This adds up to a minimum total cost of 14.

In Table 2, we contrast the predictions of the sequential-move game with those in the corresponding simultaneous-move game.⁷

While we obtain 16 equilibria for Scenario 1 and 101 equilibria for the Scenario 2, they can be subsumed under a much smaller set of equilibrium types. Equilibrium types comprise all equilibria where strategies only differ in regard to the permutations of payments between different legislators. In all four equilibrium types in Scenario 1, the pro-change lobby A randomizes between a grand coalition with payments of 1 for each legislator, and forming simple majorities by offering a payment of 1 to any two legislators. Each of the four possibilities carries an equal

⁷We used the software GAMBIT 14 to solve the simultaneous games. Documentation can be found in McKelvey et al. (2016) and at <http://www.gambit-project.org/>. We will provide the details of all the different equilibria to the interested reader upon request.

Table 2: Theoretical Predictions for Scenarios with Three Legislators

	Sc1	Sc2
Legislator valuation	- 0.5	-4.5
Equilibrium types:		
sequential	1	1
simultaneous	4	12
Coalition size A:		
Equilibrium: sequential	3	2
Equilibrium: simultaneous	2.25	2
Leveling by A:		
Equilibrium: sequential	100	100
Equilibrium: simultaneous	100	0 – 100 (dep. on eq. type)
Total bribes proposed by A:		
Equilibrium: sequential	5	14
Equilibrium: simultaneous	2.25	11

probability weight of 0.25. Consequently, we expect a supermajority in a fourth of cases and in three-quarters of cases a simple majority. This implies that, on average, coalition sizes formed by A should be 2.25 and the expected costs amount to 2.25 as well. Compared to the sequential set-up, this makes it substantially cheaper for lobby A to effect policy change, which reflects the second-mover advantage of the defender of the status quo in the sequential set-up, as well as the fact that it is optimal for the pro-change lobby to give up a 100% probability of winning the vote. The different strategies by lobby B define the four equilibrium types. However, they look very similar: all place a large probability of about 95% on not making any offers, while the six strategies where either one or two legislators are offered an amount of 1 carry almost equal shares of the remaining 5% probability. Consequently, we expect, on average, close to zero payments by lobby B.

In Scenario 2, we find 12 equilibrium types. All equilibria have in common that the pro-change lobby A will form a minimal coalition of two legislators and all involve expected total costs of 11.

These are clear predictions that we will test in the experiment. Comparing the two scenarios in the simultaneous game, the average coalition size should be larger in Scenario 1 compared

to Scenario 2 and the amount spent to win the majority should be higher. Relative to the sequential game, we expect to find smaller coalition sizes, less payments offered in total, and a lower probability of winning the vote for lobby A in the simultaneous game.

2.3 Procedural Details

A total of 162 students at ETH Zurich and the University of Zurich (58% female, average age 23 years) participated in 10 experimental sessions.⁸

Table 3: Number of Sessions and Participants

	Seven legislators		Three legislators	
	Seq	Sim	Seq	Sim
Sessions	3	3	2	2
Subjects	82	80	56	56

Notes: A session lasted on average 110 minutes and average earnings were CHF 52.

Participants played one round of each of the seven scenarios in the seven-legislators sessions. Before that, they played three practice rounds. The sequence of scenarios was varied randomly between the sessions with sequential moves. For each session with a specific sequence in the sequential-moves treatment, we also ran one with the same sequence in the simultaneous-moves treatment. In the three-legislators sessions, subjects played five rounds of each of the two scenarios in a row after two practice rounds. One of the two sessions in the two subtreatments (sequential and simultaneous) started with Scenario 1, the other one with Scenario 2. In all treatments, subjects were randomly re-matched after every round, and the roles of lobby A and lobby B were also randomly assigned within each pair of matched subjects in every round. As our focus is on the behavior of the lobbies, we choose to hardwire the behavior of the legislators in the following way: each computerized legislator is programmed to vote for the alternative that gives it the highest payoff. Subjects were informed about these details in the instructions (see Appendix B).

⁸The experiment was programmed in zTree (Fischbacher, 2007).

3 Experimental Results

3.1 Seven Legislators

3.1.1 Number and Level of Bribes

Sequential moves Starting with Scenarios 1–5, we observe that the comparative statics predictions with respect to the bias of the legislators are confirmed. However, while the comparative statics prediction regarding the willingness to pay of lobby B holds for the comparison of Scenarios 1 and 3, it does not hold for the comparison of Scenarios 2 and 4. Moreover, the point predictions with respect to number of bribes by lobby A are not very accurate and the observed means differ significantly from the predictions in all five scenarios (see Figure 1).⁹ However, regarding the distribution of number of bribes, the mode corresponds to the theoretical prediction in all five scenarios. Regressing the actual number of bribes offered on the theoretically predicted number, reveals that the theoretically predicted values have a strongly significantly positive coefficient and explain 42% of the variation across Scenarios 1–5 (Table A1).¹⁰ While the total sum of bribes offered differs significantly from the point predictions (Table 4), regressing the former on the latter, indicates that the theoretically predicted values have a strongly significantly positive coefficient and explain 21% of the variation in the bribe levels across Scenarios 1–5 (Table A2).

Turning to Scenarios 6 and 7 (Figure 2 and Table 4), we find that the point predictions are again not accurate but the comparative statics prediction regarding the willingness to pay of lobby B is confirmed. Regressing the actual number of bribes and the total sum of bribes offered on the theoretically predicted values we find that the latter are strongly significant predictors of the observed behavior in the lab and explain 35% of the variation in both regressions (Tables A1 and A2).

Lobby A does not always win when it should (see Table 1). In Scenarios 4 and 7, where winning is most costly, it wins in only 49% of the cases. In the other scenarios, lobby A

⁹In Scenarios 6–7, legislators’ valuations are not homogeneous and predictions are qualitatively different. We therefore analyze these scenarios separately. However, we also present the regression results of all scenarios combined in Appendix A.

¹⁰When we speak of (strong) statistical significance throughout the text, we mean significance at the 5% (1%) level in two-sided t-tests or F-tests with standard errors clustered at the subject level.

wins substantially more often. To a large extent the low winning rates are due to suboptimal behavior on the part of lobby A. However, in some cases lobby B wins by paying more than its willingness to pay. This occurs in 17% of all cases in which B cannot win without making a loss. In Scenario 5, where A is predicted to lose, it indeed always loses.

Simultaneous moves Starting again with Scenarios 1–5, we observe a similar pattern regarding the comparative statics. However the differences between treatments with respect to the average number of bribes and the total bribe level are less pronounced than in the sequential case. When we regress the actual number of bribes offered on the theoretically predicted number for the sequential case, we see that these values again have a strongly significantly positive coefficient but explain only 10% of the variation across Scenarios 1–5 (Table A1). Regressing the total sum of bribes offered on the predicted values for the sequential case, reveals that again the theoretically predicted values have a strongly significantly positive coefficient but explains only 3% of the variation across Scenarios 1–5 (Table A2). When we turn to Scenarios 6 and 7, we see no predictive power for the theoretically predicted values for the sequential case for either the number of bribes offered or the total sum of bribes. In neither of the two regressions the coefficients for the theoretically predicted values is significantly different from zero, and we get p-values larger than 0.6 (Tables A1 and A2).

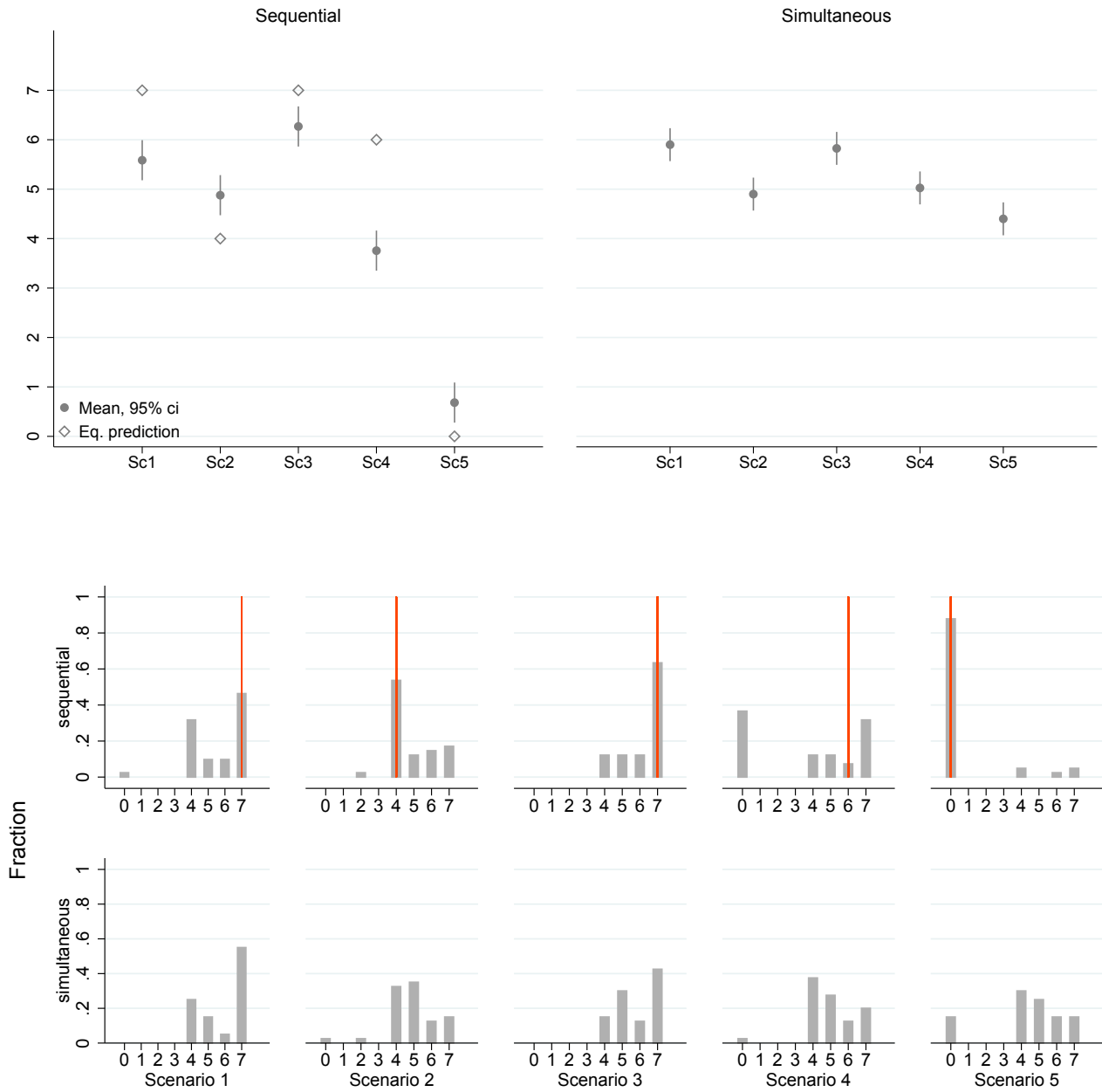
Interestingly, lobby A wins more often in all scenarios as compared to the sequential case.¹¹ This is surprising as the predicted winning rates are 100% for all scenarios (except Scenario 5, where it is 0%) in the sequential-moves case, while there are no equilibria with a winning rate of 100% in the simultaneous case.

3.1.2 Leveling, Flooding and Mixing

We now turn to the predictions regarding leveling and flooding. In theory, all members of a coalition should be equally expensive to buy back for lobby B. With our discretization of the bribes and initial valuations with half points, it is sufficient to bring them to almost the same level so that the legislators' valuations differ by maximally one point in scenarios with

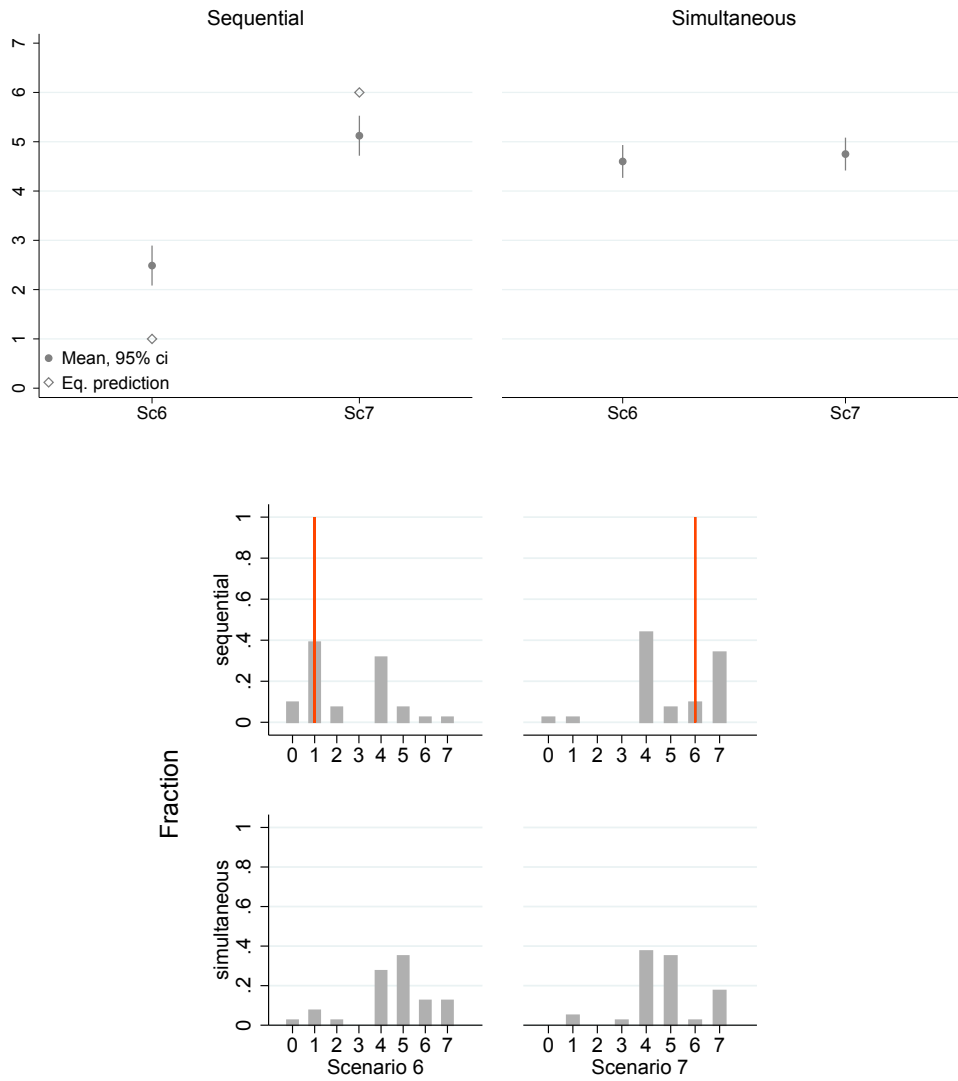
¹¹The difference is strongly significant in Scenarios 3, 4, 5 and 7, and if all scenarios are pooled.

Figure 1: Number of Bribes in Scenarios 1–5 with Seven Legislators



Notes: The upper panel shows the means, their 95% confidence intervals based on standard errors clustered at the subject level and the theoretical point predictions (as diamonds). The lower panel displays the observed and theoretically predicted (in red) distributions.

Figure 2: Number of Bribes in Scenarios 6 and 7 with Seven Legislators



Notes: The upper panel shows the means, their 95% confidence intervals based on standard errors clustered at the subject level and the theoretical point predictions (as diamonds). The lower panel displays the observed and theoretically predicted (in red) distributions.

Table 4: Results for Scenarios with Seven Legislators

	Sc1	se	Sc2	se	Sc3	se	Sc4	se	Sc5	se	Sc6	se	Sc7	se
<i>Bribes proposed by A:</i>														
Equilibrium: sequential	7		4		7		6		0		1		6	
Observed: sequential	5.59	(0.18)	4.88	(0.14)	6.27	(0.12)	3.76	(0.34)	0.68	(0.21)	2.49	(0.21)	5.12	(0.19)
Observed: simultaneous	5.9	(0.15)	4.9	(0.16)	5.83	(0.13)	5.03	(0.16)	4.4	(0.24)	4.6	(0.19)	4.75	(0.16)
<i>Votes won by A:</i>														
Equilibrium: sequential	7		4		7		6		0		4		6	
Observed: sequential	5.2	(0.2)	4.54	(0.16)	5.34	(0.2)	3.44	(0.33)	0.37	(0.11)	4.32	(0.15)	4.49	(0.2)
Observed: simultaneous	5.38	(0.21)	4.23	(0.2)	5.1	(0.18)	4.25	(0.19)	2.88	(0.24)	4.68	(0.16)	4.6	(0.16)
<i>A wins (%):</i>														
Equilibrium: sequential	100		100		100		100		0		100		100	
Observed: sequential	80.49	(4.43)	73.17	(4.95)	65.85	(5.3)	48.78	(5.58)	0	(0)	75.61	(4.8)	48.78	(5.58)
Observed: simultaneous	92.5	(2.98)	75	(4.9)	90	(3.39)	77.5	(4.72)	47.5	(5.65)	85	(4.04)	77.5	(4.72)
<i>Total bribes proposed by A:</i>														
Equilibrium: sequential	25		128		109		238		0		32		142	
Observed: sequential	69.27	(6.07)	148.68	(6.69)	126.46	(6.24)	141.41	(13.58)	17.8	(5.46)	69.98	(8.16)	137.76	(8.87)
Observed: simultaneous	98.8	(9.64)	137.68	(8.21)	118.58	(8.25)	162.05	(8.01)	122.08	(10.61)	111.3	(8.21)	117.23	(9.48)
<i>Winning coalition size if A wins:</i>														
Equilibrium: sequential	7		4		7		6		X		4		6	
Observed: sequential	5.82	(0.16)	5.13	(0.16)	6.56	(0.12)	6.15	(0.18)	X	X	4.77	(0.16)	6.05	(0.21)
Observed: simultaneous	5.76	(0.15)	5.07	(0.13)	5.47	(0.14)	4.94	(0.13)	4.79	(0.15)	5.06	(0.14)	5.1	(0.15)
<i>Winning coalition size if B wins:</i>														
Equilibrium: sequential	4.38	(0.25)	4.09	(0.06)	4	(0)	6.14	(0.21)	6.63	(0.11)	4.1	(0.07)	4	(0)
Observed: sequential	6.33	(0.4)	5.3	(0.27)	5.25	(0.4)	5.11	(0.29)	5.86	(0.19)	4.5	(0.23)	4.11	(0.08)
<i>Leveling by A (%):</i>														
Equilibrium: sequential	100		100		100		100		0		100		100	
Observed: sequential	90	(4.84)	85.37	(5.63)	82.93	(5.99)	92.31	(5.33)	60	(22.34)	29.73	(7.66)	32.5	(7.55)
Observed: simultaneous	30	(7.37)	46.15	(8.121)	35	(7.67)	46.15	(8.121)	52.94	(8.71)	0	(0)	7.5	(4.24)
<i>Quasi-leveling by A (%):</i>														
Observed: sequential	95	(3.52)	90.24	(4.73)	92.68	(4.15)	96.15	(3.85)	80	(18.26)	34.62	(9.52)	52.5	(8.06)
Observed: simultaneous	50	(8.05)	79.49	(6.58)	47.5	(8.04)	56.41	(8.08)	58.82	(8.59)	16.22	(6.17)	27.5	(7.19)

Notes: Standard errors (ses) are clustered at the subject level. Lobby A never wins in the sequential set-up in Scenario 5. Therefore, we have no observations of winning coalition sizes for this scenario (as indicated by the "X"). Leveling and quasi-leveling refer to the strategy types as defined in 3.1.2.

supermajorities because it costs B a full point to turn a valuation of 0.5 into -0.5. We thus consider a bribe offer schedule as leveling if the valuation of all members of a coalition differ by at most one point. In Scenarios 1 to 5, we compute the relative frequency of bribe schedules in which more than one bribe is offered. For Scenarios 6 and 7, we also consider bribe schedules in which only one bribe is offered as the legislators with positive ex-ante valuation are also coalition members whose valuations can be compared to those of the bribed. In addition to leveling as just described, we also report “quasi-leveling” bribe profiles, in which the valuations (after the bribe offers) of legislators must not be different by more than 5 points.

Sequential moves In Scenarios 1–4, where the model predicts 100% leveling, we indeed observe high percentages of leveling (Table 1). However, in Scenarios 6 and 7 where the theory also predicts full leveling, we observe leveling only in around 30% of all cases. This suggests that leveling may not entirely originate from subjects realizing that it is optimal to leave no soft spot but possibly also from the fact that it is very easy to offer the same amount to every legislator. The number almost doubles when the more lenient criterion of quasi-leveling is applied but only for Scenario 7. Flooding is predicted for Scenario 7, and we see in Figure 2 that most lobby As indeed offer bribes to more than one legislator. The mode is 1 for Scenario 6, where it is indeed optimal to only bribe one additional legislator.

Simultaneous moves Leveling occurs much less frequently in the simultaneous case. However, in Scenarios 1–5 it is still a popular strategy (see Table 4). As a consequence of the lower degree of leveling, the standard deviation in bribes is much (and strongly significantly) higher in the simultaneous-moves case (5, compared to 1.5 points). This indicates substantially different strategy choices than with sequential moves. The box plots in Figure A1 provide further evidence for different strategy choices between the two treatments. This indicates that subjects do not apply Strong Stackelberg reasoning, which predicts the same strategy choices in the simultaneous as in the sequential case.

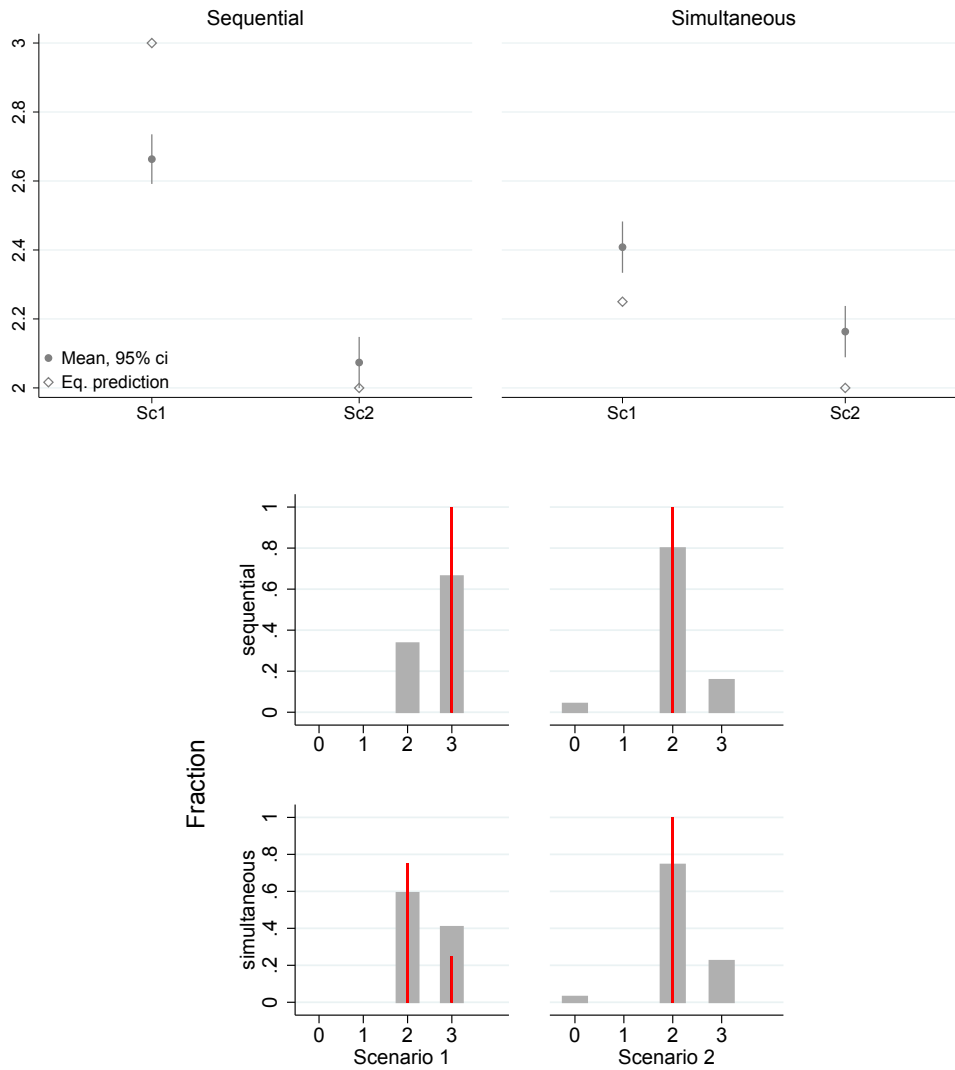
3.2 Three Legislators

Number and level of bribes First, recall the differences in the theoretical predictions between the sequential and the simultaneous case. The comparative statics predictions go in the same direction. However, the predicted differences in the number of bribes is smaller in the simultaneous-moves case. The prediction is that lobby A always offers bribes to only two legislators in Scenario 2 in both cases. However, in Scenario 1 lobby A is predicted to make offers to two legislators with 75% probability and with 25% probability to all three legislators in the simultaneous-move case, whereas in the sequential-move case the prediction is that lobby A always makes offers to all three legislators. The predicted pattern for the simultaneous case is clearly reflected in the data (Figure 3 and Table A3). The mode is correct in all four situations and the comparative statics all hold. However, the point predictions regarding the average number of bribes are again not accurate. The same holds for the total sum of bribes offered (Table 5 and Table A4). We observe again that lobby A wins more often in the simultaneous-moves case, which goes against the theoretical predictions.¹²

Leveling Leveling is very prevalent in both sub-treatments and both scenarios and at least 86% of the lobby As adopt a leveling strategy. However, this is hardly surprising as the number of strategies that are not leveling and not weakly dominated is much lower as a result of the much lower willingness to pay as compared to the seven-legislators scenarios. The differences in the distributions of bribes for each legislator again indicate different strategy choices in the sequential as compared to the simultaneous treatments (Figure A3).

¹²The difference is only significant when the two scenarios are pooled.

Figure 3: Number of Bribes for Scenarios with Three Legislators



Notes: The upper panel shows the means, their 95% confidence intervals based on standard errors clustered at the subject level and the theoretical point predictions (as diamonds). The lower panel displays the observed and theoretically predicted (in red) distributions.

Table 5: Results for Scenarios with Three Legislators

	Sc1	se	Sc2	se
<i>Bribes proposed by A:</i>				
Equilibrium: sequential	3		2	
Observed: sequential	2.66	(0.04)	2.07	(0.05)
Equilibrium: simultaneous	2.25		2	
Observed: simultaneous	2.41	(0.04)	2.16	(0.06)
<i>Votes won by A:</i>				
Observed: sequential	2.35	(0.06)	1.77	(0.07)
Observed: simultaneous	2.27	(0.06)	1.84	(0.07)
<i>A wins (%):</i>				
Equilibrium: sequential	100		100	
Observed: sequential	83.17	(3.12)	73.68	(3.97)
Equilibrium: simultaneous	<100		<100	
Observed: simultaneous	92.86	(2.53)	79.59	(3.91)
<i>Total bribes proposed by A:</i>				
Equilibrium: sequential	5		14	
Observed: sequential	6.54	(0.25)	11.92	(0.44)
Equilibrium: simultaneous	2.25		11	
Observed: simultaneous	6.66	(0.33)	11.66	(0.44)
<i>Winning coalition size if A wins:</i>				
Observed: sequential	2.64	(0.04)	2.14	(0.04)
Observed: simultaneous	2.38	(0.04)	2.18	(0.04)
<i>Winning coalition size if B wins:</i>				
Observed: sequential	2.12	(0.05)	2.28	(0.07)
Observed: simultaneous	2.29	(0.1)	2.5	(0.1)
<i>Leveling by A (%):</i>				
Equilibrium: sequential	100		100	
Observed: sequential	86.14	(4.76)	95.6	(2.64)
Equilibrium: simultaneous	100		0-100	
Observed: simultaneous	88.78	(4.25)	87.37	(4.01)

Notes: Standard errors (ses) are clustered at the subject level. The theoretical predictions for the simultaneous case are expected values.

4 Conclusions

We set out to test the key predictions of the seminal vote-buying model by Groseclose and Snyder (1996). We design nine different scenarios, varying the number of legislators (three and seven) between sessions, and the relative willingness to pay of the lobbies and the preference biases of the legislators within sessions. To the best of our knowledge, this is the first experimental study of this model. A key feature of our experiment is that we run treatments with the sequential-moves structure, as assumed in the original model, as well as treatments in which this assumption is relaxed and the subjects move simultaneously instead. We argue, and show theoretically for the three-legislators scenarios, that the key comparative statics predictions of the GS model carry over to the simultaneous-moves case.

In the experiment, we find for the sequential-moves set-up that most comparative statics predictions are borne out by the data. The main insights regarding how the majority size depends on the relative willingness to pay of the lobbies and on the biases of the legislators are confirmed. However, specific predictions regarding the exact number and level of bribes are inaccurate. Turning to the simultaneous set-up, we find that the main comparative statics predictions still hold but that behavior varies much more and the predictive power of the sequential-moves model is reduced substantially. Overall, this suggests that the GS model does capture some important insights that are even robust to the relaxation of the central modeling assumption of sequential moves. However, its predictive power is substantially lower when the sequentiality assumption is relaxed, and it is also limited with respect to the more specific predictions regarding individual strategies in the sequential-moves treatments.

In stress-testing a seminal model by relaxing a central model assumption our paper shares similarities with the work of Tremewan and Vanberg (2016), who study legislative bargaining in an arguably more realistic but not theoretically (analytically) solvable set-up than that in the established bargaining models. We see this approach, which is much less often followed than simply implementing the original structure of a game theoretic model, as a useful complement. It allows for new insights into how strongly predictions depend on certain modeling assumptions which might not hold in the field, and thus speaks to external validity concerns regarding a

model's predictions. We believe that more studies of this kind would be highly valuable.

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A Additional Tables and Figures

Table A1: Number of Bribes – Seven Legislators

	1–5 seq	1–5 sim	6–7 seq	6–7 sim	All seq	All sim
GS prediction	0.67*** (0.05)	0.19*** (0.05)	0.53*** (0.08)	0.03 (0.06)	0.62*** (0.05)	0.16*** (0.04)
_cons	1.01*** (0.27)	4.27*** (0.31)	1.96*** (0.35)	4.57*** (0.31)	1.37*** (0.22)	4.33*** (0.24)
N	205	200	82	80	287	280
R^2	0.42	0.10	0.35	0.00	0.40	0.07
N_clust	80	77	62	58	80	80

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered at the subject level. The first two column refer to Scenarios 1–5, the third and fourth to Scenarios 6–7 and the last two to all scenarios combined.

Table A2: Sum of Offered Bribes – Seven Legislators

	1–5 seq	1–5 sim	6–7 seq	6–7 sim	All seq	All sim
GS prediction	0.51*** (0.08)	0.17*** (0.06)	0.89*** (0.10)	0.03 (0.13)	0.56*** (0.08)	0.16*** (0.05)
_cons	60.85*** (8.25)	130.02*** (9.77)	43.60*** (13.69)	124.67*** (14.25)	60.82*** (7.98)	126.26*** (8.78)
N	205	200	82	80	287	280
R^2	0.21	0.03	0.35	0.00	0.23	0.02
N_clust	80	77	62	58	80	80

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered at the subject level. The first two column refer to Scenarios 1–5, the third and fourth to Scenarios 6–7 and the last two to all scenarios combined.

Table A3: Number of Bribes – Three Legislators

	seq		sim		sim	
GS prediction	0.58***	(0.09)	0.19**	(0.07)		
sim eq prediction					0.77**	(0.30)
_cons	0.92***	(0.22)	1.76***	(0.21)	0.61	(0.65)
N	280		280		280	
R^2	0.21		0.03		0.03	
N_clust	56		56		56	

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered at the subject level. “sim eq prediction” refers to the expected value of the theoretically predicted mixed-strategy equilibria.

Table A4: Sum of Offered Bribes – Three Legislators

	seq		sim		sim	
GS prediction	0.85***	(0.06)	0.81***	(0.09)		
sim eq prediction					0.74***	(0.08)
_cons	1.67***	(0.61)	1.73*	(0.88)	4.93***	(0.55)
N	280		280		280	
R^2	0.49		0.43		0.43	
N_clust	56		56		56	

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered at the subject level. “sim eq prediction” refers to the expected value of the theoretically predicted mixed-strategy equilibria.

Figure A1: Bribes Offered to the Seven Legislators in Scenarios 1–5

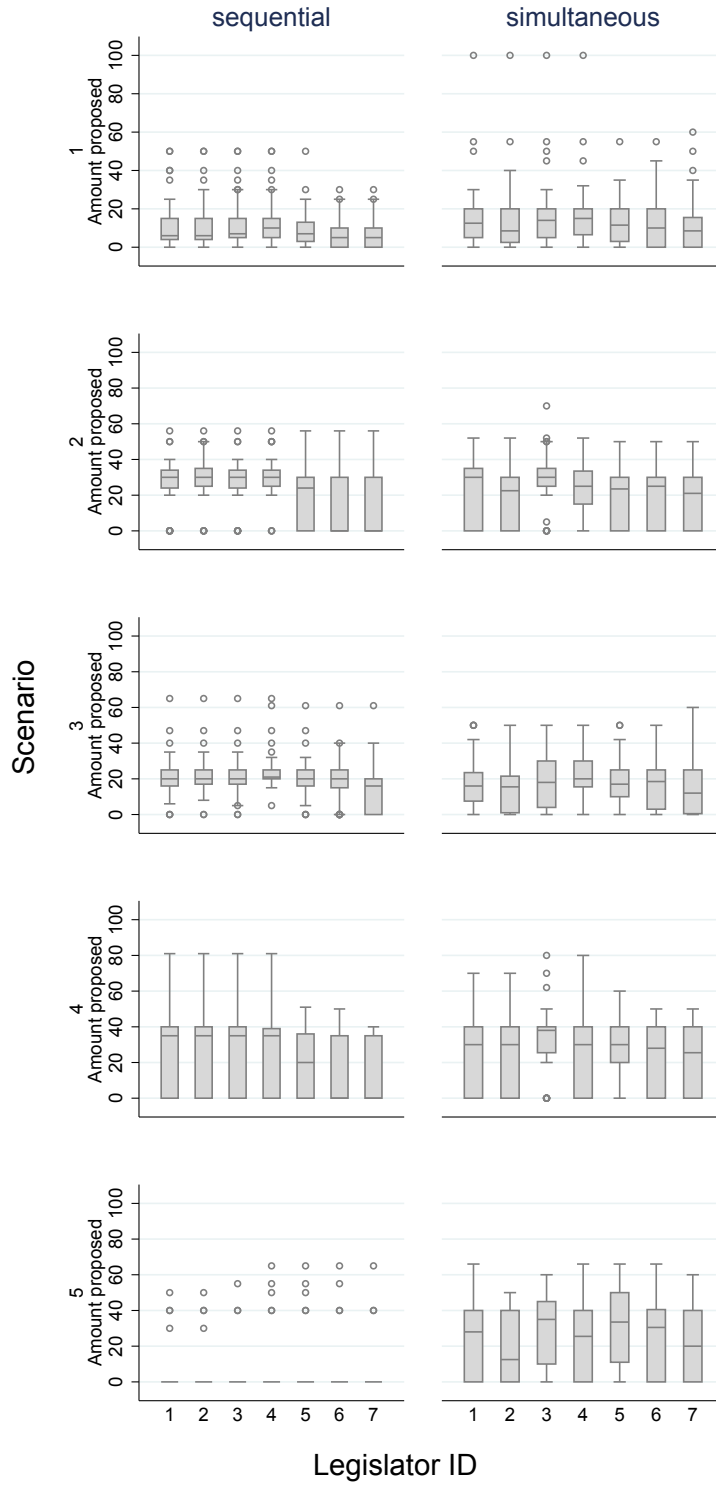


Figure A2: Bribes Offered to the Seven Legislators in Scenarios 6 and 7

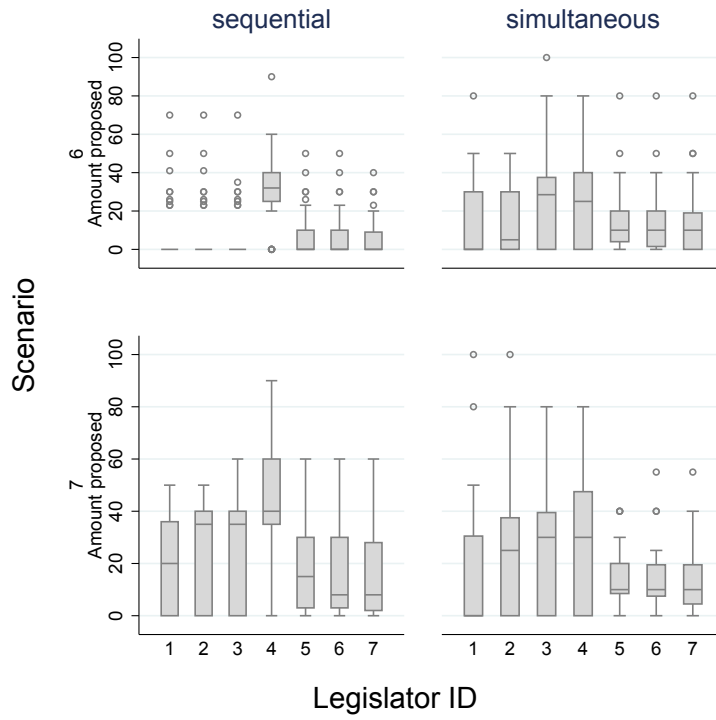
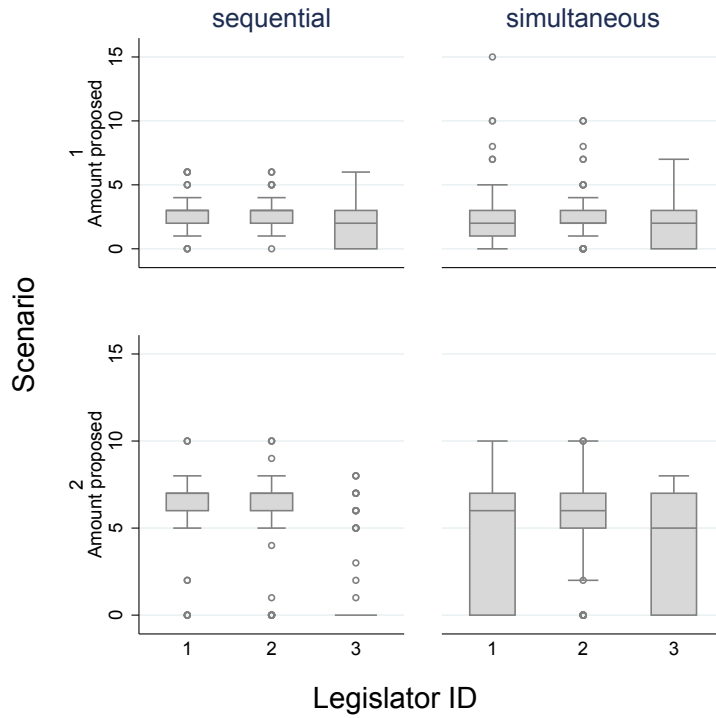


Figure A3: Bribes Offered to the Three Legislators



B Experimental Instructions

[Below are the instructions for the seven-legislators sequential-moves treatment. Instructions for the other treatments were very similar and are therefore omitted here. They can be obtained from the authors upon request, along with the original instructions in German.]

Overview Welcome to this experiment. We ask you not to speak with other participants during the experiment and to switch off your mobile phones and other mobile electronic devices.

For your participation in today's session, you will be paid in cash at the end of the experiment. The amount of the payout depends in part on your decisions and partly on the decisions of other participants. It is therefore important that you carefully read and understand the instructions before the start of the experiment.

In this experiment, every interaction between participants goes through the computers you are sitting in front of. You will interact with each other anonymously and your decisions will only be saved along with your random ID number. Neither your name nor the names of other participants will be made public, either today or in future written evaluations.

Today's session includes several rounds. Your payout amount is the sum of the earned points in all rounds, converted into Swiss francs, plus your participation fee of CHF 5. The conversion of points into Swiss francs is done as follows. Each point is worth 2 cents, so the following applies: 50 points = CHF 1.00.

Each participant will be paid privately at the disbursement desk, so that other participants will not be able to see how much they have earned.

Experiment This experiment consists of 7 structurally identical rounds.

The group of two Participants are randomly divided into groups of two members each. Each round, these groups are re-formed at random. All decisions within a round and a group of two affect only the members of the group of two and have no influence on other groups.

The person you are forming a group with remains anonymous: that is, neither you nor the other member learns the identity of the other member during or after the experiment.

Two group members, a committee and two alternatives In each group of two, there is a member Ma and a member Mb. Chance decides each new round who is Ma and who is Mb, so you will most likely be Ma in some rounds and Mb in other rounds.

In addition to Ma and Mb, there is a committee in each round and for each group, which consists of 7 committee members. The committee members are automated, that is they are played by computers and not by other participants. The individual committee members are labeled with the labels K1–K7 and thus are distinguishable from each other.

The committee decides by vote on one of two alternatives, A or B. A simple majority of votes for an alternative is enough for it to be selected. That is, if alternative A receives 4, 5, 6, or 7 votes from the 7 committee members, then alternative A wins and B loses; where there are 4, 5, 6 or 7 votes for alternative B, alternative B wins.

Your payout depends on this decision of the committee. If you are a group member Ma, you prefer alternative A and the other group member (Mb) prefers alternative B. If you are a group member Mb, you prefer alternative B and the other group member (Ma) prefers alternative A.

The committee members automatically receive a certain number of points from the computer each time they vote for A or B. Below we denote by V_a the number of points a committee member gets more if it votes for A than for B. If it gets more points for a vote for B, V_a is negative. The V_a values of the committee members are numbered according to their labels, so we refer to the V_a value of member K2 as V_{a2} . For example, if

a committee member K4 receives 3 points more for a vote for A than for a vote for B, then $Va4 = 3$. If a committee member K2 receives 4 points more for a vote for B than for a vote for A, then $Va2 = -4$.

Before the committee vote, you can try to convince committee members to vote for your preferred alternative. You can make offers to any number of committee members. An offer includes a number of points that you pay to the committee member if it votes for your preferred alternative.

Budgets and offers Group member Ma receives a budget of 400 points at the beginning of the round. Group member Mb receives a budget of 200 points at the beginning of the round.

If Ma's preferred alternative wins the vote in the committee – that is, alternative A – Ma gets a number of points Xa , while Mb receives no extra points. If Mb's preferred alternative wins the vote on the committee – that is, alternative B – Mb receives a number of points Xb , while Ma receives no additional points. Xa is 300 points in each round, while Xb can be different in different rounds. Both members learn the value of Xb at the beginning of the round.

Ma and Mb may offer committee members a number of points, Pa and Pb respectively, to vote for their preferred alternative. These offers are binding: that is, if, for example, committee member K3 is offered by Ma $Pa3 = 5$ points to vote for A, and actually votes for A, 5 points will be transferred from Ma's budget to K3. Should K3 vote for B despite Ma's offer, K3 will not receive points from Ma.

Ma and Mb can each submit offers to any number of the 7 committee members. It should be noted that in total no more points can be offered than the budget includes. It should also be noted that only integer scores can be offered.

Ma makes his offers first. Mb then learns the offers of Ma and makes his offers, after which the committee decides.

The decision of the committee members The individual committee members decide according to the following decision rule:

$$Va + Pa - Pb > 0: \text{ vote for A}$$

$$Va + Pa - Pb < 0: \text{ vote for B}$$

This means that a committee member always votes for an alternative if it receives more points from this decision than from the decision for the other alternative.

The result for member Mb is as follows: If Mb wants to induce a committee member, for example, K4, to move to vote for B, his offer must be at least as high as the sum of the offer of Ma and Va : that is, in the example, his offer must meet the following condition: $Pb4 > Va4 + Pa4$.

Example: Committee member K3 automatically receives 3.5 points more from the computer when voting for alternative B, that is $Va3 = -3.5$. Ma offers 8 points if K3 votes for A, that is $Pa3 = 8$, and Mb offers 5 points, that is $Pb3 = 5$. In this case, K3 will decide on B because: $Va3 + Pa3 - Pb3 = -0.5 < 0$.

Sequence of a round At the beginning of a round, the first screen tells you whether you are Ma or Mb, and thus whether your budget is 400 or 200 points. In addition, you will see the number of points Xa and Xb that Ma or Mb receive if their preferred alternative, A or B, is selected by the committee (where Xa is 300 points in each round).

Then Ma first takes an action and can submit offers $Pa1$ – $Pa7$ to any number of committee members in the following input mask [omitted here]. As you can see, Ma finds the Va values of each committee member on the same screen (example values).

If Ma leaves a field blank, this is interpreted as an offer of $Pa = 0$ points to the appropriate committee member. After Ma has submitted his offers, it is Mb's turn. Mb can now also submit offers to any number of committee members. This is done via the following input mask [omitted here], on which Mb can see the Va values of the individual committee members, as well as the offers of Ma to the individual committee members (example values).

If Mb releases a field, this is interpreted as an offer of $P_b = 0$ points to the corresponding committee member.

After Mb has made his offers, the committee members decide on the decision rule above for A or B. The committee chooses the alternative for which most votes were cast.

Payment in each round (in points) Group member Ma receives the following payout in a round: the budget (400) plus X_a (300) when his preferred alternative A is selected by the committee, minus Ma's offers to committee members who actually voted for A.

Group member Mb receives the following payouts in a round: the budget (200) plus X_b if his preferred alternative B is selected by the committee, minus Mb's offers to committee members who actually voted for B.

Example 1: Ma made offers P_{a1} , P_{a4} , P_{a5} and P_{a7} , Mb has made offers P_{b1} , P_{b2} and P_{b6} and committee members K1, K2, K3 and K7 voted for A, while K4, K5 and K6 voted for B, thus alternative A was selected by the committee. In this case, the following round payments result in points as follows:

$$\text{Ma's Points} = 400 + X_a - P_{a1} - P_{a7}$$

$$\text{Mb's Points} = 200 - P_{b6}$$

Example 2: Ma made offers P_{a2} , P_{a4} , P_{a5} and P_{a7} , Mb made offers P_{b1} , P_{b2} and P_{b6} and committee members K2, K3 and K7 voted for A, while K1, K4, K5 and K6 voted for B, thus alternative B was selected by the committee. In this case, the following round payments result in points:

$$\text{Ma's Points} = 400P_{a2} - P_{a7}$$

$$\text{Mb's Points} = 200 + X_b - P_{b1} - P_{b6}$$

Payment at the end (in CHF) At the end of the experiment, the earned income is converted into Swiss francs is paid in private together with your participation fee of CHF 5.

Practice rounds and quiz Before the 7 rounds of the experiment, there will be a short quiz on the screen, as well as 3 practice rounds; these are intended to aid your understanding but are not taken into account for the payout. The practice rounds and the quiz are designed to ensure that all participants have fully understood the instructions.

Questions? Take your time to review the instructions. If you have questions, please raise your hand. An experimenter will then come to your cubicle.

Important Terms

- Ma Member who prefers alternative A and can make offers first. Ma has a budget of 400.
- Mb Member who prefers alternative B and can make offers second. Mb has a budget of 200.
- X_a Number of points for Ma should alternative A win. $X_a = 300$ in all rounds.
- X_b Number of points for Mb should alternative B win. X_b can be different from round to round.
- K1–K7 Committee members 1–7.
- Va1–Va7 Number of points a committee member with the corresponding number will automatically receive if it votes for alternative A instead of alternative B. If this value is negative, the amount indicates the number of points that the committee member receives less if it votes for alternative A instead of alternative B.
- Pa1–Pa7 Ma's offer to the committee member with the appropriate number to vote for alternative A. Ma only has to pay this amount to the committee member if it actually votes for alternative A.
- Pb1–Pb7 Mb's offer to the committee member with the appropriate number to vote for alternative B. Mb only has to pay this amount to the committee member if it actually votes for alternative B.