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

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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" in terms of the time it takes to reach agreement, but gains are more effective than losses. This difference is attributed 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

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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 available 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 in order 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 outcomes 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 Loss treatments, but there are substantial differences in outcomes 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 results in a substantial shift in proposer power between the two cases. We attribute these differences to legislators responding differentially to gains and losses relative to benefits received under the 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 severe budget cuts, 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 achieving 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 endowment effects 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 comparable 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 this endowment effect. This is but the tip of the iceberg on this long-studied topic; see, for example, Koszegi 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 in order to achieve a theoretically isomorphic final outcome relative to the Gains treatment. It also eliminates many of the potentially confounding effects identified in Plott and Zeiler. To our

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

[2] Details regarding these outcomes will be reported on below.

knowledge, it is also the first experiment to address the issue of gains versus losses in a well-structured legislative bargaining game with clear theoretical predictions.

Earlier experiments have looked at how framing impacts bargaining outcomes 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 private goods and policy 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, and(2) Our experiment employs a highly structured bargaining framework as opposed to the unstructured bargaining for a fixed time period employed in these earlier 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 Christiansen et al.

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.

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, and it is assumed u_i is 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. The game always proceeds to a new stage so long as a proposal was not approved in the preceding stage. 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 $t \in \{1, 2, \ldots\}$is valued as $\delta^t u_i(y, x_i)$.[3] 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, is used to generate a unique equilibrium for the game.[4]

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 legislators T1, T2 and T3, respectively. Legislators also differ in cost to deviating from their ideal points: Each integer deviation from a legislator's ideal point costs 1, 3 and 6 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 ($\delta = 1$).[5]

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[3] If the game never terminates, a default decision (a policy location and split of the private goods) is reached. It turns out that even if $\delta = 1$ the default decision plays no role in the analysis when $X > 0$. See JM for details.
[4] See BF for a discussion of the properties of the SSPE.
[5] Instructions are at the web site: http://www.trinity.edu/nchristi/doc/Instructions_Gains_Costs.pdf

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,

$$R_i = E - \text{UWC}_\text{i} \left| \, y_i^* - y_{prop} \right|$$

where y_{prop} is the policy proposed and E is the legislators starting endowment, the same for all types. Private goods allocated to *i*, or taken away from *i* in the form of taxes, 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*. There are 100 ECUs of cash to be distributed and $E = 600$ for all players. A proposal is a policy location and distribution of cash, (y, c_1, c_2, c_3), such that the cash allocations sum 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.

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:

$$\begin{aligned} R_i &= 700 - \text{UWC}_\text{i} \left| \, y_i^* - y_{prop} \right| - \tau_i \\ &= 600 - \text{UWC}_\text{i} \left| \, y_i^* - y_{prop} \right| + (100 - \tau_i), \end{aligned}$$

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 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.[6] 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 between stages, there are penalties to delay from the perspective of 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.[7] 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 location of policy without access to private goods under exactly the same parameter values 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.[8] 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 in the baseline treatment.[9]

[6] 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 of 200.

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

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

[9] 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.

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 Member's Payoff	98	550	450

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

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 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 a majority of votes, a new stage began with a new set of proposals, with this process repeating itself until a proposal passed.[10] 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

[10] 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.

Experimental sessions typically lasted for 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.[11] 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.[12] 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. (2012; CGK) for detailed analysis of the Baseline treatment. Unless otherwise noted, we report results for rounds 7-15 in order to give subjects an opportunity to learn the structure of the game and the functionality of the software. To simplify the presentation and to make comparisons between treatments easier, we represent the private goods allocation 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 the two.[13] In the Baseline treatment the predicted policy location is 33 with zero variance. While the average policy location comes close to this (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 a relatively large standard error.[14] 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

[11] 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.

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

[13] 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.

[14] The predicted standard error in both the Gains and Costs treatments is 27.2.

significant in both treatments ($p < 0.01$).[15] The average policy location is almost exactly the same between the Gains and Costs treatments, and is remarkably similar 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)	36.9 (19.5) [33]	57%	1342 [1365]
Gains	49.8 (29.3) [49.67]	78%	1483 [1465]
Costs	50.8 (30.6) [49.67]	69%	1480 [1465]

[a] Predicted outcomes 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 ($p < 0.01$).[16] Acceptance rates are significantly higher in 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

[15] Based on a t-test using outcomes in each bargaining round as the unit of observation.
[16] 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% with the highest at 67%.

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 they simply involve reductions in private goods, which 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 (1.1) ECUs (standard errors of the mean in parentheses), and in the Costs treatment they nearly fully tax third players, with an average tax of 90.7 (1.7) 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.[17] As just noted, it shows that T2s depart from the SSPE prediction in both the Gains and Cost treatments, as they form coalitions with T1s as opposed to the predicted coalition with T3s. They also give more private goods to T1s than predicted along with a public policy closer to their ideal point (and T1's ideal point) than predicted. 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 T1s average earnings as proposers are lower than predicted under the SSPE by some 50-60 ECUs. Coalitions between T1s and T3s with T3s as proposers generally form as predicted under the SSPE.

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 a 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.[18] 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 as do T3s for accepted proposals.

For T2 and T3 proposers, average policy outcomes 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 for the different proposers: 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.[19] 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.

[17] 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.
[18] 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 do divide private goods in order to equalize payoffs between the two of them.
[19] The lower acceptance rate by T2 proposers in the Costs treatment narrowly misses significance at conventional levels ($p = 0.13$).

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, b]
Gains Treatment

Proposer	Average Location	Average Private Good Allocations			Stage 1 Pass Rate[c]	Average Payoffs[d] [predicted]		
		T1	T2	T3		T1	T2	T3
T1	36.4 (4.8) [16.3]	63 (4.7) [100]	35 (4.8) [0]	1 (1.3) [0]	81% [100%]	**627** **(2.8)** **[684]**	596 (15.5) [550]	220 (29.2) [98]
T2	34.0 (3.5) [49.7]	48 (4.5) [0]	44 (3.1) [100]	8 (4.3) [0]	84% [100%]	614 (7.4) [550]	**621** **(7.4)** **[650]**	211 (23.6) [298]
T3	88.2 (3.0) [83.0]	71 (12.8) [100]	22 (11.3) [0]	7 (4.6) [0]	68% [100%]	583 (11.9) [617]	456 (17.0) [450]	**537** **(17.7)** **[498]**
				Average	78% [100%]	613 (2.9) [616]	566 (8.3) [550]	304 (16.5) [298]

Costs Treatment[e]

Proposer	Average Location	Average Private Good Allocations			Stage 1 Pass Rate[c]	Average Payoffs[d] [predicted]		
		T1	T2	T3		T1	T2	T3
T1	41.2 (5.0) [16.3]	50 (5.7) [100]	36 (4.5) [0]	15 (5.6) [0]	94% [100%]	**608** **(8.2)** **[684]**	585 (11.1) [550]	262 (31.4) [98]
T2	35.2 (3.8) [49.7]	51 (4.0) [0]	44 (3.8) [100]	5 (2.3) [0]	70% [100%]	616 (6.1) [550]	**611** **(8.0)** **[650]**	216 (22.2) [298]
T3	90.6 (1.9) [83.0]	61 (7.9) [100]	22 (6.2) [0]	17 (5.1) [0]	45% [100%]	571 (6.7) [617]	449 (10.1) [450]	**561** **(9.8)** **[498]**
				Average	69% [100%]	601 (3.2) [616]	565 (6.4) [550]	313 (14.8) [298]

[a] Using subject averages as the unit of observation.
[b] Predicted values in brackets.
[c] Percent of Ti's proposals voted on that were passed in stage 1 only.
[d] Proposers' payoffs in **bold**. Note that because T2's payoff function is specified in absolute deviations from her ideal point, one cannot calculate T2's average payoff directly from this table.
[e] Private good allocation in the Cost treatment is 100 - τ_i.

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 93% 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 higher payoffs as proposers in the Costs treatment, the steep decline in their pass rates more than offsets this increase.

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 in acceptance rates for T3s (23 percentage points), a modest decrease in acceptance rates 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.

The natural question is what underlies the large changes in acceptance rates between the Gains and Costs treatments? Table 5 gets at this directly, reporting voting patterns by player types. For T1s voting in response to T2s and T3s proposals are reported separately. For T2s voting in response to T1s are reported, as most T3 proposals target T1, which T2s routinely vote against as they leave T2s with substantially lower payoffs. To do otherwise would mix responses to offers T2s were seriously considering, with those they routinely rejected. 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 a dummy variable equal to 1 for the Costs treatment (0 otherwise) to account for any fixed differential response in voting, a voter's payoff from the proposal, and the voters payoff from her proposal which was not selected to be voted on. We include the latter since subjects might use the payoff from their own proposal as a reference point in determining how to vote. There are also interaction terms between these variables with the dummy variable for the Costs treatment.

Table 5
Voting Probits with Private Goods Available

	T1 Voter		T2 Voter	T3 Voter
	T2's proposals	T3's proposals	T1's proposals	T1 and T2's proposals (pooled)
Intercept	2.34 (21.4)	24.0 (13.7)*	-7.65 (3.77)**	-4.92 (1.72)***
Dummy for Cost treatment	-27.28 (22.41)	-25.97 (14.54)*	-7.02 (5.65)	1.42 (2.07)
Own payoff	0.026 (0.010)***	0.021 (0.006)***	0.021 (0.006)***	0.01 (0.002)***
Own Payoff*Dummy for Costs	0.006 (0.014)	-0.014 (0.008)*	-0.000 (0.008)	0.002 (0.003)
Own payoff from own proposal not selected	-0.028 (0.027)	-0.057 (0.023)**	-0.007 (0.004)*	0.003 (0.003)
Own payoff from own proposal not selected*Dummy for Costs	0.037 (0.027)	0.053 (0.024)**	0.012 (0.007)*	-0.004 (0.003)

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

As expected, in all cases the coefficient value for own payoff is positive and significant at the 1% level. For T1s the coefficient for the Costs treatment dummy is negative, and nearly the same size for proposals from T2s and T3s, achieving statistical significance for T3s proposals. Further, for T3 proposals the interaction between own payoff and the dummy for Costs is negative and significant, so that in conjunction with the negative dummy for the Costs treatment, the two are jointly significant at the 5% level, consistent with the dramatic reduction in T3s proposals passing in the Costs treatment. For T2s the dummy for the Costs treatment is also negative, but not statistically significant at conventional levels, with the Costs by Own payoff interaction effect negative but very small. The two in combination indicate a reduced tendency to accept T1s' proposals, other things equal, but the effect is substantially smaller, and not as consistent as T1s' response to T3s proposals.[20] One implication of this is that the increase in T1s' acceptance rates reported in Table 4 between Gains and Costs was the result of somewhat increased offers to T2s.[21]

Conclusion 3: Voting probits indicate that T1s are less likely to vote in favor of proposals from T2s and T3s under the Costs treatment, other things equal, with this effect substantially stronger with respect to T3s. This accounts for the sharp reduction in the frequency with which T3s proposals are accepted, as reported in the raw data, in going from Gains to Costs. Note that there is a similar tendency for T2s to reject offers from T1s, which however is not strong enough to be statistically significant, other things equal.

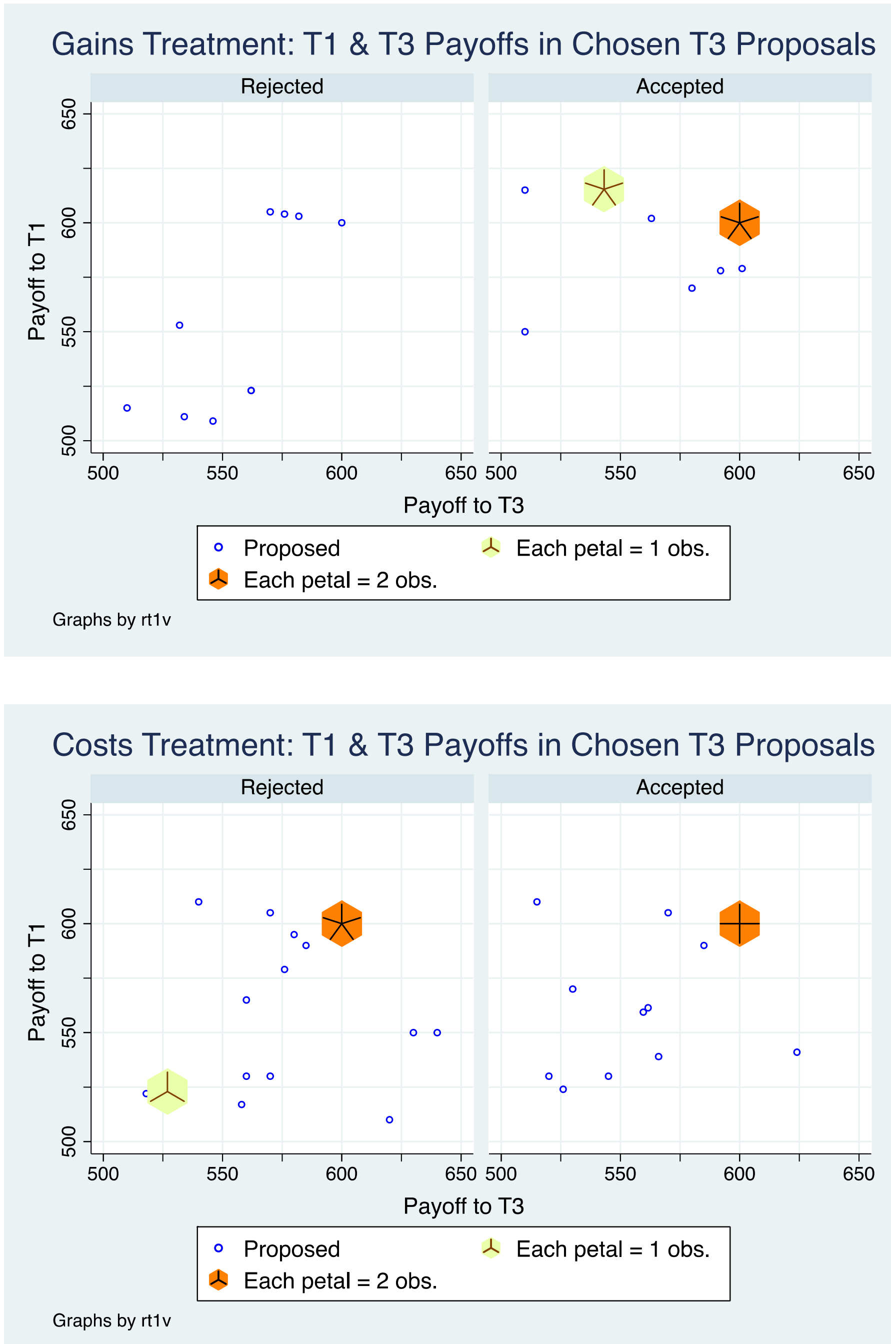
What factors explain T1's reduced frequency for accepting T3's offers in going from Gains to Costs given that the two treatments yield the same equilibrium payoff under the SSPE as well as under the efficient equal split? In what follows we attribute these differences to legislators responding differentially to gains and losses relative to benefits received under the initial budget allocation, which serves as a natural reference point when voting on proposed allocations.

Figure 1 plots T3's payoff, along with T1's payoff in chosen T3 proposals. Payoffs for proposals that are rejected (left hand panel) and accepted (right hand panel) by T1s are reported for both the Gains and Costs treatments. Multiple observations are represented by larger circles, with the number of "petals", along with the circle coloring, indicating the number of observations.

[20] The two are not significant at anything approaching conventional levels (p = 0.630).
[21] T2's average payoff in all T1 proposals increases from 590 in Gains to 598 in Costs, though the difference is not statistically significant.

Figure 1

Accepted and Rejected Proposals for T3s



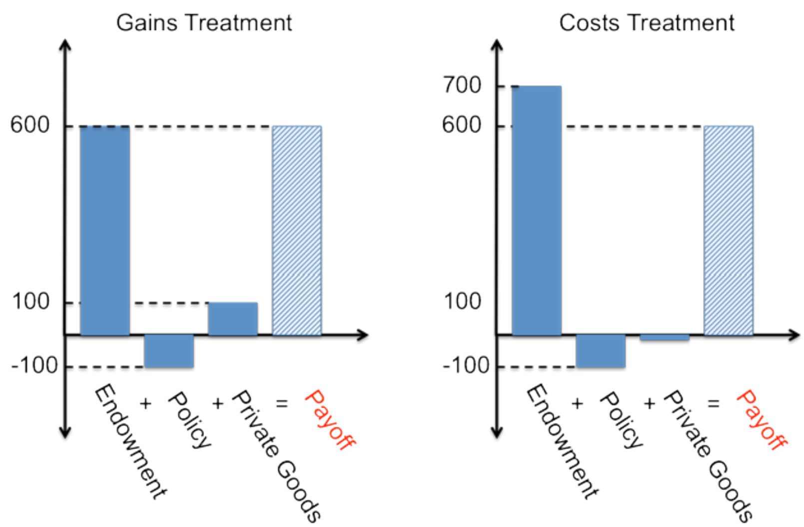
Note: Stage 1 proposals only.

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. For T3s and T1s the EES consists of a policy location at 100 with private good allocations $x_1 = 100$, $x_2 = 0$, and $x_3 = 0$ and payoffs $R_1 = 600$, $R_2 = 399$, and $R_3 = 600$ for T1, T2, and T3, respectively. 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. 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. We call proposals of this sort - $y \in [90, 100]$ with nearly all private goods going to T1 - "nearly efficient equal splits" (NEES).[22]

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 is in spite of the fact that T1s have a lower empirical continuation value in the Costs treatment, so they have less to hold out for.

Figure 2

T1's Payoff from y = 100 and x_1 = 100

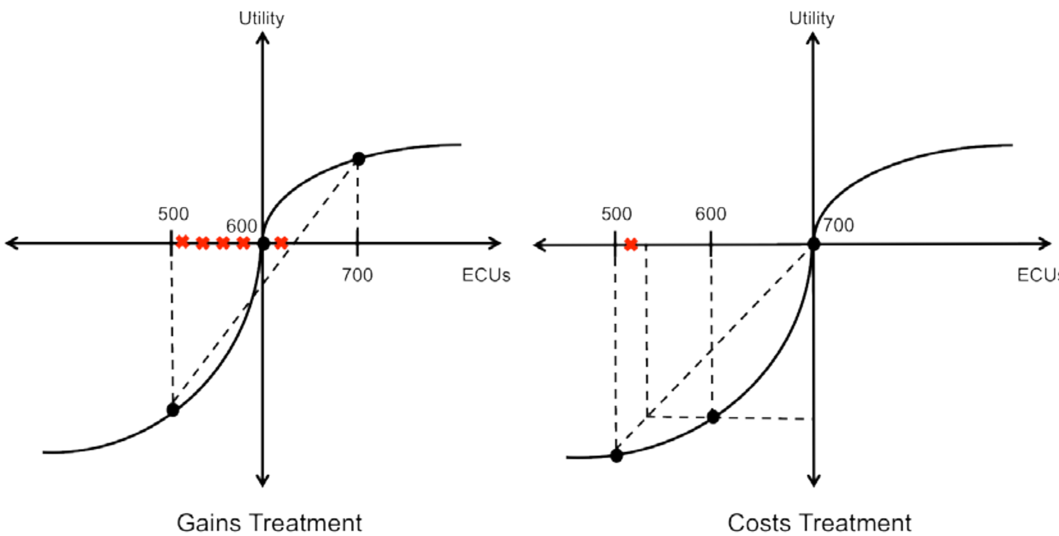


The sharp increase in T1s' rejection of NEES proposals in the Costs treatment can be attributed to a reference point effect based on players' higher starting valuations in conjunction with the well-established tendency to overvalue losses relative to gains. Figure 2 illustrates this differential impact in terms of T1's payoff from an EES proposal (a special case of the NEES). In the Gains treatment, T1 loses 100 ECUs from the policy location but gains that amount back

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

from her allocation of private goods. T1 is left with 600 ECUs, the lightly shaded bar, which in terms of her initial endowment is where she started. In the Costs treatment, however, T3 can do nothing to offset the 100 ECU policy loss to T1 because even after receiving all of the private goods in this treatment (a tax of 0), T1's payoff is *below* her initial endowment.

Figure 3
Continuation Values for T1 Voters with Lower Expected Utility than the EES



Notes: The EES with a T3 proposer gives T1 voters 600 ECUs. 500 ECUs and 700 ECUs are the minimum and maximum payoffs, respectively, which T1 can earn in a future stage. The EES is preferred to continuation values marked with an "X".

Figure 3 illustrates the impact on T1s' acceptance rates from using these initial endowments as their reference point in conjunction with prospect theory's S-shaped valuation function (Kahnamen and Tversky, 1979) centered on the respective reference points. To fix ideas, we again assume that T3 offers T1 an EES with a payoff of 600 ECUs. The dotted line shows T1's expected utility for a given expected payoff (i.e., their continuation value) should the EES be defeated.[23] The payoffs marked with an "X" are the continuation values with lower expected utility than the EES. That is, these are the continuation values for which T1s should accept an EES offer from T3. Notice that the EES is preferred for a much wider range of

[23] For simplicity, we assume the expected utility is a linear function of the highest and lowest payoffs T1 can expect to receive in the next stage, with these payoffs set at 700 and 500 ECUs, respectively. More generally, the expected utility can lie on any chord connecting the utilities from the highest and lowest payoffs, which depends on the actual play of the game. Using a smaller range of empirical continuation values would dampen the effects reported in Figure 3, but would not overturn the qualitative implications.

continuation values in the Gains than in the Costs treatment where T1s only accept the EES if their estimate of the continuation value is extremely low.

Similar factors are at work in terms of T2s voting for offers from T1s, and for T1s voting for offers from T2s, as indicated by the negative coefficient value for the Costs dummy for both in the probits reported in Table 5. The question then is why do these two cases not result in a sharp reduction in the rate at which proposals are rejected similar to what is reported for T3s? One answer is that the continuation value for T2s (565) is far below what T1 proposers generally offer them, so that T2s 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 (a difference of approximately 150 ECUs compared to accepting the typical T1 offer). Similarly, there is no large reduction in T1 acceptance rates of T2 proposals in the Costs treatment since T2s offer payoffs above T1's continuation value. [24]

Conclusion 4: The sharp increase in rejection rates for T3s proposals under the Costs treatment can be attributed to an endowment effect as they 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 do not result in a sharp, and consistent, increase in rejection rates, other things equal, on account of the fact that their continuation values were below the offers they were getting.

5. Summary and Conclusions

We experimentally investigate the impact on legislative bargaining of what, if any, differences result from adding versus cutting private goods under a design that should result in no difference between the two regimes. Although this is unlikely to happen outside the laboratory, the experiment does serve to isolate the impact of increasing versus decreasing budget allocations absent "piling on" one of the legislators. The experiment also serves to investigate the impact of reference point effects within a structured bargaining environment that eliminates essentially all of the potential confounds identified in the Zeiler and Plott's (2005) critique of past experiments on this issue.

[24] Note that in the Gains treatment T1s' payoff from the EES with a T3 proposer is somewhat below their continuation value (xxxx vs yyy), 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.

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. However, we do 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 focal point identified in an earlier Gains experiment (the efficient equal split) 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 the large decrease in T1's payoff under the Costs treatment relative to their initial endowment, whereas there is no such loss with the increase in private goods.

One of the primary motivations for the Jackson-Moselle model is 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 theory predicts that there are two stable parties, T1-T2 and T2-T3. However, the empirical continuation values reported for the Gains treatment in Christiansen et al. (2012) show that a T2-T3 party is unstable.[25] 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. This leaves fewer gains for these players from forming a binding agreement with one another, and greater gains from partnering with T1s whose experimental continuation value is lower than predicted. In both theory and using the experimental data, T1s prefer to partner with T2s because of the proximity of their ideal points, rendering this 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

[25] 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.

some of the actors behind the use of automatic budget cuts ("sequestration") in case legislators cannot agree on a grand budget deficit reduction that would require changes in public policy (e.g., the retirement age or the indexing formula for Social Security). In 2011 the U.S. Congress passed the Budget Control Act, which mandated across-the-board cuts in mandatory and discretionary spending if a joint committee on deficit reduction failed to achieve a specified level of spending cuts. Critics decried the blunt force approach to deficit reduction, but some commentators noted that these large, and in many cases misguided, cuts might incentivize Congress to get a deal done, since inaction was no longer a possibility.[26] In terms of the experiment reported on here, 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. Indeed something of this sort appears to have taken place in January 2014 as both houses of Congress reached a budget deal for fiscal year 2014, after a long period of disagreement. This agreement came about through the repeal of $61 billion in sequester cuts evenly divided among defense and non-defense departments. Republicans applauded easing cuts in defense spending, while Democrats praised smaller cuts to Head Start and the NIH, among other priorities.[27]

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[26] "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.

[27] 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

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