

The Effects of Increasing versus Decreasing Private Goods on Legislative Bargaining:
Experimental Evidence*

Nels Christiansen
Department of Economics
Trinity University
nels.christiansen@trinity.edu

John H. Kagel
Department of Economics
Ohio State University
kagel.4@osu.edu

9/2/2014

Abstract

Recent interest in reducing budget deficits raises questions regarding the impact of cuts versus increases in private good allocations on legislative bargaining. We investigate this issue using an experimental design where the outcomes are theoretically isomorphic. Payoffs are similar between the two cases, but which type gets their proposals passed changes substantially. Both gains and losses help to “grease” the legislative bargaining “wheels”, reducing the time it takes to reach agreement. But gains are more effective than losses, a difference attributable to a change in agents’ reference point in going from gains to losses.

Key words: legislative bargaining, policy decisions, budget deficit, budget surplus, experiment

JEL classification: D72, C92, C52

*We are grateful for comments received at the 2013 Political Economy meeting at Cal Tech, the 2013 Public Choice Society Conference, and Trinity University. We received able research assistance from Xi Qu and Matt Jones. This research has been partially supported by National Science Foundation grant SES-1226460. Opinions, findings, conclusions or recommendations offered here are those of the authors and do not necessarily reflect the views of the National Science Foundation.

1. Introduction

Legislative bargaining often takes the form of bargaining over an ideological issue along with allocations of private goods. Recent interest in reducing budget deficits raises the question of what (if any) changes in policy outcomes and proposer power result when legislators must reduce rather than increase the budget they have to work with. Understanding these differences may provide some insight into current stalemates in Congress, along with designing rules and procedures to more effectively facilitate agreement. Our experimental design also addresses more general issues, since looking at increases versus decreases in private goods available to forge legislative compromise provides a natural framework for investigating possible differences in bargaining outcomes under theoretically isomorphic outcomes.

We use the Jackson and Moselle (2002) model for the theoretical underpinnings of the experimental design. In that model, legislators with heterogeneous preferences bargain over a one-dimensional public policy issue along with a distribution of private goods that benefit each legislator's home district. We report on three treatments: A Baseline treatment in which there are no private goods available to "grease" the legislative bargaining "wheels", a Gains treatment in which there are private goods to distribute between potential coalition partners along with deciding on the public policy issue, and a Costs treatment in which legislators must come up with reductions in private goods to pay for the costs associated with the public policy issue. The Costs treatment is motivated by the fact that much of current legislative bargaining is done within the context of a constant or shrinking overall budget. The Gains and Costs treatments are structured so that they are theoretically isomorphic, resulting in the same stationary subgame perfect equilibrium outcome, as well as the same behavioral outcome that our earlier experiment (Christiansen et al., 2012) identified as guiding behavior.

Our results show that in both the Gains and Costs treatments (i) the average accepted public policy outcome shifts away from the median legislator's ideal point toward the legislator who cares the most about the policy issue and the least about private goods, and (ii) there is less delay in achieving bargaining outcomes compared to the Baseline (no private goods) treatment. Payoffs for passed proposals are similar between the Gains and Costs treatments, but there are substantial differences between the two cases: It takes longer to reach agreement in the Costs treatment - a 10 percentage point decrease in average frequency with which stage one agreements are reached - along with a 23 percentage point decrease when the legislator who

cares the most about the public policy issue is the proposer. This in turn shifts proposer power between the two cases, along with a substantial reduction in overall payoffs for the legislator who cares the most about the public policy issue. We attribute these differences to legislators responding differentially to gains and losses relative to their initial budget allocation, which serves as a natural reference point when voting on proposed allocations. The results suggest that agreement on deficit reduction might be easier to achieve when legislators are allowed to soften budget cuts that everyone agrees are too severe rather than attempt to forge agreement directly with more realistic budget cuts, much as occurred in the recent Murray-Ryan 2014 budget deal in the U.S. Congress.

This paper is part of a growing literature on the experimental analysis of legislative bargaining models.¹ It is most closely related to Christiansen et al. (2012), who investigate the predictions of the Jackson and Moselle (JM) model with and without private goods. Christiansen et al. show that introducing private goods into the bargaining process helps to “grease the wheels” of legislative compromise, significantly increasing the likelihood of a proposal passing relative to bargaining strictly over policy outcomes. They show that coalition formation is better characterized in terms of an “efficient equal split” between coalition partners than the stationary subgame perfect equilibrium prediction. This in turn leads to differences in the predicted composition of stable political parties relative to what the JM model predicts.²

This paper is also related to a long line of research on reference points impacting agents’ choices due to differential responses to gains and losses (Kahneman and Tversky, 1979). In the original “mugs” paper, Kahneman et al. (1990) report that agents endowed with a mug value it more than agents who do not have a mug, which they referred to as the “endowment effect”. In contrast, Plott and Zeiler (2005) report that small, seemingly inconsequential, changes in the details of the experimental design and instructions go a long way to eliminating the endowment effect in this case. This is but the tip of the iceberg on this long-studied topic; see, for example, Köszegi and Rabin (2006) and Bateman et al. (1997) and the many references cited therein. Our experimental design naturally embeds a differential endowment effect between the Gains and Costs treatments, as the latter requires a higher starting valuation to achieve a theoretically

¹ Early papers such as McKelvey (1991), Fréchet, Kagel, and Lehrer (2003), Diermeier and Morton (2005), Diermeier and Gailmard (2006) and Fréchet, Kagel and Morelli (2005a and 2005b) focus on divide the dollar games. More recent work incorporates simultaneously bargaining over private and public goods. See Fréchet, Kagel and Morelli (2012) and Christiansen (2010).

² Details regarding these outcomes will be reported on below.

isomorphic final outcome relative to the Gains treatment. It also eliminates many of the potentially confounding effects identified in Plott and Zeiler.

Earlier experiments have looked at how framing impacts bargaining outcomes. Camerer, et al. (1993) study a shrinking-pie, multi-round, bilateral bargaining game and compare the results to an isomorphic treatment in which losses increase over time.³ They find more dispersed offers, greater initial rejections and lower proposer payoffs with losses increasing over time as opposed to (equivalent) shrinking of benefits. Other experiments focus on bargaining between buyers and sellers. Neale and Bazerman (1985) show that framing a collective bargaining game between union and management as a gain rather than a loss results in fewer negotiations being sent to arbitration (also see Bazerman, et al., 1985). A similar result is reported in Kristensen and Gärling (1997) where buyers and sellers negotiate over the sale price of a condominium. They show that when buyers perceive the seller's first offer price as a gain relative to their reference point it results in higher counteroffers than if they perceive the first offer price as a loss, thereby reducing the overall number of counteroffers and bargaining impasses.

The structure of the game in this paper—a legislature committee deciding on a public policy along with a private good (aka “pork”) allocation by majority rule—has a number of important differences from these earlier bargaining experiments: (1) We have a multilateral-as opposed to a bilateral-bargaining framework, (2) In our experiment subjects are bargaining over a two-dimensional choice space as opposed bargaining over a one-dimensional choice space, (3) Our analysis of the behavioral differences between Gains and Costs is more detailed than in Camerer et al. with the focus on the mechanism(s) by which bargainers reach agreement, and (4) We employ a highly structured bargaining framework as opposed to the unstructured bargaining for a fixed time period employed in the buyer and seller experiments. As a result, we are able to structure the experiment so that there is a unique theoretical (Nash equilibrium) outcome of the bargaining process that is isomorphic between the two treatments. The treatments are also isomorphic if subjects follow the behavioral equilibrium identified in an earlier Gains experiment (Christiansen et al., 2014).

The paper proceeds as follows: Section 2 reviews the underlying JM legislative bargaining model. Section 3 outlines the experimental design. Section 4 provides the results of the experiment and Section 5 summarizes the results and their implications for field data.

³ Their emphasis is on using an eye-tracking technique to record information search prior to deciding what option to offer in the two treatments to determine the extent to which agents use backward induction.

2. The Legislative Bargaining Model

The JM model extends the Baron-Ferejohn (1989; BF) legislative bargaining model by including a policy component in the bargaining process. In our case, three legislators must divide an exogenously determined level of private goods, $X \geq 0$, while choosing over a one-dimensional policy proposal, $y \in [0, Y]$. If $Y = 0$ and $X > 0$ the game reduces to a straightforward BF divide the dollar game. On the other hand, if there is only the policy proposal to bargain over ($Y > 0$ and $X = 0$), the game reduces to a median voter game.

Legislators have heterogeneous preferences, which depend on the policy chosen and the legislator's share of private goods. Legislator i 's utility function $u_i(y, x_i)$ is nonnegative, continuous, and strictly increasing in x_i for every $y \in Y$. Preferences over the public policy are assumed to be separable from the distributive decision, with u_i single peaked in y , with the ideal point denoted as y_i^* .

A legislative bargaining *round* consists of a potentially infinite number of *stages*. In the first stage, one legislator is randomly selected to make a proposal. A proposal is a vector (y, x_1, x_2, x_3) consisting of a public policy proposal and a distribution of private goods such that $\sum x_i \leq X$. The proposal needs a majority of votes for approval. If the proposal is approved, the bargaining round ends and payoffs are awarded. If the proposal fails, the game moves on to a second stage in which a new proposer is randomly selected, and the process repeats itself until a proposal passes. Legislators are assumed to employ a discount rate $0 < \delta \leq 1$ to their benefits from any delays in reaching agreement, so that an agreement in stage $t \in \{1, 2, \dots\}$ is valued as $\delta^t u_i(y, x_i)$.⁴ There are multiple Nash equilibria to these games to the point that any proposal that is accepted constitutes a Nash equilibrium. As is standard in the literature, the stationary subgame perfect equilibrium (SSPE) outcome, which is subgame perfection absent any punishment strategies resulting from proposals in earlier stages of the bargaining process, generates a unique equilibrium for the game, which is the standard reference point to compare with experimental outcomes.⁵

⁴ If the game fails to terminate, a default decision (a policy location and split of the private goods) is implemented. It turns out that even if $\delta = 1$ the default decision plays no role in the analysis when $X > 0$. See JM for details.

⁵ See BF for a discussion of the properties of the SSPE.

3. Experimental Design

In the experiment the 3 legislators must decide on a policy $y \in [0, 100]$ (integer values only). Legislators' ideal points are 0, 33, and 100 for T1, T2 and T3, respectively. Legislators also differ in the cost to deviating from their ideal point: Each integer deviation costs 1, 3 and 6 experimental currency units (ECUs) for T1, T2 and T3, respectively. To fix ideas about the policy proposal, we told subjects they must decide on a "bus stop location" on the line interval between 0 and 100, with the cost to deviating from their ideal location referred to as their "unit walking cost" (UWC). There was no discounting of payoffs from delays in reaching agreement ($\delta = 1$).⁶

Payoffs in the experiment were in experimental currency units (ECUs), which were converted to dollars at a fixed conversion rate. Type i 's payoff was given by,

$$R_i = E - \text{UWC}_i | y_i^* - y_{prop} |$$

where y_{prop} is the policy proposed and E is the legislators' starting endowment set at 600 and 700 ECUs in the Gains and Costs treatments, respectively. Private goods allocated to i , or taken away from i were simply added to or subtracted from this payoff function.

We consider two main treatments: In the Gains treatment, private goods are added to the bargaining process, and will be referred to as "cash," c , set at 100 ECUs. A proposal is a policy location and distribution of cash, (y, c_1, c_2, c_3) , such that the cash allocation sums to 100. In the Costs treatment, each player is endowed with an extra 100 ECUs ($E = 700$). Bargaining is over 200 ECUs in "taxes," τ , with the restriction that no more than 100 ECUs can come from any one player. (In order to avoid any positive or negative associations with taxes, subjects were told the 200 ECUs were "construction payments" needed to pay for the bus stop.) A proposal then is a vector $(y, \tau_1, \tau_2, \tau_3)$ such that $\sum \tau_i = 200$ and $\tau_i \leq 100$ for all i . This restriction on taxes is needed to generate the theoretical isomorphism between final outcomes in the Gains and Costs treatments, which provide the focus of the experiment. This restriction might be thought of as a constitutional restriction, a result of a prior bargaining outcome, or a political "reality" restriction. It might also simply reflect the fact that the legislature cannot get the requisite amount of spending cuts from any one legislator's stock of private goods.

⁶ Instructions are at the web site: http://www.trinity.edu/nchristi/doc/Instructions_Gains_Costs.pdf

Under this structure, a net of 100 ECUs of private goods are added to the Baseline (no private goods) treatment. In the Gains treatment, a proposer has 100 ECUs directly at her disposal to “grease the wheels”, in addition to specifying a policy proposal, y_{prop} . In the Costs treatment, given the 100 ECU increase in player’s initial endowments, and because per player taxes must be less than or equal to 100, in effect the proposer is able to allocate between 0 and 100 ECUs of private goods to any player just as in the Gains treatment. That is, payoffs in the Costs treatment are:

$$R_i = 700 - UWC_i \mid y_i^* - y_{prop} \mid - \tau_i$$

$$= 600 - UWC_i \mid y_i^* - y_{prop} \mid + (100 - \tau_i),$$

which is exactly the same payoff as in the Gains treatment where the private goods allocation is $c_i = (100 - \tau_i)$. Since nothing else about the bargaining game has changed, the games are isomorphic in that they have the same SSPE.

Table 1
Public Good Location and Private Good Allocations as a Function of Proposer’s Type
(under the SSPE)

	Proposer		
	T1	T2	T3
Policy Location (y)	16.33	49.67	83
Allocation of Cash (c_1, c_2, c_3)	(100, 0, 0)	(0, 100, 0)	(100, 0, 0)
Allocation of Taxes (τ_1, τ_2, τ_3)	(0, 100, 100)	(100, 0, 100)	(0, 100, 100)
Partner’s Type	T2	T3	T1
Proposer’s Payoff	684	650	498
Partner’s Payoff	550	298	617
Excluded Voter’s Payoff	98	550	450

$\delta = 1$; Coalition partners receive their continuation value for the game.

Table 1 details the equilibrium by proposer type. The SSPE is in pure strategies, and in all cases involves a minimum winning coalition (MWC); e.g., as a proposer T1 partners with T2 and leaves T3 outside the coalition, generating a substantially lower payoff for T3 than in any other case.⁷ Rejecting T1’s offer may turn out to be costly for T2 if T3 is chosen to propose in the next stage since T3 partners with T1. As such even though there is no discounting of payoffs

⁷ The equilibrium would be different if proposers in the Costs treatment were not restricted to taxing players above 100 ECUs. In that case, a proposer would always tax the player outside the coalition the maximum possible amount.

between stages, there are penalties to delay for the players in the game: If a proposal includes that player as a member of the MWC and is rejected, the player cannot be sure she will be included in the winning coalition in the next stage.⁸ This provides the motivation for players to accept proposals that equal or exceed their continuation value for the game, resulting in the prediction that proposals will always pass in stage 1 of all bargaining rounds.

In order to compare the overall effects of bargaining with private goods, we ran the Baseline treatment where subjects bargain over the policy location without access to private goods with $E = 600$ and $E = 700$. In both cases the ideal point of the median voter, 33, is approved in any SSPE with probability 1.⁹ Any other proposed public policy to the left (right) of 33 would always be less desirable from the perspective of the median voter and the voter to her right (left), so that with $\delta = 1$ these two legislators can do better by rejecting the current offer.

Because private goods serve only to redistribute payoffs, the efficient outcome in each treatment is $y = 100$, since given the unit walking costs, the marginal social benefit of moving the policy one step to the right is always greater than the cost. With $y = 100$, total payoffs *net of private goods* are 1499 versus 1365 for the SSPE prediction, the same total payoff as in the baseline treatment.¹⁰

The parameters of the model were chosen to meet two primary objectives: First, we wanted the equilibrium to be in pure strategies since previous research shows that mixing is difficult to achieve in practice. This also helped meet the second objective, an equilibrium where players with opposite ideal points (“strange bedfellows”) frequently form coalitions under the SSPE. These coalitions between a T3 proposer and a T1 are especially interesting because not only must the T3 proposer give all of the cash to T1 in the Gains treatment, or fully tax herself in the Costs treatment, but the theory predicts she must give her partner a higher payoff than she receives.

Experimental sessions consisted of 15 bargaining rounds, with between 12 and 18 subjects in each session. Subjects’ designation as a T1, T2 or T3 was randomly determined at the

⁸ Note that if players are risk averse (Harrington, 1990) or have other regarding preferences along the lines of Fehr and Schmidt (see Montero, 2007) coalition partners would be willing to accept offers *below* their continuation value.

⁹ Contrary to the Gains and Costs treatments, there is no financial penalty to delay in the Baseline treatment when the discount factor is 1. In this case the theory predicts that in any SSPE the median ideal point will eventually be approved. See Benchmark 1 in JM for further details.

¹⁰ Even though the treatments with private goods have an average predicted policy location closer to 100 than in the baseline treatment (49.67 versus 33), total social welfare does not increase, because policies passed to the left of 33, which T1 proposes, are extremely harmful to social welfare.

start of a session and remained the same throughout. In each stage of the bargaining process all subjects submitted proposals, after which one was selected at random to be voted on. If the proposal failed to receive majority approval, a new stage began with a new set of proposals, with this process repeating itself until a proposal passed.¹¹ Each bargaining round continued until all groups had passed a proposal, with the groups who finished early having a “please wait” screen until everyone finished. At the end of each bargaining round, subjects were randomly re-matched into new bargaining groups (subject to the constraint of a single player of each type in each group). One round, selected at random, was paid off on at the end of the session.

Experimental sessions typically lasted between an hour and an hour and a half. Software for conducting the experiment was programmed using zTree (Fishbacher, 2007). We conducted four sessions of the Costs treatment and three sessions of the Gains treatment with a total of 66 and 39 subjects, respectively.¹² For the Baseline treatment we ran three sessions with $E = 600$ and two sessions with $E = 700$ with a total of 42 and 36 subjects, respectively.¹³ The conversion rate from ECUs to dollars was $\$1 = 33$ ECUs for all sessions, along with a show-up fee of $\$6$.

4. Results

Our focus is on the comparison of the Gains and Costs treatments. The reader is referred to Christiansen et al. (2014; CGK) for detailed analysis of the Baseline treatment relative to the Gains treatment. Unless otherwise noted, we report results for rounds 7-15 at which point subjects are thoroughly familiar with the game and the functionality of the software. To simplify the presentation and to make comparisons between treatments easier, we represent the private good allocations as $x_i = c_i$ in the Gains treatment and as $x_i = 100 - \tau_i$ in the Costs treatment. If the Gains and Costs treatments impact behavior in the same way, then the private good allocations should be equivalent between the two treatments.

Table 2 reports aggregate outcomes where we have pooled the results for the baseline treatments with $E = 600$ and $E = 700$, as there are no statistically significant differences between

¹¹ The software was designed to permit up to 15 stages of bargaining before the program moved on to a new bargaining round. All bargaining rounds ended well before 15 stages.

¹² We ran an additional session of the Costs treatment to compensate for one of the early sessions, which ended after 11 rounds when we encountered computer problems (we use the data up through the 11th round). This, along with higher turnout in the Costs treatment, accounts for the higher participation rate than in the Gains treatment.

¹³ Data for the Gains treatment and Baseline treatment with $E = 600$ are from Christiansen et al. (2012).

the two.¹⁴ In the Baseline treatment the predicted policy location is 33 with zero variance. While the average policy location comes close to this (the median player's ideal point), the convergence is not as complete as predicted and there is a large standard error, equal to about two thirds of what is reported for the Gains and Costs treatments, both of which are predicted to have relatively large standard errors.¹⁵ The introduction of private goods moves the policy location toward the ideal point of the legislator who cares the most about it (T3), with the shift statistically significant in both treatments ($p < 0.01$).¹⁶ The average policy location is similar between the Gains and Costs treatments, and is remarkably close to the predicted location under the SSPE. The increase in the variance around the mean relative to the baseline is also statistically significant in both cases ($p < 0.01$).

Table 2
Aggregate Outcomes^a

	Average Location (standard errors)	% of Proposals Accepted in Stage 1	Total Payoffs ^b
Baseline (No Private Goods)	38.6 (20.0) [33]	57%	1343 [1365]
Gains	53.0 (30.3) [49.67]	78%	1491 [1465]
Costs	50.5 (30.6) [49.67]	69%	1479 [1465]

^a Averages are weighted by the predicted fraction of proposals passed given the proposer acceptance rates, to account for differences in the frequencies with which each type is selected as proposer. Predicted outcomes are in brackets.

^b Total payoffs in the baseline treatment with $E = 700$ are normalized by subtracting 300.

Two other things are worth noting in Table 2: First, proposals do not always pass in stage 1, although the theory predicts immediate passage in the Gains and Costs treatments. For the data, the Baseline treatment has the lowest acceptance rate, which is significantly below the rates in both the Gains and Costs treatments ($p < 0.01$).¹⁷ Acceptance rates are significantly higher in

¹⁴ More precisely, there are no significant differences in the average policy location, proposed or passed, in stage 1 acceptance rates, or in the variance in policy location chosen.

¹⁵ The predicted standard error in both the Gains and Costs treatments is 27.2.

¹⁶ Based on a t-test using outcomes in each bargaining round as the unit of observation.

¹⁷ Though any stage 1 pass rate is consistent with equilibrium in the Baseline treatment provided the policy location of 33 eventually passes, we do not find substantial differences in stage 1 pass rates between sessions, with the lowest rate at 51% and the highest at 67%.

the Gains than in the Costs treatment ($p = 0.10$). Although it is an accepted fact in the empirical literature on legislative bargaining that the introduction of private benefits helps to “grease the wheels” of the legislative bargaining process (see, for example, Evans, 2004), at first blush it might seem paradoxical that the taxes needed to pay for the public policy can have the same effect. However, taxes which involve decreases in private benefits can help to form coalitions in much the same fashion, albeit not as easily as when the benefits are positive. This is immediately obvious once one recognizes that the taxes needed to pay for the public policy (the “bus stop” in this case) are capable of bringing T1 and T3 together by imposing the maximum tax on T2, with T3 taxing herself for the sake of the relatively larger benefits she gets from having the location closer to her ideal point.

Second, total welfare is lower than predicted in the Baseline treatment and higher than predicted in both the Gains and Costs treatments. This is despite the fact that the deviation from the predicted policy outcome in *favor* of the efficient outcome is greatest in the Baseline treatment. Welfare does not increase relative to the predicted outcome in this case because there are a significant number of proposals which pass to the left of 33, and these proposals impose a large drag on welfare.

Conclusion 1: Average policy outcomes are very close to predicted outcomes in all three treatments. However, the likelihood of proposals passing is greater in both the Gains and Costs treatments than in the Baseline (no public goods) treatment, and greater in the Gains than in the Costs treatment. The higher passage rate with private benefits is consistent with the notion that they help to “grease” the legislative “wheels”. That taxes do the same seems somewhat paradoxical until one recognizes that by distributing taxes appropriately, they can help to bring legislators with different policy positions together.

Coalitions in the Gains and Costs treatments are of the minimum-winning variety. In both treatments accepted proposals receive an average of 1.05 votes in addition to the proposer’s vote. Table 3 shows which players vote with which proposers. T1s generally form coalitions with T2s as predicted, but T2s opt to partner with T1s, contrary to the SSPE. T3s predominantly form coalitions with T1s as the theory predicts. As will be reported in Table 4 below, proposers in the Gains treatment give almost no private goods to the third player outside the coalition, only 2.4

ECUs on average, and in the Costs treatment they nearly fully tax third players, with an average tax of 90.7 ECUs for accepted proposals.

Table 3
Percentage of Accepted Proposals Approved by Voter Type in Games with Private Goods

Proposer	Treatment	T1 only	T2 only	T3 only	Both other voters
T1	Gains	--	74%	21%	4%
	Costs	--	75%	19%	6%
T2	Gains	84%	--	12%	5%
	Costs	84%	--	14%	2%
T3	Gains	85%	7%	--	7%
	Costs	72%	19%	--	8%

Predicted coalition partners under the SSPE are in **bold**.

All stages.

Table 4 reports detailed data for accepted proposals.¹⁸ As just noted, it shows that T2s depart from the SSPE prediction in both the Gains and Cost treatments, forming coalitions with T1s as opposed to T3s. T2s also give more private goods to T1s than predicted, along with a public policy closer to their (and T1's) ideal point. The SSPE prediction that T2s will work with T3s rests on the idea that if T2s form coalitions with T1s, it gives T1s too much bargaining power, enabling them to hold out for unreasonably high payoffs. However, this does not happen, as T1's average earnings as proposers are lower than predicted under the SSPE by over 50 ECUs. T3s generally form coalitions with T1s, as predicted, holding on to minimal private goods (or taxing themselves close to the maximum possible), along with modestly lower payoffs compared to T1s.

¹⁸ Median values are quite close to the average values reported in Table 3, with the median location for accepted proposals for T1 and T2 at 33 for both Gains and Costs, and 90 and 93 for T3s in Gains and Costs, respectively. Since no proposer type proposes exclusively to one type of voter, the average private good allocations reported mask the fact that players outside of the coalition receive almost no private goods.

Table 4
Accepted Proposals in Games with Private Goods:
Location, Private Good Allocations, Pass Rates, and Payoffs
(standard error of the mean in parentheses)^a

Gains Treatment

Proposer	Average Location	Average Private Good Allocations			Stage 1 Pass Rate ^b	Proposers' Average Payoffs for Accepted Proposals ^c [predicted]
		T1	T2	T3		
T1	38.9 (3.4) [16.3]	66 (3.0) [100]	32 (3.0) [0]	1 (0.8) [0]	81% [100%]	627 (1.7) [684]
T2	35.6 (2.5) [49.7]	49 (3.3) [0]	43 (2.5) [100]	8 (3.4) [0]	84% [100%]	619 (5.2) [650]
T3	91.2 (1.8) [83.0]	79 (7.1) [100]	14 (6.4) [0]	7 (2.7) [0]	68% [100%]	554 (10.4) [498]

Costs Treatment^d

Proposer	Average Location	Average Private Good Allocations			Stage 1 Pass Rate ^c	Proposers' Average Payoff for Accepted Proposals ^d [predicted]
		T1	T2	T3		
T1	40.8 (3.2) [16.3]	49 (3.6) [100]	42 (3.1) [0]	9 (2.3) [0]	94% [100%]	608 (5.1) [684]
T2	37.5 (2.7) [49.7]	48 (2.7) [0]	48 (2.8) [100]	4 (1.7) [0]	70% [100%]	611 (5.5) [650]
T3	91.1 (1.1) [83.0]	64 (6.5) [100]	21 (5.5) [0]	15 (3.7) [0]	45% [100%]	562 (8.1) [498]

^a Predicted values in brackets.

^b Percent of T_i 's proposals voted on that were passed in stage 1.

^c Proposers' payoffs in **bold**. Note that because T2's payoff function is specified in absolute deviations from her ideal point, so that it is not possible to calculate T2's average payoffs directly from this table.

^d Private good allocation in the Cost treatment is $100 - \tau_i$.

T1s consistently propose own payoffs well below the SSPE prediction in both the Gains and Costs treatments. The most common proposal is the "efficient equal split" (EES) with T2 as

the coalition partner. An EES is defined as the payoff-maximizing proposal that equalizes payoffs to within 1 ECU between the proposer and one other coalition partner. For T1s the EES consists of a policy location at 33 with private good allocations $x_1 = 67$, $x_2 = 33$, and $x_3 = 0$ and payoffs $R_1 = 634$, $R_2 = 633$, and $R_3 = 198$ for T1, T2, and T3, respectively.¹⁹ In both treatments the median policy for T1 proposers in accepted allocations is 33, and the median private goods allocations for T1 and T2 are within 1 ECU of 67 and 33, respectively. T2 proposers also cluster at or near the EES in both treatments.

For T2 and T3 proposers, the average policy outcome and payoffs are quite similar between the Gains and Costs treatments. What is really strikingly different between the two treatments are the stage 1 pass rates: Both T2s and T3s have substantially lower pass rates under the Costs treatment, with T3's pass rate falling by nearly 25 percentage points ($p < 0.05$) and T2's dropping 14 percentage points.²⁰ As reported on below this resulted in substantial reductions in payoffs, particularly for T3s compared to what they would have earned had their proposals been accepted at the same rate as in the Gains treatment. In contrast to T2 and T3 proposers, the acceptance rate for T1's proposals is 13 percentage points higher under the Costs treatment ($p < 0.10$), without which the pass rate for the Costs treatment would have fallen even more.

The changes in pass rates result in decreased proposer power in the Costs treatment. Changes in proposer power are calculated in terms of the expected payoff of the proposer as a percentage of predicted payoffs under the SSPE, where expected payoffs are calculated using each type's average payoff for accepted proposals, the empirical pass rates for their proposals, and the empirical continuation values for the game. Proposer power is reduced uniformly going from the Gains to the Costs treatment: T1's drops from 91% to 89%, T2's from 94% to 92%, and T3's from 95% to 85%. T1's power falls even though their proposals are accepted more often because their average payoff as a proposer decreases in the Costs treatment. T2's falls because of reduced payoffs along with the reduction in pass rates. Although T3s get slightly higher payoffs as proposers in the Costs treatment, the steep decline in their pass rates more than offsets this increase.

¹⁹ The EES for a T2 proposer is the same as that for a T1 proposer. The EES is a natural focal point. Once a T1 or T2 proposer realizes that it will be payoff-maximizing to set the policy location at 33, it is an easy task for subjects to figure out how to divide private goods in order to equalize payoffs between the two of them.

²⁰ The lower acceptance rate by T2 proposers in the Costs treatment narrowly misses significance at conventional levels ($p = 0.13$).

Conclusion 2: Under both the Gains and Costs treatments T1s primarily partner with T2s, and T3s with T1s as the SSPE predicts, but T2s partner with T1s contrary to the SSPE. The decrease in average acceptance rates under Costs compared to Gains is led by a much sharper decrease for T3s (23 percentage points), a modest decrease for T2s (14 percentage points), and an *increase* in acceptance rates for T1s (13 percentage points). T1s do *not* take advantage of T2s partnering with them to get substantially higher payoffs relative to the SSPE, contrary to what the theory predicts. Proposals cluster close to the EES for both the Gains and Cost treatments.

The natural question is what underlies the large change in acceptance rates between the Gains and Costs treatments? One possibility is that T2 and T3 are proposing larger payoffs for themselves and lower payoffs to coalition members, which result in more rejections. There is some evidence that proposers take more in the Cost treatment: the average own payoff for a T3 proposer in all proposals voted on goes from 549 to 561 going from Gains to Costs, and from 617 to 620 for a T2 proposer. However, neither change is close to statistical significance. Another possibility is that the proposer's coalition partner, generally T1, has more to hold out for in the Cost treatment. However, T1's empirical continuation value actually declines from 613 to 601 in going from Gains to Costs.

Table 5 gets at the question of acceptance rates directly, reporting voting patterns by player types. For T1s and T2s we run separate probits conditioning on the proposer's type. This is important for T2s as they routinely reject T3 proposals, only seriously considering T1 proposals, so that to run a single probit is likely to distort voting patterns. We do the same for T1s for the sake of consistency and to account for the fact that T1s typically are offered higher payoffs from T2s than T3s, as occurs under the EES. T3s votes are reported for completeness sake, pooling their responses to T1s and T2s proposals since, in both cases, they tend to routinely reject these proposals, as they are not aimed at securing T3s vote. In all cases votes on own proposals are excluded.

In the probits the dependent variable is 1 for a "yes" vote and 0 for a "no" vote, with standard errors clustered at the subject level. Explanatory variables consist of voter's payoff from the proposal, a dummy variable equal to 1 for the Costs treatment (0 otherwise), the Costs dummy interacted with the voter's payoff, and the voter's payoff from her proposal which was not selected to be voted on. We include the latter as a measure of players' aspirations, which has

been shown in earlier bargaining experiments to impact behavior.²¹ Although these earlier bargaining experiments used a relatively unstructured environment, the results show that negotiators with higher aspirations will exhibit more patience at the bargaining table, being more willing to tolerate a longer give and take (Korobin, 2002). This translates directly into being more willing to reject offers that do not meet aspirations. Own payoffs for proposals that were not recognized in that bargaining round provide a readymade measure of aspirations. This measure of aspirations is also interacted with the Cost dummy.

Table 5
Voting Probits with Private Goods Available

	T1 Voter		T2 Voter		T3 Voter
	T2's proposals	T3's proposals	T1's proposals	T3's proposals	T1 and T2's proposals (pooled)
Intercept	22.04 (27.15)	25.26 (17.84)	-26.62 (12.63)**	25.19 (13.85)*	-7.20 (2.49)***
Own payoff	0.025 (0.010)**	0.030 (0.006)***	0.051 (0.022)**	0.068 (0.026)***	0.012 (0.002)***
Dummy for Cost treatment	-52.68 (28.60)*	-25.04 (18.52)	8.22 (13.50)	-27.78 (14.22)*	-0.35 (4.72)
Own Payoff*Dummy for Costs	0.014 (0.016)	-0.024 (0.009)***	-0.017 (0.023)	-0.049 (0.026)*	0.007 (0.005)
Own payoff from own proposal not selected	-0.058 (0.039)	-0.068 (0.031)**	-0.006 (0.006)	-0.099 (0.041)**	0.005 (0.004)
Own payoff from own proposal not selected*Dummy for Costs	0.070 (0.039)*	0.061 (0.031)**	0.004 (0.010)	0.086 (0.041)**	-0.005 (0.007)

*** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level
Errors clustered at the subject level. Stage 1 proposals only.

²¹ Siegel and Fouraker (1960) provide the classic study showing that negotiators with higher aspirations tend to achieve better bargaining results. Also see White and Neale (1994) for similar results in the context of negotiating over housing prices.

As expected, in all cases the coefficient value for own payoff is positive and significant at the 5% level or better. For T1s and T2s the Costs dummy is negative for T3 proposals, and is nearly the same size. The Costs dummy is significant in the case of T2s but misses significance on its own for T1s ($p = 0.18$). For both voters the interaction between own payoff and the dummy for Costs is also negative and significant. For T1s the absolute size of the coefficient is close to the coefficient on own payoff and, in conjunction with the negative dummy for the Costs treatment, the two are jointly significant at the 5% level.²² These results match the raw data in terms of the large reduction in the pass rate for T3 proposals in the Costs treatment.

The results show smaller differences between the Costs and Gains treatments for T1s voting on T2 proposals and vice versa. For T1s the dummy for the Costs treatment is negative and significant, but the interaction between own payoff and the Costs dummy is positive and insignificant, consistent with the smaller decrease in T2's pass rates relative to T3s. For T2s neither the Costs dummy nor the interaction with own payoff is significant.²³ This suggests that the increase in T1's pass rate between Gains and Costs was the result of somewhat increased offers to T2s.²⁴ Finally, for the probits we are primarily interested in—T1s voting on proposals from T2s and T3s, and T2s voting on proposals from T1s—the coefficient values for own payoffs for proposals not selected are all negative, as expected. However, the coefficients for the interaction effect with the Costs dummy and own payoff are all positive, and of sufficient size to wipe out any effect of aspirations in the Costs treatment.

Conclusion 3: Voting probits indicate that T1s are less likely to vote in favor of proposals from T2s and T3s under the Costs treatment, with a stronger negative response with respect to T3s, consistent with the raw data. Neither the Costs dummy nor the interaction between Costs and own payoff are significant for T2s voting on T1 proposals which, along with a modest increase in T1's offers to T2s, may account for the increase in T1's acceptance rate in the Costs treatment.

What factors explain the reduced frequency for T1s accepting T2 and T3's offers in going from Gains to Costs given that the two treatments yield the same payoff under both the EES, as well as under the SSPE? In what follows we attribute these differences to legislators responding

²² For T2s the joint test just misses statistical significance ($p = 0.12$).

²³ For both T1 and T2 the joint test misses statistical significance, though it is closer for T1s ($p = 0.18$).

²⁴ T2's average payoff in chosen T1 stage 1 proposals increases from 590 in Gains to 598 in Costs, though the difference is not statistically significant.

differentially to gains and losses relative to their initial budget allocations, which serves as a natural reference point when voting. We focus on T1s responding to T3 proposals since that is where the sharpest decrease in pass rates exists, and T1s are the T3 proposer's typical partner.

Figure 1 plots T3's payoff, along with T1's payoff for all T3 proposals voted on in stage 1 where both players' payoffs exceeded 500 ECUs.²⁵ Payoffs for proposals that are rejected (left hand panel) and accepted (right hand panel) by T1s are reported for both treatments. Multiple observations are represented by larger circles, with the number of "petals", along with the circle coloring, indicating the number of observations.

The first thing to notice is the large cluster of proposals in both treatments at the efficient equal split (EES), payoffs to T1 and T3 of 600 ECUs; a policy location at 100 with private good allocations $x_1 = 100$, $x_2 = 0$, and $x_3 = 0$ (T2's payoff is 399). There are also a number of proposals to the west of the EES with T3's payoff below 600 in both treatments. These proposals look very much like the EES except that they involve policy locations slightly below 100.²⁶ We pool these with the (strict) EES proposals to form the class of "nearly efficient equal splits" (NEES) - $y \in [90, 100]$ with nearly all private goods going to T1.²⁷

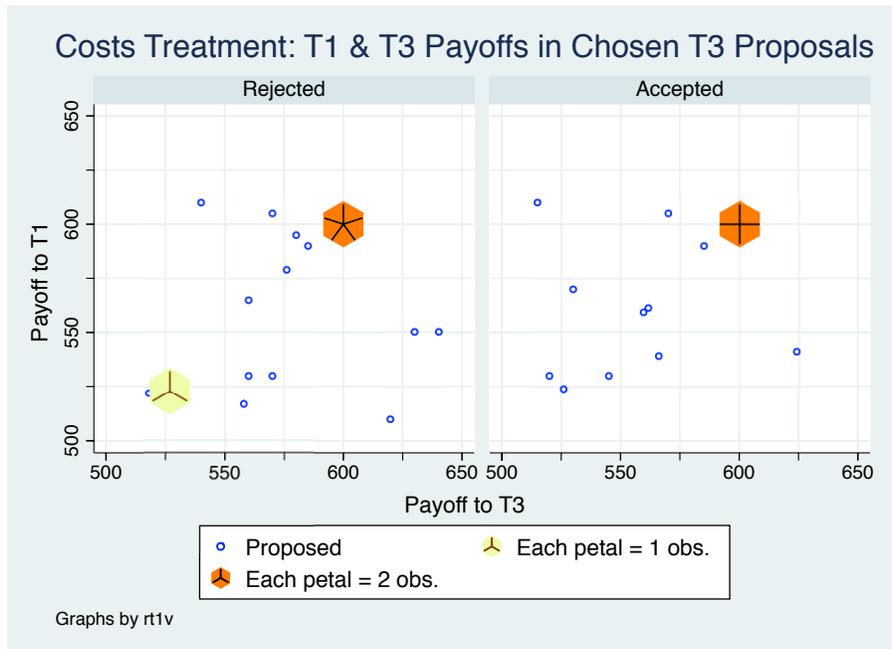
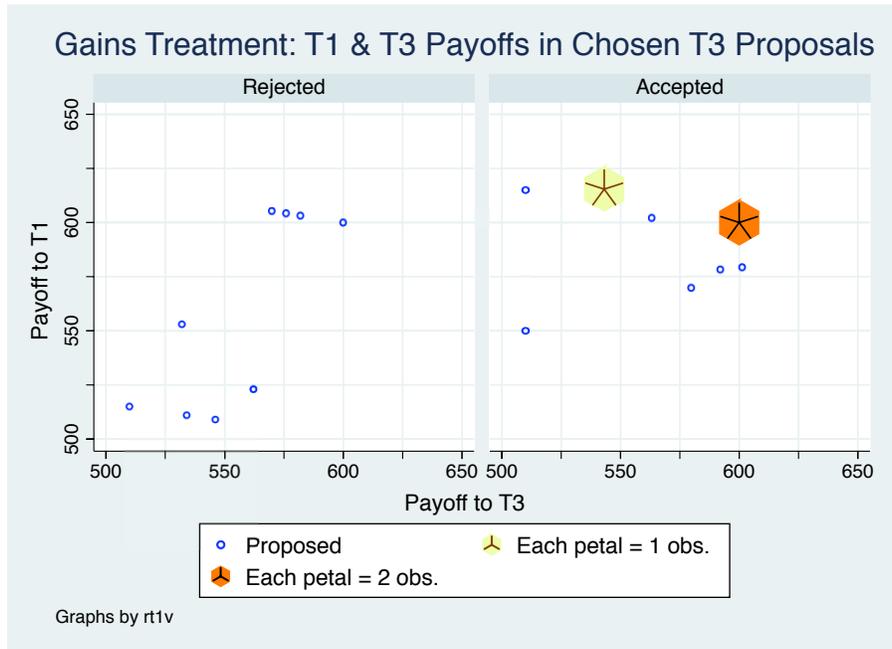
Of T3s' proposals selected to be voted on, 51% and 46% were NEES proposals in the Gains and Costs treatments, respectively. And while these constitute a similarly large share of T3 proposals in both treatments, their acceptance rate is only 36% in the Costs treatment compared to 77% in the Gains treatment, which accounts for T3s' lower pass rates in the Costs treatment. This higher rejection rate on the part of T1s is in spite of the fact that T1s have a lower empirical continuation value in the Costs treatment, so that within the standard theory, they have less to hold out for.

²⁵ Only 6 T3 proposals in Gains and 6 in Costs did not meet these criteria.

²⁶ Note that because T3's unit walking cost is so high, even a proposal that allocates all of the private goods to T1 and proposes a policy of 90 lowers T3's payoff to 540.

²⁷ NEES proposals yield payoffs of $R_3 \in [540, 610]$ and $R_1 \in [590, 610]$ and include the EES as a special case.

Figure 1
Accepted and Rejected Proposals for T3s



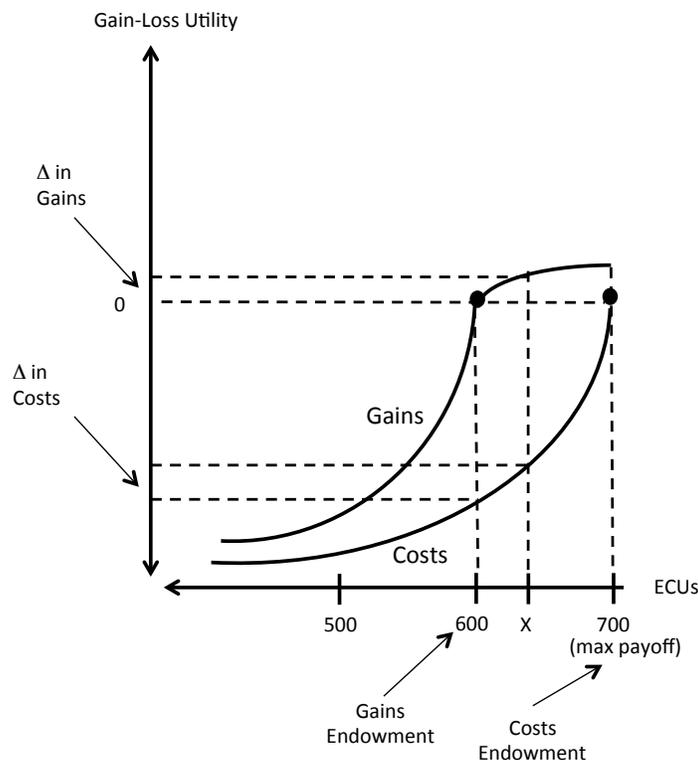
Note: Stage 1 proposals only. Each orange petal represents 2 observations so that a large circle with 5 petals represents 10 observations at that point in the plane. Similarly, each yellow petal represents 1 observation.

The sharp increase in T1s' rejection of NEES proposals in the Costs treatment can be attributed to a reference point effect based on players' higher endowment in the Costs treatment,

in conjunction with the well-established tendency to overvalue losses relative to gains. To illustrate, suppose players have reference-dependent preferences as in Köszegi and Rabin (2006). That is, suppose a player’s utility is the sum of her payoff in the game and her “gain-loss” utility. The latter is a function of the difference between her payoff in the game and her reference point, which in this case is her initial endowment. We assume the gain-loss utility function satisfies the usual assumptions from Prospect Theory, including loss aversion and diminishing sensitivity to losses (the marginal change in gain-loss sensation is smaller) as one moves farther from the reference point.²⁸

Under these assumptions Köszegi and Rabin show that for a fixed payoff, a player is always better off (i.e., her gain-loss utility is greater) with a lower endowment. In our experiment this means that, for a fixed payoff, a player has higher gain-loss utility in the Gains treatment as illustrated in Figure 2, which graphs the gain-loss function for T1 in both treatments along with the corresponding endowments.

Figure 2
Gain-Loss Utility in Gains and Costs Treatments



²⁸ See Köszegi and Rabin (2006) for a formal description.

To see why this can increase rejections in the Costs treatment, consider a T3 proposing an EES payoff to T1 of 600. Suppose T1 compares this against some other possibility with a higher payoff, X (in Figure 2), such as an EES proposal from T2 with a payoff of 633. As shown in Figure 2, as long as (i) T1 is sufficiently loss averse, and (ii) her sensitivity to losses does not diminish too quickly, the change in her gain-loss utility going from 600 to X in Costs compared to Gains is larger, resulting in a higher probability of rejecting the current proposal.

This large drop in T1s accepting T3 proposals imposed significant reductions in earnings for T3s compared to what they would have earned if T1s continued to accept proposals at the same rate as in the Gains treatment. We can estimate the cost to T3 from the change in T1's voting using the probit results in Table 5. To do so, we use the coefficients from the Gains treatment (that is, set the dummy for the Costs treatment to 0 for T1 and T2 voters) and make an out of sample prediction of the probability that a T1 or a T2 accept T3's proposals from the Costs treatment. These probabilities are then used to calculate the predicted probability of accepting a given T3 proposal along with the T3 proposer's expected return. We compare these to the predicted acceptance probability and expected return for T3 proposals using the coefficients and data from the Costs treatment (that is, comparing them to in-sample predictions).

This exercise shows that the average predicted probability of a T1 voting for a T3 proposal in the Costs treatment would be 71% if T1s voted the same way as they do in the Gains treatment. Instead, the average predicted probability of voting in favor of a T3 proposal is only 49% in the Costs treatment. This results in an average expected return for a T3 proposer of 491 compared to 431 from the in-sample predictions.²⁹ In other words, if voters responded to proposals in the same way in the Costs treatment as they do in Gains, T3 proposers would see their expected payoffs increase by 60 ECUs. So there are real costs to T3 from these higher rejection rates.

This raises the question as to why there is still a proliferation of EES proposals by T3 in the Costs treatment. First, each proposer, including T3, faces strategic uncertainty when they choose their proposal. That is, they are unsure as to what responders will accept. As a result proposers initially opt for some sort of a fairness norm, of which the EES (or an NEES) is a prime candidate. Second, even though the rejection rate is substantially higher for an EES proposal, it is difficult for a T3 to respond by offering T1 higher payoffs. T3 is already taxing

²⁹ This calculation holds T3's empirical continuation value constant.

herself the maximum amount possible in the Costs treatment, so offering T1 more means moving the policy location to the left, which imposes a high cost on T3 and quickly makes for a much more inequitable payoff compared to T1.

The same reference point effects exist for T2s responding to proposals from T1s. However, the reason that the Cost variables in T2's voting probits are not statistically significant is likely due to T2's low continuation value relative to what T1s are offering (565 versus 633 under the EES), so they would have to be extremely risk-loving to reject T1's offers in the Costs treatment. Indeed, if T2s get a decent offer from T1s and they fail to accept it they suffer the possibility that a T3 will become the proposer and successfully partner with a T1, which typically makes them even worse off, leaving T2 with a payoff below 400. Similarly, there is a smaller reduction in T1 acceptance rates of T2 proposals in the Costs treatment since T2s offer payoffs above T1's continuation value.³⁰

Conclusion 4: The sharp increase in rejection rates for T3s proposals under the Costs treatment is consistent with an endowment effect in conjunction with Prospect Theory type preferences, as subjects start with substantially higher endowments under Costs compared to Gains. The probits indicate that some of these same forces are at work with respect to T1s voting over proposals from T2s, and vice versa. But they did not result in a sharp, and consistent, increase in rejection rates on account of the fact that their empirical continuation values were well below the offers they were getting.

A natural question is what happens in equilibrium when individuals bargain with reference-dependent preferences. In the Appendix we solve for the SSPE in a simple case of Köszegi and Rabin preferences where the gain-loss utility term is linear. The analysis shows that voters hold out for higher payoffs in Costs than in Gains, which means proposers must respond with higher payoffs. T1s and T2s as voters hold out for higher payoffs from T3s in the Costs treatment. But as proposers, they do not reduce their own payoffs. Details are provided in the Appendix.

³⁰ Note that in the Gains treatment T1s' payoff from the EES with a T3 proposer is somewhat below their continuation value (600 vs. 613), with the difference quite similar to what is reported for the Costs case. The story the data is telling is that these differences, which are relatively small, have a much greater impact when T1s are worse off relative to their initial endowment than when they are not.

5. Summary and Conclusions

We experimentally investigate the impact on legislative bargaining from increasing budget allocations versus decreasing budget allocations under a design that should result in no difference between the two regimes using standard economic or political science models. Although a situation such as this is unlikely to occur outside the laboratory, the experiment does serve to isolate the impact of increasing versus decreasing budget allocations, other things equal. The experiment also serves to investigate the impact of reference point effects within a structured bargaining environment that eliminates all of the potential confounds identified in the Zeiler and Plott's (2005) critique of the original Kahneman et al. (1990) experiment.

Using the Jackson-Moselle (2002) legislative bargaining model, there are minimal differences in the average policy outcome, or bargainers' benefits, for *accepted* proposals under a Gains treatment, where legislators have private goods available to "grease" the bargaining "wheels", and a Costs treatment, where it is necessary to reduce private goods in order to free up money to pay for a public policy. Subjects in both treatments commonly choose the efficient equal split, or something quite close to it. If this is accepted, it constitutes a rule of thumb equilibrium based on a fairness norm for the game, or strategic uncertainty as to what responders are likely to accept.³¹ However, we find that on average it takes significantly longer for agreement to be reached under the Costs treatment compared to the Gains treatment under an experimental design where both the preferred theoretical equilibrium (the stationary subgame perfect equilibrium) and the EES predict no differences. The Costs treatment is particularly disadvantageous for legislators who care the most about the public policy (T3s) to get their proposals passed, as their round 1 acceptance rates decline by over 20 percentage points despite making similar proposals to the dominant player (T1s). We argue this results from T1s using their initial endowment as a reference point in bargaining in conjunction with Prospect Theory type preferences. Short of some sort of dramatic change in T1's gain-loss utility function as a result of these different initial endowments, or significantly diminishing sensitivity to losses, this will result in greater losses to T1s from the EES since they end up below their initial endowment

³¹ That is, if players care only about fairness (achieved in a joint surplus maximizing way) or the strategic uncertainty is great enough then an EES between T1 and T2, T2 and T1, and T3 and T1 where coalition members vote to accept these proposals constitutes a Nash equilibrium. This holds even if players care about own payoffs provided the fairness norm is strong enough. Strong enough concern for own payoffs will result in T1s rejecting EES offers from T3 in favor of waiting for one from T2s (or their proposing an EES to T2) as the EES with T2 yields a higher payoff. It is still an equilibrium, however, since there is no way T3s can deviate without violating the fairness norm. So it is an equilibrium where the EES proposal from T3 is not always approved, which is what we see in the experiment.

in in the Costs treatment, whereas an EES puts them at or above their initial endowment in the Gains treatment.

One of the primary motivations for the Jackson-Moselle model was to explain the formation and composition of stable political parties. In their model, groups of legislators can increase their expected payoffs by forming binding agreements (“political parties”) prior to the legislative bargaining game, which specify how they will vote and what they will propose if selected as proposer. In our experimental set-up the SSPE predicts that there are two stable parties, T1-T2 and T2-T3.³² However, the empirical continuation values reported for the Gains treatment in Christiansen et al. (2012) show that a T2-T3 party is unstable.³³ The same result holds using the empirical continuation values from the Costs treatment. The reason is that in both treatments the empirical continuation values of T2 and T3 exceed the values predicted under the SSPE. This leaves fewer gains for these players from forming a binding agreement with one another before the proposer is selected, and greater gains from partnering with T1s whose empirical continuation value is lower than predicted. Since T1s still prefer to form a party with T2, this is the only stable party.

The net result of our findings is that there are fewer coalitions of strange bedfellows in the Costs treatment. This may partly explain some of the polarization in Congress in the face of budget cuts in recent years. The results reported here may also help explain the goals of at least some of the actors behind the use of automatic budget cuts (“sequestration”), as well as the final outcome of this process. In 2011 the U.S. Congress passed the Budget Control Act, requiring across-the-board cuts in mandatory and discretionary spending if a joint committee on deficit reduction failed to achieve a specified level of spending consistent with a “grand bargain”, cutting some social programs which Republicans favored and Democrats opposed (e.g., increasing the retirement age, or the indexing formula, for Social Security), as well as increasing taxes on upper income earners which Democrats favored but Republicans opposed. The large across the board budget cuts under sequestration followed the failure to reach agreement on a grand bargain of this sort. Critics decried this blunt force approach to deficit reduction, but some commentators noted that these large, and in many cases misguided, cuts might incentivize

³² T2 and T3 are indifferent between forming parties with one another and with T1. However, because of the proximity of their ideal points, there are more gains for T1 from forming a party with T2 than with T3.

³³ A “stable” party is one for which no member can form an agreement with another set of players and achieve a higher payoff. JM assume parties split the gains according to the Nash bargaining.

Congress to get a deal done, since they imposed significant costs to both political parties.³⁴ While both parties continued to negotiate a more sensible deal than the sequestration solution, the pain behind these across the board cuts got to be too much. In January 2014 they were able to compromise as both houses of Congress reached a budget deal for fiscal year 2014 repealing \$61 billion in sequester cuts evenly divided between defense (which Republican favored) and non-defense (which Democrats favored).³⁵

In terms of this paper, a direct interpretation of the failure to reach agreement, leading to sequestration, followed by the compromise to restore a significant portion of the budget cuts is as follows: The grand bargain, which involved negotiating budget cuts, and which failed to be passed, is similar to negotiating in the Costs treatment, which our experiment shows is more difficult to reach agreement in. The subsequent across-the-board cuts are akin to taking 100 ECUs from each player, reducing their endowments from 700 to 600, and then letting them bargain over 100 ECUs in relief from the cuts as occurs in the Gains treatment. Not only does the experiment suggest that agreement is easier in this case, but we find that overall bargaining outcomes are mostly unchanged. In other words, if spending cuts are a foregone conclusion, it may be easier to reach agreement on important public policy issues with a relatively large across the board, or misguided, budget cut followed by renegotiation in which there is some (selected) relief from the budget cuts involving increases in private goods.

References

Baron, D. P., and J. A. Ferejohn (1989) "Bargaining in Legislatures," *American Political Science Review*, 83(4), 1181-1206.

Bateman, I., Munro, A., Rhodes, B., Starmer, C., & Sugden, R. (1997). "A test of the theory of reference-dependent preferences." *The Quarterly Journal of Economics*, 112(2), 479-505.

Bazerman, M. H., T. Magliozzi, and M. A. Neale (1985) "Integrative Bargaining in a Competitive Market," *Organizational Behavior and Human Decision Processes*, 34, 294-313.

³⁴ "It's [the sequester] a lousy way to cut \$1.2 trillion, which is imminently achievable. This is the chance to do the big deal. ... I'm willing to raise \$600 billion in new revenue, if my Democratic friends would be willing to reform entitlements and we can fix sequestration together ..." Senator Lindsey Graham as reported in http://www.huffingtonpost.com/2013/02/25/lindsey-graham-sequester_n_2762133.html.

³⁵ See: <http://www.washingtonpost.com/blogs/wonkblog/wp/2014/01/14/heres-a-breakdown-of-whats-in-congress-1-012-trillion-spending-bill/> and http://www.upi.com/Top_News/US/2014/01/13/Republicans-Democrats-reach-deal-on-11-trillion-spending-bill/UPI-24531389665791/?spt=hts&or=1

Camerer, C. F., E. J. Johnson, T. Rymon, and S. Sen (1993) "Cognition and Framing in Sequential Bargaining for Gains and Losses" in: *Frontiers of Game Theory*. Cambridge, MA: MIT Press, pp. 27-47.

Christiansen, N. (2010) "Greasing the Wheels: Pork and Public Good Contributions in a Legislative Bargaining Experiment," Unpublished manuscript.

Christiansen, N., S. Georganas, and J. H. Kagel (2014) "Coalition Formation in a Legislative Voting Game," *American Economic Journal: Microeconomics*, 6(1), 182-204.

Diermeier, D. and S. Gailmard (2006) "Self-Interest, Inequality, and Entitlement in Majoritarian Decision-Making," *Quarterly Journal of Political Science*, 1(4), 327-350.

Diermeier, D. and R. Morton (2005) "Proportionality versus Perfectness: Experiments in Majoritarian Bargaining," David Austen-Smith and John Duggan, eds. *Social Choice and Strategic Behavior: Essays in the Honor of Jeffrey S. Banks*. Berlin et al.: Springer.

Evans, D. (2004). *Greasing the Wheels: Using Pork Barrel Projects to Build Majority Coalitions in Congress*. Cambridge: Cambridge University Press.

Fishbacker, U (2007) "z-Tree: Zurich Toolbox for Ready Made Economic Experiments," *Experimental Economics*, 10: 171-178.

Fréchette, G. R., J. H. Kagel, and S. F. Lehrer (2003) "Bargaining in Legislatures: An Experimental Investigation of Open versus Closed Amendment Rules," *American Political Science Review*, 97(2), May, 221-232.

Fréchette, Guillaume, Kagel, John H. and Morelli, Massimo (2005a) "Nominal bargaining power, selection protocol, and discounting in legislative bargaining." *Journal of Public Economics*, 89: 1497-1517.

_____ (2005b) "Gamson's Law versus Non-Cooperative Bargaining Theory," *Games and Economic Behavior*, 51: 365-390.

_____ (2012) "Pork Versus Public Goods: An Experimental Study of Public Good Provision Within a Legislative Bargaining Framework," *Economic Theory*, 49: 779-800.

Harrington, J.E., Jr. (1990) "The Role of Risk Preferences in Bargaining when Acceptance of a Proposal Requires Less than Unanimous Approval," *Journal of Risk and Uncertainty*, 3 (2): 135-154.

- Jackson, M. O. and B. Moselle (2002) "Coalition and Party Formation in a Legislative Voting Game," *Journal of Economic Theory*, 103 (1): 49-87.
- Kahneman, D. and A. Tversky (1979) "Prospect Theory: An Analysis of Decision Under Risk," *Econometrica*, 47(2), 263-291.
- Kahneman, D., J. L. Knetsch and R. H. Thaler (1990) "Experimental Tests of the Endowment Effect and the Coase Theorem" *Journal of Political Economy*, 98 (6) 1325-1348
- Korobin, R. (2002) "Bounded Rationality, Standard Form Contracts, and Unconscionability," *University of Chicago Law Review*, 70(4), 1203- 1295.
- Kőszegi, B., and Rabin, M. (2006). "A model of reference-dependent preferences." *The Quarterly Journal of Economics*, 121(4), 1133-1165.
- Kristensen, H. and T. Gärling (1997) "The Effects of Anchor Points and Reference Points on Negotiation Processes and Outcomes," *Göteborg Psychological Reports*, 27(8).
- McKelvey, R. D. (1991); "An Experimental Test of a Stochastic Game Model of Committee Bargaining: in Contemporary Laboratory Research in Political Economy, ed. by Thomas R. Palfrey. Ann Arbor: University of Michigan Press.
- Montero, M. (2007) "Inequity Aversion May Increase Inequity," *Economic Journal*, 117 (519): C192-C204.
- Neale, M. A., and M. H. Bazerman (1985) "The Effects of Framing and Negotiator Overconfidence on Bargaining Behaviors and Outcomes," *The Academy of Management Journal*, 28(1), 34-49.
- Plott, C. R. and K Zeiler (2005) "The Willingness to Pay-Willingness to Accept Gap, the 'Endowment Effect,' Subject Misconceptions, and Experimental Procedures for Eliciting Valuations" *The American Economic Review*, 95 (3), 530-545
- Siegel, S. and L.E. Fouraker (1960). *Bargaining and Group Decision Making: Experiments in Bilateral Monopoly*. New York, NY: McGraw-Hill.
- White, S. B. and M. A. Neale (1994) "The Role of Negotiator Aspirations and Settlement Expectancies in Bargaining Outcomes," *Organizational Behavior and Human Decision Processes*, 57(2), 303-317.

The Effects of Increasing versus Decreasing Private Goods on Legislative Bargaining: Experimental Evidence

Nels Christiansen and John H. Kagel

Appendix

The different endowments in the Gains and Costs treatments may affect bargaining outcomes even under the SSPE if subjects use them as reference points in their decision-making. In the Costs treatment players always receive payoffs below their 700 endowment, while in the Gains treatment players may be above or below their 600 endowment depending on the policy location and the allocation of private goods. To the extent that players derive different utility from gains and losses relative to a given reference point, bargaining outcomes may diverge between the two treatments even though the SSPE is unchanged.

In an attempt to understand the potential implications for the SSPE equilibrium, we model reference-dependent preferences as in Köszegi and Rabin (2006). We utilize a special case, in which we assume a player's utility is composed of two components: her payoff in the game, R_i , and a linear "gain-loss utility" term relating her payoff to her endowment,

$$U_i = \begin{cases} R_i + \eta(R_i - E), & \text{if } R_i > E \\ R_i + \lambda\eta(R_i - E), & \text{if } R_i \leq E \end{cases}$$

where $\eta > 0$ is the weight an individual assigns to gain-loss utility, and $\lambda > 1$ represents the degree of loss aversion.

Because of the intractability of the functional forms, the SSPE in the Gains treatment is shown numerically in Figure A1 for $\lambda = 2$ and $\lambda = 4$ as a function of η . For each proposer type, the graphs depict one of the parameters (policy location, cash, or probability of proposing to individual i) as a function of the weight individuals place on gain-loss utility. The outcomes in the standard JM model are shown where $\eta = 0$.

There are two things to note about the SSPE over the $\lambda = 0$ to $\lambda = 4$ range. First, with the exception of T2 proposers, the equilibrium has the same "flavor" as in the JM model. T1 proposes to T2 and keeps all of the cash for herself. T3 almost always proposes to T1 by offering up all of the cash and proposing a high policy. In the case of a T2 proposer, the introduction of

gain-loss utility means T2s should propose to T1 with some positive probability. In doing so, the proposer sets a policy of 33 and offers T1 a share of the cash.

The second take-away from the modified SSPE is that proposers are predicted to earn higher payoffs in the Gains treatment. Each proposer is able to pull the policy closer to her ideal point, and/or keep a larger share of the cash as the weight placed on gain-loss utility increases. This is because in the Gains treatment where individual payoffs can be above or below initial endowments, the assumption that the sensation from a gain is less than from a loss results from individuals being risk-averse in the face of uncertainty. That is, with regards to the gain-loss term, individuals prefer to receive some amount for sure than the same expected amount in a future stage. Thus, in the Gains treatment a proposer should not need to give as much to get a coalition member's vote as predicted, absent an endowment effect, in the SSPE.

In the Costs treatment the inclusion of the linear gain-loss utility term does not change the SSPE. This is because payoffs are always at or below the player's endowment so that $U_i = R_i + \lambda\eta(R_i - E) = (1 + \lambda\eta)R_i - \lambda\eta E$, which simply scales the payoff function from the JM model. A non-linear gain-loss term would allow for "S-shape" gain-loss utility as in Kahneman and Tversky (1979). This would make individuals in the Costs treatment risk-loving over gain-loss utility since they are always below their endowment, which implies that proposers would need to allocate coalition members *higher* payoffs to get their vote than in the SSPE absent an endowment effect.¹

We find no evidence that proposers reduce their own payoffs in the Costs treatment.² However, with respect to voting, the probits in Table 5 show that T1s and T2s do hold out for more from a T3 proposer in the Costs treatment. The model provides a basis for this type of voting even under the SSPE. For instance, T3s offer T1s similar proposals between the two treatments, but while a payoff of 600 from the EES might be enough to satisfy a risk-averse T1 in the Gains treatment when her empirical continuation value is 613, that might not be the case in Costs when individuals are more risk-loving (even though her continuation value is only 601). In

¹ We leave the calculation of the SSPE in this general case to future work and focus on the linear case because of its tractability.

² While the average accepted payoff for a T1 proposer falls from 627 to 608 going from Gains to Costs this is the result of a handful of T1s attempting to equalize payoffs between all 3 players. Restricting proposals to those going after T2's vote, there is no difference in the proposer's payoff between treatments.

Costs a T1 may be more inclined to take her chances to possibly obtain a payoff closer to her endowment.

Finally, notice that the model does not necessarily predict an increase in rejection rates in Costs for partnerships between T1 and T2, provided those partnerships involve an EES. The reason is that an EES between T1 and T2 offers each player a payoff far in excess of her empirical continuation value for the game in both treatments. A player in Costs would have to be extremely risk-loving in order to gamble and reject the proposal.

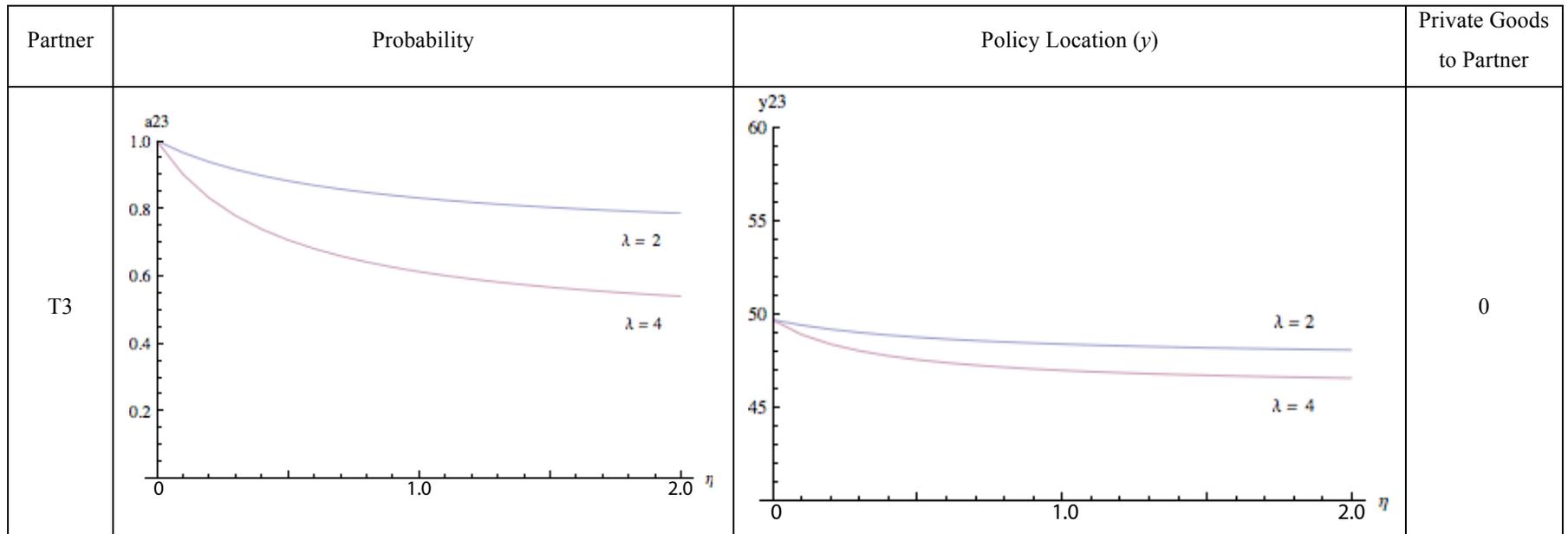
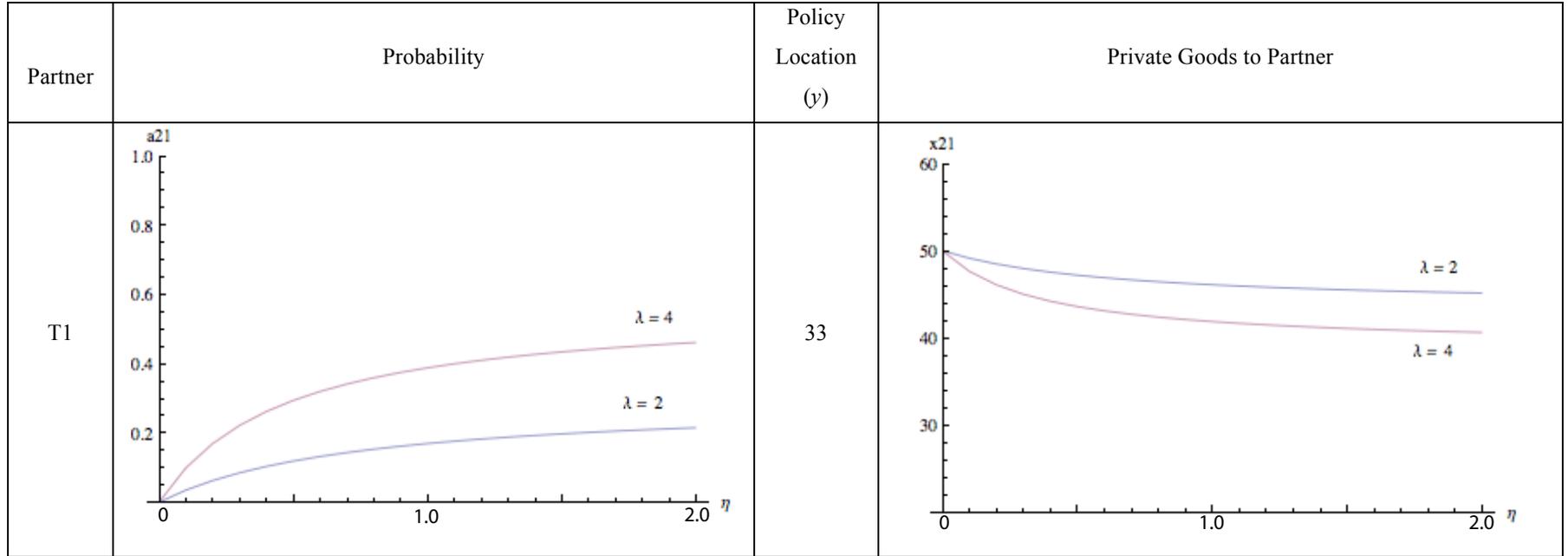
Figure A1

Public Good Location and Private Good Allocations as a Function of Proposer's Type using Reference-Dependent Preferences in Gains Treatment
 (under SSPE for $\lambda = 2$ and $\lambda = 4$)

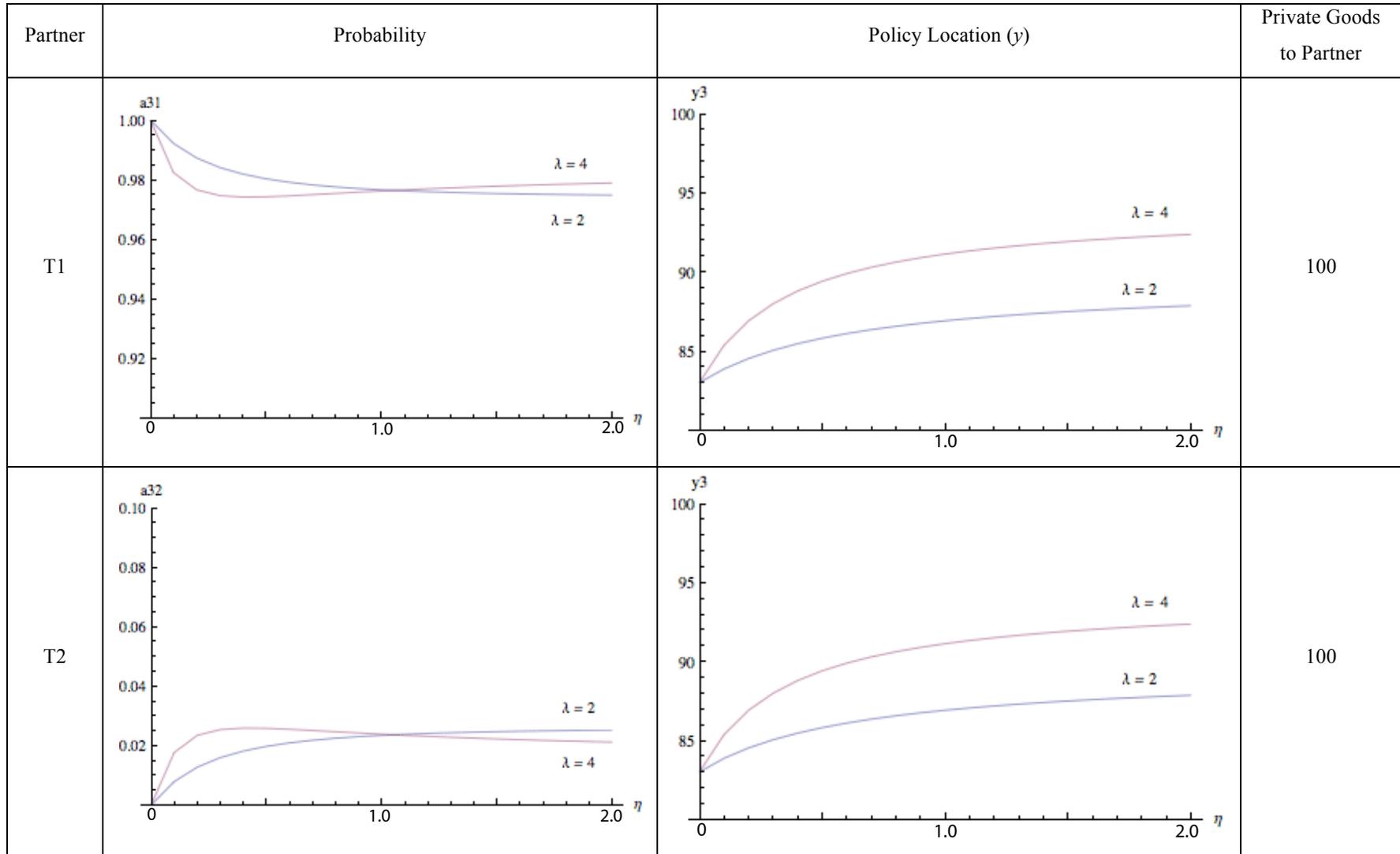
T1 Proposer

Partner	Probability	Policy Location (y)	Private Goods to Partner
T2	100%		0
T3	0%	--	--

T2 Proposer



T3 Proposer



Notes: For each proposer the first column of the figure shows the two other types with which she can form a coalition. The second column gives the probability that this happens under the SSPE as a function of η , and the third column shows the policy location proposed. The last column shows the amount of private goods allocated to the proposer's coalition partner (between 0 and 100). Note that the probabilities, policy location and private goods are sometimes independent of η .