Online Supplementary Materials
Tacit Lobbying Agreements: An Experimental Study

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ABSTRACT

This document contains supplementary materials for the paper Tacit Lobbying Agreements: An Experimental Study. It is organized as follows. The first section contains the proof for Prediction 1. The second section consists of a sample of the instructions used in the experiment. The third section contains a regression analysis testing whether candidates reciprocate changes in transfers by the lobbyist and vice versa in the *Lobbying-Strangers* treatment. This analysis mirrors the regressions done for the *Lobbying-Partners* treatment located in the main text of the paper.

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Proof of Prediction 1

We assume all players are self-interested with respect to own payoffs and that voters who are indifferent (i.e., face identical tax policies, $t_A = t_B$) vote randomly with equal probability for each candidate. These assumptions are common knowledge (thus, we analyze games with complete information) as are all procedures of the respective lobbying and redistribution games (e.g., the number of periods played). Moreover, we use iterated elimination of weakly dominated strategies in each stage of the game. We analyze the lobbying game and redistribution game, in turn. This gives the following subgame perfect equilibria:

In the one-shot lobbying game, in the election stage each voter votes sincerely for her preferred candidate: if $t_j < t_{-j}$ the rich voter R votes for candidate j and each poor voter P votes for candidate $-j$, and if $t_j = t_{-j}$ we assume all voters randomize their votes between the two candidates. This is because voting sincerely yields voter i a higher payoff than voting insincerely in cases where her vote is pivotal (that is: if n is odd, when there are $\frac{n-1}{2}$ votes for each candidate by all other $n-1$ voters and if n is even, when there are $\lfloor\frac{n-1}{2}\rfloor$ votes for her preferred candidate and $\lceil\frac{n-1}{2}\rceil$ votes for the other candidate by all other $n-1$ voters), and her payoff does not depend on her vote in all other, non-pivotal cases. Thus, voting sincerely weakly dominates voting insincerely. Each candidate anticipates the voters' equilibrium decisions in the election stage. Then, in the policy stage the two candidates immediately choose $t_A^* = t_B^* = 1$ and immediately accept this pair of tax policies. A tax policy of 1 weakly dominates any lower tax policy $t_j' < 1$ because t_j' yields the same payoff for j as t_j^* if $t_{-j} < t_j'$; a lower expected payoff than t_j^* if $t_{-j} = t_j'$; and a lower payoff than t_j^* if $t_{-j} > t_j'$ (note the similarity to a Bertrand game with price competition among firms). Moreover, $t_A^* = t_B^* = 1$ are chosen and accepted immediately because not doing so costs $c > 0$ (i.e., if in the policymaking process a candidate chooses a tax lower than 1, the opponent is always better off by choosing a higher tax than her opponent, even if costly since we assumed $\frac{b}{2} > c > 0$). Then, anticipating a equilibrium winning tax policy of $t_W^* = 1$ in the second stage, voter R chooses $l_R^* = 0$ in the lobbying stage because no strictly positive transfer can prevent candidates from choosing full redistribution in the subsequent stages (thus, any amount sent only reduces R's payoff). Moreover, using backwards induction this subgame perfect equilibrium holds in each repetition of the finitely-repeated lobbying game. Finally, it is straightforward to see that the same respective subgame perfect equilibria hold for the one-shot and finitely-repeated redistribution games, with the only difference that the rich voter has no lobbying decisions to make ■

Experimental instructions

Below are the instructions of the *Strangers* treatments in the sequence *Lobbying* → *No Lobbying*. The instructions of the *Partners* treatments and the *No Lobbying* → *Lobbying* sequence are very similar and are available from the authors upon request.

General instructions

You are participating in an experiment on economic decision-making and will be asked to make a number of choices. If you follow the instructions carefully, you can earn money. At the end of the experiment, you will be paid your earnings in cash.

You are not allowed to communicate with other participants. If you have a question, raise your hand and we will gladly help you.

During the experiment your earnings will be expressed in points. Points will be converted to US dollars at the following rate: *50 points = $1.00*.

The experiment is strictly anonymous: that is, your identity and actions will not be revealed to others and the identity and actions of others will not be revealed to you.

At the beginning of the experiment, participants will be randomly assigned to different roles. Four of you will be assigned to the role of a *voter* and the rest will be assigned to the role of a *candidate*. You will keep the same role during the entire experiment.

The experiment consists of two parts. In the following paragraphs you will find the instructions for part one. The instructions for part two will be given to you once part one has ended.

Part 1 - Instructions

Part 1 of the experiment consists of 15 periods. As payment for this part, you will receive the sum of your earnings over the 15 periods. Each period is divided into four stages. They are described in detail below. For convenience, when appropriate, we describe the decision and information procedures for the voters on the left column and those for the candidates on the right column.

Voters	**Candidates**
Stage one In stage one, voters learn what their endowment in this period is. In each period, *one* of the four voters is randomly selected (each with equal probability) to receive an endowment of *130 points*. For convenience we refer to this voter as voter130. The three remaining voters receive and endowment of *10 points*, we refer to them as voter10.	*Stage one* In stage one, *all candidates* receive an endowment of *25 points*. In addition, candidates learn whether they are active or inactive in this period. In each period, *two* candidates are randomly selected to be active (each with equal probability). They will be randomly labeled as candidate 1 and candidate 2. Note that candidate 1 and 2 will be *different* participants in every period. In a given period, only active candidates make decisions and have the opportunity of earn additional points. Candidates that are inactive can follow the progress of the experiment on their screens.
Stage two In stage two, voter130 decides how many points to transfer to candidate 1 and to candidate 2. He can choose any combination of points from his/her endowment with a total amount between 0 and 130 points (0 and 130 inclusive). Voter10s do not make any transfers. Once voter130 makes a decision, the amount transferred to each candidate will be seen by all voters on the screen.	*Stage two*

	In stage two, candidate 1 and candidate 2 are informed of the amount of points they received from voter130. They will also be informed of the number of points transferred to the other active candidate.
Stage three In stage three, voters are informed of the percentage chosen by candidate 1 and by candidate 2.	*Stage three* In stage three, candidate 1 and candidate 2 each choose a percentage between 0% and 100% (0% and 100% inclusive). The precise procedure by which they arrive to their choice is described in detail in the next page.
Stage four In stage four, voters cast a vote in favor of candidate 1 or in favor of candidate 2. The candidate with more votes wins and his/her chosen percentage is used to determine the voters' earnings in this period. In case of a tie, a candidate is randomly selected to be the winner (each with equal probability). They way in which the winning percentage determines the voters' earnings, is described in detail below.	*Stage four* In stage four, candidates are informed of the number of votes each candidate received and whether they won or lost. Candidates that win receive *20 additional points* as earnings in this period. Candidates that lose do not receive additional points.

Choosing a percentage

In this section we describe the procedure used by candidate 1 and candidate 2 to choose a percentage. The procedure is divided in steps:

Step 1: Candidate 1 chooses a percentage, which is communicated to candidate 2.

Step 2: Candidate 2 chooses a percentage, which is communicated to candidate 1.

Step 3: Candidate 1 decides either to *accept* or to *change* his/her percentage. If candidate 1 accepts, the procedure ends and the two percentages are communicated to the voters. If candidate 1 changes his/her percentage, the new percentage is communicated to candidate 2 and the procedure continues to step 4.

Step 4: Candidate 2 decides either to *accept* or to *change* his/her percentage. If candidate 2 accepts, the procedure ends and the two percentages are communicated to the voters. If candidate 2 changes his/her percentage, the new percentage is communicated to candidate 1 and the procedure goes back to step 3.

Costs of changing percentage: There is a small cost of changing the percentage in step 3 or 4. Each time a candidate chooses to change his/her percentage it costs that candidate 1 point from his/her endowment. Note that the procedure does not end until one of the two candidates decides to accept.

Winning percentage and voters' earnings

The earnings of voters in each period are determined by the percentage chosen by the winning candidate. Specifically the earnings, in points, of voter10s are given by the following rule:

earnings = 10 + [percentage] × 30

And the earnings, in points, of voter130 are given by the following rule:

earnings = 130 – [percentage] × 90 – [transfer to candidate 1] – [transfer to candidate 2]

To illustrate how earnings are calculated we provide below a series of examples.

Example 1: Suppose voter130 decides not to transfer any points to both candidates. In this case, the voters' earnings for different winning percentages are given in the table below.

Winning percentage	*Earnings of voter130*		*Earnings of voter10s*	
0%	*130 points*	= 130 – 0.00 × 90	*10 points*	= 10 + 0.00 × 30
25%	*107.5 points*	= 130 – 0.25 × 90	*17.5 points*	= 10 + 0.25 × 30
50%	*85 points*	= 130 – 0.50 × 90	*25 points*	= 10 + 0.50 × 30
75%	*62.5 points*	= 130 – 0.75 × 90	*32.5 points*	= 10 + 0.75 × 30
100%	*40 points*	= 130 – 1.00 × 90	*40 points*	= 10 + 1.00 × 30

Example 2: Suppose now that voter130 transfers 15 points to candidate 1 and 25 points to candidate 2. In this case, the voters' earnings for different winning percentages are given in the table below.

Winning percentage	*Earnings of voter130*		*Earnings of voter10s*	
0%	*90 points*	= 130 – 0.00 × 90 – 15 – 25	*10 points*	= 10 + 0.00 × 30
25%	*67.5 points*	= 130 – 0.25 × 90 – 15 – 25	*17.5 points*	= 10 + 0.25 × 30
50%	*45 points*	= 130 – 0.50 × 90 – 15 – 25	*25 points*	= 10 + 0.50 × 30
75%	*22.5 points*	= 130 – 0.75 × 90 – 15 – 25	*32.5 points*	= 10 + 0.75 × 30
100%	*0 points*	= 130 – 1.00 × 90 – 15 – 25	*40 points*	= 10 + 1.00 × 30

Candidates' earnings

The earnings of the candidate who wins are given by:

earnings = 25 + 20 + [transfer from voter130] - [costs incurred when choosing a percentage]

The earnings of the losing candidate are given by:

earnings = 20 + [transfer from voter130] - [costs incurred when choosing a percentage]

Here are a couple of examples.

Example 1: If a candidate changes his/her percentage four times, receives 5 points from voter130, and wins the election, his/her earnings equal: *46 points* = 25 + 20 + 5 – 4 × 1.

Example 2: If a candidate changes his/her percentage four times, receives 25 points from voter130, and loses the election, his/her earnings equal: *49 points* = 25 + 25 – 1 × 1.

Instructions for Part Two of the Experiment

The first part of the experiment has finished. In the second part of the experiment you will play the same game expect for one important difference: *voter130 cannot transfer any points to candidates* (i.e. the sequence of moves is the same but without stage two). The second part of the experiment will last 15 periods. Please press the button to continue.

Reciprocity in ***Lobbying-Strangers***

Here, we redo the regression analysis seen in the main text of the paper for *Lobbying-Strangers*. We start with the effect of changes in transfers on tax policies. Table A1 presents the results of the specification used in the regressions of Table 3. We slightly modify this specification because in *Strangers* candidates are randomly drawn every period, and therefore, period $x-1$ does not necessarily refer to the period previously played by a given candidate j. Specifically, the dependent variable in Table A1 is now the change in candidate j's tax policy in percentage points from period $x-\delta$ to period x, $(t_{j,x}-t_{j,x-\delta})\times 100$, where δ equals the number of periods since j played as an active candidate.[1] Similarly, our independent variables are equally modified so that they point to period $x-\delta$ instead of period $x-1$. Moreover, since candidate j might not be active in period $x-1$ but still be affected by observing others, we control for events that occur in period $x-1$. To be precise, we add three independent variables. First, we include a variable that equals the difference between the transfer received by candidate j in period x and the mean transfer received by candidates k and $-k$ in period $x-1$ if $j\notin\{k,-k\}$ (zero otherwise): $l_{R\to j,x}-\frac{1}{2}(l_{R\to k,x-1}+l_{R\to -k,x-1})$. Second, we include an interaction term between this first additional variable and the number of periods played, $\left[l_{R\to j,x}-\frac{1}{2}(l_{R\to k,x-1}+l_{R\to -k,x-1})\right]\times x$. The third additional independent variable captures the candidates' reaction to lack of coordination by others.

[1] We also ran regressions where we use as the dependent variable the difference between the tax policy chosen by candidate j in period x and the mean tax policy chosen in period $x-1$: $\left(t_{j,x}-\frac{1}{2}(t_{k,x-1}+t_{-k,x-1})\right)\times 100$ and $j\notin\{k,-k\}$. The conclusions we draw from the regressions in Table A1 do not change in this alternative specification.

Table A1 – Determinants of changes in tax policies in *Lobbying-Strangers*

Independent variables	Coefficient	Std. Err.
$l_{R\to j,x} - l_{R\to j,x-1}$	–0.167	(0.315)
$(l_{R\to j,x} - l_{R\to j,x-1}) \times x$	0.021	(0.032)
$l_{R\to j,x} - \frac{1}{2}(l_{R\to k,x-1} + l_{R\to -k,x-1})$	0.416	(0.274)
$\left[l_{R\to j,x} - \frac{1}{2}(l_{R\to k,x-1} + l_{R\to -k,x-1})\right] \times x$	–0.040	(0.028)
$\max[(t_{j,x-\delta} - t_{-j,x-\delta}) \times 100, 0]$	0.047	(0.034)
$\max[(t_{-j,x-\delta} - t_{j,x-\delta}) \times 100, 0]$	1.558***	(0.091)
$\lvert t_{k,x-1} - t_{-k,x-1} \rvert \times 100$	0.010	(0.064)
x	–0.232	(0.356)
Constant	–4.876	(3.068)
Number of observations	260	
Number of subjects	68	
Number of societies	11	
R^2	0.260	

Notes: OLS regressions with changes in candidate *j*'s tax policy from period $x - \delta$ to period x as dependent variable: $(t_{j,x} - t_{j,x-\delta}) \times 100$. Robust standard errors are given in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level.

We use a variable that equals the absolute difference in tax policies between candidates k and $-k$ in period $x - 1$ if $j \notin \{k, -k\}$ (zero otherwise): $\lvert t_{k,x-1} - t_{-k,x-1} \rvert \times 100$. As in Table 3, the regression is run with subject fixed effects, robust standard errors clustered at the society level, and expressing tax policies in percentage points.

As we can see in Table A1, there is no evidence of candidate reciprocity. The coefficient for the change in the amount transferred is negative, but it is small and is not statistically significant (p = 0.607). In fact, none of the variables measuring potential effects of changes in transfers have a significant effect on tax policies (p > 0.160). By contrast, just like in *Partners* we do see that candidates significantly increase their tax policy in period x if they experience a negative difference in tax policies in period $x - \delta$ ($p \leq 0.001$). This behavior combined with the lack of reciprocity explains why in spite of positive transfers by rich voters, candidates in *Strangers* rarely deviate from a tax policy of 1, and when they do, it does not produce further deviations from full redistribution.

Next, we look at the determinants of the rich voters' decisions to transfer points to the candidates. In Table A2 we present regressions with a similar specification to the regressions in Table 4 in the main text of the paper. As mentioned above, analyzing how subjects adjust their decisions is not as straightforward in *Strangers* as it is in *Partners* due to random matching. The regressions in Table A2 analyze how rich voters adjust their lobbying decisions in two different ways. In one case, we look at how lobbying decisions change from period to period ignoring the fact that typically different subjects are playing in the role of the rich voter (i.e., the dependent variable is the change in transfers from period $x - 1$ to period x, $l_{R,x} - l_{R,x-1}$). In other words, this regression looks at whether rich voters reciprocate the tax policies of candidates even though in all likelihood those tax policies where experienced by another rich voter. Accordingly, we label this regression "Others' experience". For this specification the independent variables are constructed in the same way as those in Table 4. In the other case, we look at how specific subjects change their lobbying decisions ignoring the fact that in most cases their decisions are not taken continually . We label this regression "Own experience". The specification and variables are similar to those in Table 4. The only difference is that when calculating lagged variables, instead of periods $x - 1$ and $x - 2$, we use periods $x - \delta_1$ and $x - \delta_2$, where period $x - \delta_1$ refers to the last period voter i played as a rich voter and the period $x - \delta_2$ refers to the second-to-last period i played as a rich voter (e.g., the dependent variable is now the change in transfers from period $x - \delta_1$ to period x, $l_{R,x} - l_{R,x-\delta_1}$). Lastly, we drop the interaction terms with the period (see Table 4) since in *Strangers-Lobbying* we don't have enough observations of changes in tax policies to estimate the coefficients of these variables. The regressions are run with society fixed effects and with robust standard errors clustered at the society level (White, 1980).

Table A2 – Determinants of changes in transfers in *Lobbying-Strangers*

	Other's experience		Own experience	
$\left(t_{w,x-\delta_1} - t_{w,x-\delta_2}\right) \times 100$ if $l_{R,x-\delta_1} > l_{R,x-\delta_2}$	0.819	(0.571)	–0.683***	(0.201)
$\left(t_{w,x-\delta_1} - t_{w,x-\delta_2}\right) \times 100$ if $l_{R,x-\delta_1} \leq l_{R,x-\delta_2}$	–0.078	(0.338)	–0.211	(0.170)
$\Delta t_{x-\delta_1} - \Delta t_{x-\delta_2}$ if $l_{R,x-\delta_1} > l_{R,x-\delta_2}$	–1.236**	(0.451)	0.387	(0.321)
$\Delta t_{x-\delta_1} - \Delta t_{x-\delta_2}$ if $l_{R,x-\delta_1} \leq l_{R,x-\delta_2}$	–0.139	(0.130)	0.119	(0.139)
1 if $l_{R,x-\delta_1} > l_{R,x-\delta_2}$	–15.097**	(6.579)	–23.583	(13.013)
x	–0.797*	(0.435)	0.483	(0.649)
Constant	17.071**	(5.420)	–4.370	(6.551)
Number of observations	116		78	
Number of societies	11		11	
R^2	0.116		0.148	

Notes: In the first OLS regression, the dependent variable equals the change in the rich voters' total transfers from period $x-1$ to period x, $l_{R,x} - l_{R,x-1}$. Moreover, note that in the description of the independent variables, $\delta_1 = 1$ and $\delta_1 = 2$ in this regression. In the second OLS regression, the dependent variable equals the change in the rich voters' total transfers from period $x - \delta_1$ to period x, $l_{R,x} - l_{R,x-\delta_1}$. Robust standard errors clustered within societies are in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level.

The first column of Table A2 tells us that rich voters significantly decrease their transfers if they observe a previous increase in transfers that is followed by no reaction from the candidates (see the coefficient of 1 if $l_{R,x-\delta_1} > l_{R,x-\delta_2}$, p = 0.045) or by an decrease in the losing tax policy (i.e., an unsuccessful attempt at coordination on low tax policies, see the coefficient of $\left(\Delta t_{x-\delta_1} - \Delta t_{x-\delta_2}\right) \times 100$ if $l_{R,x-\delta_1} > l_{R,x-\delta_2}$, p = 0.021). The second column in Table A2 reveals that rich voters do reciprocate previous increases in the winning tax policy by increasing the amount transferred (see the coefficient of $\left(t_{x-\delta_1} - t_{x-\delta_2}\right) \times 100$ if $l_{R,x-\delta_1} > l_{R,x-\delta_2}$, p = 0.007). Probably, this behavior does not translate into tacit lobbying agreements due to the lack of reciprocity by candidates (see Table A1).