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The Larger the Better? The Role of Interest-Group Size in Legislative Lobbying

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The Larger the Better?
The Role of Interest-Group Size in Legislative Lobbying[*]

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Abstract

We develop a model of legislative lobbying where policy proposals are endogenous. We show that a policy proposer with preferences tilted towards one lobby may be induced by an increase in that interest group's size to propose policies geared towards the opposing lobby. Hence, a larger lobby size can have adverse effects on policy outcomes for this same lobby. This provides another rationale as to why some interests do not organize. Moreover, we find that a second-mover advantage in Groseclose and Snyder (1996)-type lobbying models with exogenous policy proposals can turn into a second-mover disadvantage when the proposal is endogenous.

Keywords: legislative lobbying, vote buying, legislatures, interest groups, political economy

JEL: D72, P16

1 Introduction

In a recently published book, "Lobbying and policy change: who wins, who loses, and why?", Baumgartner et al. (2009) followed 98 randomly selected policy issues in which interest groups were involved over the years from 1999 - 2002. They report that

> "a surprisingly large number of issues consist of a single side attempting to achieve a goal to which no one objects or in response to which no one bothers to mobilize. Ironically, the lack of counter-mobilization is a good predictor of failure.[...] One might think that with no opposition, those lobbyists working on behalf of the issues with only one side would rule the day in Washington. Reality is far from this, even when the "lobbyist" in question is the Defense Department."[1]

Furthermore, the authors argue that "although uncertainty no doubt increases when advocates face greater active opposition, it would be premature to conclude that policy success is less likely when there is greater opposition. Just as resources are not clear predictors of policy success, the presence of active opposition is likely to be a similarly inadequate predictor."[2]

These observations seem to stand in contrast to the theoretical literature on lobbying, where usually, an interest group's efforts to change the status quo are – if at all – detrimentally affected by greater opposition. In this paper, we present a simple legislative lobbying model that is able to account for the observed patterns. We explain why it may be bad for an interest group seeking policy change if there is no opposition. We also give conditions under which an increasing opposition lobby turns out to be beneficial or detrimental for efforts to change the status quo.

To substantiate our arguments, we augment a legislative lobbying model of the Groseclose and Snyder (1996) type (i.e., the interest groups move once and sequentially) with an endogenously derived policy proposal. The basic version of the model considers only two types of individuals that differ in their preferences regarding policy and are organized into two interest groups of different sizes. The legislators are also of either of the two types. First, we show that a policy proposer with preferences tilted towards one

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[1]Baumgartner et al. (2009, p. 57). 17 of the examined 98 cases ran into no active opposition. Baumgartner et al. (2009) provide summaries of the issues under examination on the website http://lobby.la.psu.edu.
[2]Baumgartner et al. (2009, p. 76)

lobby may propose a policy change favoring the opposing lobby knowing that it will be approved by legislative vote. Interestingly, and in accordance with the above described observations, such a policy change will not be introduced if the interest group opposing the policy change is sufficiently small. Or to put it differently, a policy change may be induced by an increase in the size of the opposing interest group.

The intuition behind this result runs as follows. Even though a stronger lobby group opposing a policy change makes it harder for the pro-change lobby to ensure a majority in the legislature, it also implies higher payments to the legislators associated with a vote for policy change and thus increases the incentive to propose the change. We further show that via the same mechanism, an agenda-setter[3] with preferences for a policy change may introduce a bill that is not implementable – i.e., that will be defeated by the legislative vote, even though implementable (more moderate) policy changes might instead be proposed.

Another important result of our analysis is that in our Groseclose and Snyder (1996)-type set-up where the interest groups move sequentially and make only one offer each, the adverse effect on policy of an increase in interest group strength can only occur for the second-mover lobby and never for the interest group moving first. Consequently, we can identify situations wherein the second mover possesses a disadvantage in the sense that he would have been better off moving first. In contrast, when the policy proposal is given exogenously, the second mover possesses a clear advantage. Hence, in this class of models, the second-mover advantage may become a second-mover disadvantage when the policy proposal becomes endogenous.

We check the robustness of our results by allowing for greater heterogeneity of policy preferences. Unlike in the basic set-up, we allow interest-group size to vary endogenously. That is, the policy proposal determines the composition of the interest groups, one of which is lobbying for the proposal and the other against it. Considering different proposals, it is the politically moderate individuals who are 'swinging' between supporting a policy change or the status quo. We show that it is precisely this 'swinging' between the interest groups depending on the policy proposal that can lead to extreme policy outcomes that are to the disadvantage of the politically moderate. In fact, there are situations wherein the politically moderate will be better off if they do not organize into interest groups. This result may also explain why some interests do

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[3]Throughout the paper, we use the terms policy proposer and agenda-setter interchangeably.

not organize.[4] In the robustness discussion of our model, we further argue that our main results – except for the one on the second-mover disadvantage – are not specific to using a Groseclose and Snyder (1996)-type set-up.

The paper is organized as follows. In the next section, we relate our paper to the existing literature. Section 3 describes the model. We characterize the equilibrium of the lobbying subgame for a given proposal and the subgame-perfect equilibrium of the entire political game in Section 4. We discuss the role of interest-group size on policy outcomes in Section 5. There we establish our main results. The robustness discussion follows in Section 6. In addition to the issues mentioned earlier in the introduction, we also address welfare implications and extensions of the model with respect to lobbying at the stage where the policy proposal is crafted. Section 7 concludes. The proofs and some numerical examples are relegated to the appendix.

2   Relation to the Literature

The literature on the lobbying of interest groups hoping to affect policy outcomes includes two large branches. One studies to what extent interest groups can affect policy outcomes by providing relevant information to the lawmaker (see e.g. Bennedsen and Feldmann (2002)). The present paper relates to the second branch, wherein interest groups offer politically valuable resources or campaign contributions in exchange for legislative favors. In particular, our paper augments the legislative lobbying model of Groseclose and Snyder (1996) by an agenda-setter who endogenously decides on the policy to be proposed for a legislative vote. While Groseclose and Snyder (1996) examine the effect of the lobbies' budgets on the size of the super-majorities and the voting outcomes for a given policy proposal, our extension allows us to study the effect of the interest groups' budgets on policy outcomes. In our model, a larger lobby means a higher budget. While this can never lead to worse legislative voting outcomes for the larger lobby when the proposal is given, our model shows that if the proposal is endogenously chosen, a higher budget available for lobbying does not necessarily lead to more favorable policy outcomes for this lobby.

The present paper is also closely related to but different in focus from that of Breton and Zaporozhets (2009), which examines the Groseclose and Snyder (1996) set-up with

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[4]Usually the reason for some interests not being organized is either a collective action problem (Olson, 1965) or fixed costs of organization Mitra (1999).

an exogenous proposal when the legislators have preferences regarding outcomes rather than their vote and show the connection with notions from cooperative game theory. Recently, Dekel et al. (2008) and Dekel et al. (2009) suggested a vote-buying game that ends not at a pre-determined stage but only after two consecutive offers go by without any change in who would win. The papers study different variants of this type of game. Even though the focus of the first paper is on general elections, the model can be interpreted as a legislative vote-buying game where a policy proposal is up for vote against the status quo. In Section 6.5, we discuss whether our results would change if we chose such a vote-buying model as a lobbying subgame after the proposal had been made rather than the Groseclose and Snyder (1996) set-up. We argue that for some variants of the Dekel et al. (2008) and Dekel et al. (2009) lobbying model, our results would change. In others, however, it is possible to obtain similar results as in our basic model. This suggests that our results are not specific to the Groseclose and Snyder (1996) set-up.

There is also an interesting relation to Diermeier and Myerson (1999), who examine the internal organization of legislatures. In their basic framework, they also make use of the Groseclose and Snyder (1996) set-up with exogenously given policy proposals and consider a game between different chambers of the legislature that strategically choose their internal organization to maximize the payments they receive from the interest groups. In our model, it is simply the other way around: the organization of the legislature is given, and the agenda-setter chooses a policy proposal to maximize his benefit.

Other legislative lobbying models with endogenous policy proposals include Snyder (1991), Baron (2006), Helpman and Persson (2001), and Grossman and Helpman (2001). Snyder (1991) considers only one lobbyist who makes the proposal and then buys a majority of votes for it in the legislature. He finds that the equilibrium policy lies between the lobbyist's ideal point and the median of the legislators' ideal points. This is not necessarily the case in our model, which can – in principle – be perceived as extending Snyder (1991) via an additional competing lobby and substituting the policy proposer with a legislator. These additional components drive our main results such as a potentially positive effect of opposition for the lobby seeking policy change. Baron (2006) also presents a model of competitive lobbying in a majority-rule legislature with endogenous agenda-setting under complete information. His focus is different from ours in that he considers only two possible proposals and examines under what

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conditions both lobbies are active in equilibrium and when there are minimal winning coalitions or supermajorities.

Helpman and Persson (2001) and Grossman and Helpman (2001) combine a common agency approach with vote-buying in the legislature. However, Helpman and Persson (2001) do not model direct competition between the lobbies and focus on how the variations of the political system affect the distribution of policy benefits. Grossman and Helpman (2001, ch. 9) present a model where one of three legislators is the agenda-setter who in the first stage is offered contribution schedules for both: a policy proposal and his support in the legislative vote. In the second stage, the lobby seeking the policy change needs to buy an additional legislator to garner majority support for the proposal. With respect to the choice of the policy proposal, this set-up is essentially the standard common-agency problem with only one lawmaker who is being lobbied. In such a framework, a higher budget for one lobby given the budget of the other lobby cannot lead to worse policy outcomes. In fact, the common-agency framework predicts that lobbies without opposition will always succeed in initiating policy changes to their benefit and consequently cannot account for, e.g., the observations by Baumgartner et al. (2009) described in the introduction.

3 The Model

The model considers a continuous legislature with a measure of seats S that decides via simple majority rule on a policy t. We use $\mathcal{S}$ to denote the set of legislators. The policy will be chosen from a closed and connected set $\tau \subset \mathbb{R}$. Initially, a status quo policy $t_s \in \tau$ is in place.

In the basic version of the model, there are only two types of individuals, the X-type and the Y-type. The types differ with respect to the utility that they derive from policy $t \in \tau$. The utility of a type $i \in \{X, Y\}$ from policy t is $u_i(t)$. We assume that utility is strictly concave on τ and bounded from above and below. The X-types' most preferred policy is $t_X^* = \min_{t \in \tau} t$, and the Y-types' best policy is $t_Y^* = \max_{t \in \tau} t$. This implies that $u_X(t)$ is strictly decreasing and $u_Y(t)$ is strictly increasing on τ. Unless otherwise stated, we assume that $t_s \neq t_i^*$. Altogether given policy t, each individual of type $i \in \{X, Y\}$ enjoys total utility $U_i(t) = u_i(t) + d$, where d denotes "money". In principle, d may represent transfers that also depend on policy t.

Given the status quo policy and the utility functions, we can divide the policy space τ

into subsets of policies preferred to the status quo by each type. A policy t is preferred to the status quo by type i if $v_i(t) := u_i(t) - u_i(t_s) > 0$. Consequently, the set of policies preferred to the status quo by types X and Y are defined by $\tau_X := \{t : t < t_s\}$ and $\tau_Y := \{t : t > t_s\}$, respectively. This implies that $\tau_Y \cap \tau_X = \emptyset \; \forall t_s \in \tau$.

Legislators are also either of type X or type Y.[5] The share of Y-type legislators is denoted by λ_Y. Accordingly, the legislature is comprised of a measure $(1 - \lambda_Y)S$ of legislators of type X. We assume that there is a majority of Y-type legislators – i.e., $\lambda_Y > \frac{1}{2}$.

For example, with regard to the U.S. Congress, one could think of the X-types as the Republicans and the Y-types as the Democrats. A broader interpretation might refer to the group of X-types as a social elite and the group of Y-types as the people. Alternatively, the X-types might be entrepreneurs and the Y-types the workers. In principle, we can think of the types as members of any two groups that have opposing interests. A policy t then determines how the payoffs are distributed among the two groups.

3.1 Lobbying

Although there are many channels through which lobbying takes place, we assume that "money" is paid to the legislators.[6] There are two interest groups. A measure l_i of individuals of type i is organized in an interest group denoted by $i \in \{X, Y\}$.[7] For simplicity, we assume that legislators are not members of interest groups.

Suppose that a policy t is up for vote against t_s in the legislature. If an individual of type i is in favor of the proposal, he possesses the maximal willingness $v_i(t)$ to support t. If the individual prefers the status quo, he is willing to spend $-v_i(t)$ to prevent policy t. Accordingly, the maximal willingness to pay of interest group i to influence the legislative vote in its favor given that t is voted against t_s amounts to $l_i|v_i(t)|$. In this paper, we abstract from budget constraints of single individuals. Hence, the interest groups' budgets are only constrained by their size – i.e., the measure of the

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[5]In Section 6.3.1, we discuss the role of more heterogeneous preferences of the legislators.

[6]The "money"-payments can be generally interpreted as something which is beneficial for the receiver and costly for the donor. They can range from explicit bribery over providing lucrative positions for politicians to donations to the policy proposer's party.

[7]More broadly, l_i can also be interpreted as the interest groups' level of organization. The idea is that not only may size (in terms of official members) matter with regard to the budget available for lobbying but also, how efficiently resources can be collected from non-members may have an impact.

set of members. We denote the lobbies' budgets by $B_i(t) := l_i|v_i(t)|$. The lobbying expenses of the interest groups are shared equally among their members.

The interest groups can use the budget to make payments to the legislators. For each legislator $k \in \mathcal{S}$, we use $b_i(k,t)$ to denote the offer of interest group i given policy proposal t for a vote of legislator k in favor of the proposal if $t \in \tau_i$ and against the proposal otherwise. We refer to $b_i(\cdot, t)$ as lobby group i's offer function. Each offer function must respect the lobby's budget – i.e., $\int_{\mathcal{S}} b_i(k,t)\, dk \leq B_i(t)$.

3.2 Voting behavior of the legislators

We assume that legislators have preferences regarding *policy outcomes* rather than regarding the *act of voting* itself. The legislators take the interest groups' offer functions $b_i(\cdot, t)$ as given and vote for the alternative that yields the greatest expected utility. If no payments are made, they vote for the policy alternative that yields the highest direct utility from policy.[8] Since the legislature comprises a continuum of legislators, no single legislator is pivotal. This means that each legislator votes in favor of the lobby group that makes the highest offer – i.e., a legislator k who has received at least one positive payment offer supports policy proposal t if and only if

$$b_i(k,t) \geq b_j(k,t), \tag{1}$$

where $i,j \in \{X,Y\}, i \neq j$, and i denotes the lobby that is in favor of the policy proposal, whereas j is the one that prefers the status quo. Note that in (1), we have assumed that when positive payments are offered and legislators are indifferent, legislators vote against the status quo.[9]

The assumptions that legislators care about outcomes and that the legislature is continuous (i.e., that no legislator is pivotal) have been made to simplify the analysis. Our main results are not affected by these assumptions.[10] Besides simplicity, another justification for assuming away pivot considerations is the following. As will become clear later, with our model specification, it is cheapest for the winner of the lobbying game to bribe a supermajority of legislators. Thus, no legislator would be pivotal even

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[8]They vote for proposal t if $v(t) > 0$ and against it otherwise.

[9]This assumption brings a slight mathematical simplification but does not affect the generality of the results.

[10]A formal set-up where legislators vote as if they are pivotal can be found in Schneider (2009). With this setting, the same qualitative results are obtained.

if the legislature were discrete.[11]

3.3 The political game

Now the entire political game can be described. In principle, it is a lobbying game in the style of Groseclose and Snyder (1996) augmented by a policy proposer that (endogenously) determines the proposal to be voted on in the legislature. The policy proposer is also a member of the legislature which is a common feature of most democracies.[12] More precisely, we assume that the agenda-setter is randomly drawn from the majority type of legislators, which is type Y.[13] With respect to the U.S. Congress, where the composition of the committees usually reflects the seat shares of the parties in the respective chamber, the Y-type individual proposing the policy can be perceived as the median legislator in the respective committee. With regard to most parliamentary democracies, our specification is equivalent to the assumption that there is a 'Y party' that forms the government and proposes a new policy to the legislature. In Section 6.1 we will also examine the case where a legislator of minority-type X is the agenda-setter. Because the majority of legislators are of type Y, the legislative vote will be in favor of lobby Y without any payments. Hence, lobby X is the natural first mover in the lobbying subgame. The game possesses the following structure:

1. The policy proposer decides on a policy proposal t_g to put up for a vote against t_s.

2. Interest group X offers a payment schedule $\{b_X(k, t_g)\}_{k \in \mathcal{S}}$ to the legislators for a vote pro t_g if $t_g \in \tau_X$ and for a vote in favor of the status quo if $t_g \notin \tau_X$.

3. Interest group Y offers $\{b_Y(k, t_g)\}_{k \in \mathcal{S}}$ for a vote pro t if $t_g \in \tau_Y$ and for a vote in favor of the status quo if $t_g \notin \tau_Y$.

4. Each legislator k who receives at least one positive payment offer votes for t_g if and only if $b_i(k, t_g) \geq b_j(k, t_g)$, where $t_g \in \tau_i$ and $i \neq j$. If he obtains no positive payment offer, he votes for $t_g \in \tau_i$ if and only if he is of type i. The policy

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[11]See also Dal Bo (2007) for a similar argument.

[12]In parliamentary democracies, the executive branch, which makes the proposals, is formed by one or more parties with a majority of seats in the legislature. In presidential democracies such as the US, the executive is not part of the legislature. However, it does not possess proposal rights in the legislature either. Only members of Congress can introduce a bill.

[13]A similar assumption is made by, e.g., Bennedsen and Feldmann (2002). In our setting, the assumption is equivalent to assuming that the median of the legislature may propose policy.

proposal will be implemented if the majority of the legislators vote in favor of it. If no majority for t_g can be established, the status quo remains in place.

4 Equilibrium

We begin the equilibrium analysis by characterizing the equilibrium of the lobbying subgame – i.e., the subgame that starts once policy proposal t_g has been introduced.

4.1 The lobbying subgame

To determine the equilibrium in the lobbying subgame, it is necessary to know how large a budget is necessary for the first mover X to outcompete the second mover Y in the lobbying game.

The structure of the lobbying subgame in the present paper is a variant of Groseclose and Snyder (1996) where legislators have no preference regarding the act of voting for or against the proposal. This allows to infer from Proposition 1 in Groseclose and Snyder (1996) that it is optimal for X to follow a leveling strategy when making its offers. A strategy is leveling if $b_X(k, t_g)$ is the same for *almost all* bribed legislators.[14] The intention behind a leveling strategy is to leave no 'soft spots' to the second mover of the lobbying subgame. A more detailed discussion of leveling strategies can be found in Groseclose and Snyder (1996).

We can now determine how expensive it is for X to ensure a majority of votes in the legislature for its preferred policy alternative. We use m to denote the measure of legislators who receive payments additional to those necessary for a minimal majority. This implies that the size of the supermajority that votes for the preferred policy of interest group X is $\frac{S}{2} + m$ legislators.[15] m is the measure of legislators that interest group Y needs to buy back to ensure the approval of its preferred alternative. Hence, given proposal t, for X to win the lobbying subgame, each of the bribed legislators must receive payments of at least $\frac{B_Y(t)}{m}$. Because a leveling strategy is cheapest for X,

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[14]'Almost all' means all bribed legislators except a set of measure zero.

[15]Groseclose and Snyder (1996) showed that it can be less expensive for the first mover, in our case interest group X, to form a supermajority in the legislature rather than a minimal winning coalition.

the total payments to establish a supermajority of size $\frac{S}{2} + m$ accrue to

$$T_X(t) = \left[\frac{S}{2} + m \right] \frac{B_Y(t)}{m}.$$

Since the objective is declining in m, it is optimal to make payments to the entire legislature – i.e., $m^* = \frac{S}{2}$.

Consequently, the minimal amount of payments by X necessary to win the lobbying game is $T_X(t) := 2\, B_Y(t)$. The factor by which lobby X's budget needs to exceed that of Y to win the lobbying subgame has been called the *hurdle factor* by Diermeier and Myerson (1999). In this particular case, we obtain a hurdle factor of 2.

We are now in the position to characterize the equilibrium in the lobbying subgame. Two situations can arise: (1) the willingness to pay of lobby X, $B_X(t)$, is (weakly) higher than $T_X(t)$, or (2) it is lower than $T_X(t)$. In the first case, X will spend $T_X(t)$ to ensure a majority of legislative votes in its favor. In the second case, it will abstain from offering payments.[16] Interest group Y will not make a positive offer in the first scenario because it has no chance of influencing the legislative vote. In the second situation it offers no payments because the majority of the legislators is of type Y and votes in its favor anyway. We summarize our observations using the following proposition:

Proposition 1 (Equilibrium in the lobbying subgame)

For each policy proposal of the policy proposer, t, there exists a unique equilibrium in the lobbying subgame which implies that

(i) *if $B_X(t) \geq T_X(t)$*

Stage 2 *X makes payments $b_X(k,t) = \frac{2B_Y(t)}{S}$ to all of the legislators for a vote in its favor.*

Stage 3 *Y does not make any payment offer.*

Stage 4 *All legislators vote in favor of X. Hence, if $t \in \tau_X$, t will be implemented, otherwise the status quo prevails.*

(ii) *if $B_X(t) < T_X(t)$*

Stage 2 *X makes no payment offers.*

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[16]The reason is that the second mover only needs to secure a minimal majority and will buy back the "cheapest" legislators. By this, the first mover cannot make a positive offer without incurring some costs for itself. Thus, when knowing that it will lose the lobbying subgame, a positive payment offer is not profitable.

Stage 3 Y *makes no payment offers.*

Stage 4 *All legislators of type X vote in favor of X and all legislators of type Y vote in favor of Y. If $t \in \tau_Y$, t will be implemented, otherwise the status quo prevails.*

According to Proposition 1, only the first-mover lobby X will make payments to the legislators in equilibrium. Furthermore, we know that X offers the same amount of payments to all legislators. Hence, we can drop indices and write $b(t)$ instead of $b_X(k, t)$. When bribes are paid in equilibrium, we have

$$b(t) = \frac{2l_Y}{S}|v_Y(t)|. \tag{2}$$

Before we move on to the characterization of the equilibrium of the complete game, the next lemma examines how the total payments of lobby X necessary to craft a majority in the legislature and payments per legislator change with the size S of the legislature and the size l_Y of the second-mover lobby. This is instructive as it already reveals a great part of the mechanics of the model.

Lemma 1 (Comparative statics of lobbying)

For a given policy proposal t, we have

(i) $\frac{\partial T_X(t)}{\partial S} = 0$, $\frac{\partial T_X(t)}{\partial l_Y} > 0$.

(ii) $\frac{\partial b(t)}{\partial S} < 0$, $\frac{\partial b(t)}{\partial l_Y} > 0$.

The proof follows directly from taking the derivatives of $T_X(t) = 2\ l_Y(t)|v_Y(t)|$ and $b(t)$ as given in equation (2). Lemma 1 indicates that an increase in the size of the legislature does not affect the amount necessary to win the lobbying game but leads to strictly lower payments per legislator.[17] With respect to total payments $T_X(t)$, an increase in S increases the size of the supermajority but at the same time reduces payments per legislator. In our basic model, the two effects cancel each other out. An increase in the size of interest group Y has the effect that more resources are necessary for X to outcompete Y in the lobbying subgame. For this reason, total payments to the bribed legislators increase, and as a consequence, so do payments per legislator.

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[17]Note that the share of type-Y legislators is held constant when differentiating $T_X(t)$ with respect to S.

4.2 Partitions of the policy space

The equilibrium of the lobbying subgame allows one to characterize which policy proposals will be approved by the legislature and which ones have no chance of being implemented. This is important information for the policy proposer when considering his proposal. To identify the policies that can be implemented, it is convenient to use the function

$$F(t) := l_X v_X(t) + 2 l_Y v_Y(t), \tag{3}$$

which indicates for each policy t whether the budget of X exceeds the amount necessary to outcompete Y in the lobbying subgame. A policy t is implementable if and only if $F(t) \geq 0$. In each of the sets τ_i, the policies that can be implemented by the policy proposer are defined by $\tau_i^I := \{t \in \tau_i : F(t) \geq 0\}$. We denote the set of all implementable policies by $\tau^I := \tau_Y^I \cup \tau_X^I$. Similarly, the sets of policies that cannot be implemented are referred to by $\tau_i^{\neg I} := \tau_i \setminus \tau_i^I$.

Equation (3) reveals two important properties. First, $F(t)$ is a strictly concave function on τ as both $v_X(t)$ and $v_Y(t)$ are strictly concave. Second, $F(t_s) = 0$, which follows from $v_X(t_s) = v_Y(t_s) = 0$. The two properties imply that $F(t)$ possesses at most two roots in the interval τ with one of them being t_s. We can now fully characterize the sets of implementable and non-implementable policies dependent on the shape of function $F(t)$. For this purpose we use $F'(t_s)$ to denote $\left.\frac{F(t)}{dt}\right|_{t=t_s}$.

Proposition 2 (Partitions of the policy space)

(i) If $F'(t_s) > 0$ and $F(t_Y^*) \geq 0$, then $\tau_Y^I = \tau_Y$ and $\tau_X^{\neg I} = \tau_X$

(ii) If $F'(t_s) > 0$ and $F(t_Y^*) < 0$, then $\tau_Y^I = (t_s, \hat{t}_Y]$, $\tau_Y^{\neg I} = (\hat{t}_Y, t_Y^*]$ and $\tau_X^{\neg I} = \tau_X$, where $\hat{t}_Y \neq t_s$ and $F(\hat{t}_Y) = 0$.

(iii) If $F'(t_s) = 0$, only the status quo is implementable.

(iv) If $F'(t_s) < 0$ and $F(t_X^*) < 0$, then $\tau_Y^{\neg I} = \tau_Y$, $\tau_X^I = [\hat{t}_X, t_s)$ and $\tau_X^{\neg I} = [t_X^*, \hat{t}_X)$, where $\hat{t}_X \neq t_s$ and $F(\hat{t}_X) = 0$.

(v) If $F'(t_s) < 0$ and $F(t_X^*) \geq 0$, it follows that $\tau_Y^{\neg I} = \tau_Y$ and $\tau_X^I = \tau_X$.

The proof can be found in the appendix. The intuition of Proposition 2 can be summarized as follows: the slope of $F(t)$ at $t = t_s$ indicates on which side of t_s the function $F(t)$ attains its maximum. In other words, it indicates whether the set of implementable policies is a subset of τ_Y or τ_X. We directly obtain the following corollary:

Corollary 1 (Set of implementable policies)

The set of implementable policies will never comprise both, policies favoring X and policies favoring Y.

Formally: if $F'(t_s) \neq 0$, then $\tau^I \subseteq \tau_X$ or $\tau^I \subseteq \tau_Y$.

The second part of the conditions in (i), (ii), (iv) and (v) – i.e., $F(t_Y^*) \geq 0$ or $F(t_X^*) \geq 0$ – specifies whether the boundary points t_Y^* and t_X^* are in the set of implementable policies. For example, consider cases (i) and (ii). In both conditions, $F'(t_s) > 0$ indicates that the implementable set is a subset of τ_Y. Hence, t_X^* will not be implementable, but t_Y^* could be. Thus, we are interested in condition $F(t_Y^*) \geq 0$ rather than $F(t_X^*) \geq 0$. In (i) we infer from $F(t_Y^*) \geq 0$ that $F(t)$ possesses no further root in the interior of τ and τ_Y^I is identical to the entire set τ_Y. In (ii) $F(t_Y^*) < 0$ and t_Y^* is not in the implementable set. Hence, $F(t)$ has a root at some $\hat{t}_Y \in \tau_Y$. Thus, for all $t \in \tau_Y$, we can state that if $t \leq \hat{t}_Y$ then $t \in \tau_Y^I$ and if $t > \hat{t}_Y$ then $t \in \tau_Y^{\neg I}$. The intuition for cases (iii) and (iv) follows the same line of argument.

An illustration of case (ii) of Proposition 2 is given by Figure 1. As can be seen in the graph, the slope of $F(t)$ at t_s is positive. Hence, the implementable set of policies (all t for which $F(t) \geq 0$) is a subset of the policies favoring Y. However, because $F(t_Y^*) < 0$, the implementable set is not comprised of all policies benefiting Y. The most favorable policies for Y can be prevented by lobby X.
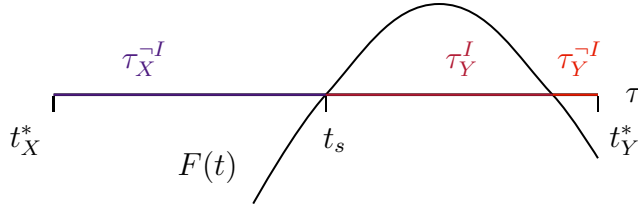

Figure 1: Illustration of the partition of the policy space in case (ii) of Proposition 2.

Proposition 2 outlines five different decision environments that the agenda-setter may face when considering his policy proposal. In particular, if $\tau_i^I \neq \emptyset$, then policy change in favor of lobby i is possible, whereas the best lobby $j \neq i$ can hope for is that the status quo remains. In the following, we speak of lobby i as the lobby *seeking policy change* if $\tau_i^I \neq \emptyset$ and as the lobby *opposing policy change* or *defending the status quo* if $\tau_i^I = \emptyset$.

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4.3 Subgame-perfect equilibrium of the political game

To complete the equilibrium analysis, we determine the policy proposal at the first stage of the political game. Facing a certain partition of the policy space induced by the equilibrium of the lobbying subgame, the agenda-setter chooses the policy proposal so as to maximize

$$V_Y(t) := U_Y(t) - U_Y(t_s) = 1_{t \in \tau^I} v_Y(t) + 1_{t \in \tau_X^I \cup \tau_Y^{\neg I}} b(t). \tag{4}$$

In the proposer's objective function, $1_{t \in \tau^I}$ is the indicator function that returns a 1 if $t \in \tau^I$ and a zero otherwise. The corresponding interpretation applies to the indicator function in front of $b(t)$. The first term of the objective function represents the utility gain derived directly from the new policy, which is only obtained by introducing an implementable policy. The second summand represents the payments associated with the policy proposal. The corresponding indicator function reflects the fact that bribes are paid only for a vote in support of implementable policy proposals that favor the first mover X or a vote against non-implementable policy proposals in favor of Y.

Here we assume that the agenda-setter cares only about his own utility when crafting the proposal. It might be more realistic that he also cares about the utility of his fellow party members in the legislature because the party determines his committee membership. Interpreting the Y-type legislators as the Y party, such an extension could easily be incorporated into the agenda-setter's objective and would not affect the qualitative results.

The maximization problem of the policy proposer can be solved using a two-step procedure. First, within each of the four relevant policy subsets, the most preferred policy is identified, and in a second step, the policy is chosen that yields the highest utility level of those four. The most preferred policy choices within the implementable and non-implementable sets are defined as

$$t_i^a := \arg \max_{t \in \tau_i^a \cup t_s} V_Y(t), \tag{5}$$

where $a \in \{I, \neg I\}$. As a tie-breaking rule, we assume that if within a set τ_i^a no policy yields higher utility than the status quo, then the status quo will be chosen as the best policy t_i^a. The policy that yields the highest utility for the agenda-setter is

$$t_g = \arg \max_{t \in \{t_Y^I, t_Y^{\neg I}, t_X^I, t_X^{\neg I}, t_s\}} V_Y(t). \tag{6}$$

In case of indifference between an implementable and a non-implementable policy, we assume that the agenda-setter proposes the implementable one. With this tie-breaking assumption, the proposer's choice is unique.[18] It is now possible to fully characterize the subgame-perfect equilibrium of the political game.

Proposition 3 (Subgame-perfect equilibrium of the political game)

The political game possesses a unique subgame-perfect equilibrium where at the first stage the policy proposer proposes policy t_g as given by (6) and then the equilibrium of the lobbying subgame is played as specified in Proposition 1.

4.4 Characterization of the policy proposal

In this section, we further characterize the equilibrium policy proposal. First we can state that

Lemma 2

Proposing t_X^{-I} is never strictly preferred to the status quo.

The reason is that if a policy $t \in \tau_X^{-I}$ is proposed, the status quo will prevail and – according to Proposition 3 – the agenda-setter will not receive any payments. Hence, $V_Y(t_X^{-I}) = 0$. As a consequence of Lemma 2, we can neglect t_X^{-I} as a potential policy proposal in the following.

It is now instructive to examine the most preferred policy proposals within the different implementable and non-implementable sets. First, consider the set τ_Y^I. Within this set, the most preferred policy proposal maximizes $v_Y(t)$. Hence we conclude that $t_Y^I = \max \tau_Y^I$. Policies within the set τ_Y^{-I} cannot be implemented. Therefore, the best choice for the proposer maximizes the amount of bribes, $b(t)$. Equation (2) reveals that $b(t)$ is strictly increasing with $|v_Y(t)|$. Consequently, we have $t_Y^{-I} = \max \tau_Y^{-I} = t_Y^*$.

With regard to the set of implementable policies favored by X, τ_X^I, the policy proposer also seeks to maximize bribes, which increase with worsening policy proposals from Y's perspective. Intuitively, the reason is that interest group Y's willingness to pay increases to avoid the pro-X policy. However, with respect to τ_X^I, the agenda-setter faces a trade-off because he knows that such a policy proposal will be implemented. Hence, the legislator of type Y who decides on the proposal suffers himself from a

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[18]It will become clear in the next subsection why this is the case.

policy change favoring X. For $t \in \tau_X^I$, the proposer's objective can be written as

$$V_Y(t) = v_Y(t)\left[1 - \frac{2\,l_Y}{S}\right]. \tag{7}$$

This reveals that the utility gain of a Y-type agenda-setter from introducing an implementable pro-X policy is positive if and only if

$$2\,l_Y > S. \tag{8}$$

Moreover, the proposer's utility increases with $|v_Y(t)|$, implying that $t_X^I = \min \tau_X^I$ if condition (8) is satisfied. If (8) does not hold, the status quo will be chosen.[19] We summarize our findings in the following lemma:

Lemma 3 (Candidates for policy proposal)

(i) If $\tau_Y^I \neq \emptyset$, then $t_Y^I = \max \tau_Y^I$,

(ii) If $\tau_Y^{\neg I} \neq \emptyset$, then $t_Y^{\neg I} = \max \tau_Y^{\neg I} = t_Y^*$,

(iii) If $\tau_X^I \neq \emptyset$ and (8) is satisfied, then $t_X^I = \min \tau_X^I$.

As a consequence of Corollary 1, the policy proposer does not have to decide between proposing an implementable policy pro Y and an implementable policy pro X. If $\tau_Y^{\neg I}$ is non-empty, the proposer's most preferred non-implementable policy is t_Y^*. Hence, when deciding on his proposal, the agenda-setter compares the utility gain associated with the best implementable policy with the utility gain associated with the non-implementable policy t_Y^*. If $\tau_Y^{\neg I} = \emptyset$, t_Y^* is implementable. t_Y^* will be proposed because any other non-implementable proposal yields no utility gain relative to the status quo (see Lemma 2). For these reasons, we obtain the following:

Lemma 4 (Implementation bias)

The policy proposer introduces an implementable policy $t \in \{t_Y^I, t_X^I\}$ if and only if

$$I_Y(t) := V_Y(t) - V_Y(t_Y^*) \geq 0.$$

We also refer to $I_Y(t)$ as the policy proposer's *implementation bias*. In this way, a policy t that will be implemented necessarily satisfies $F(t) \geq 0$ and $I_Y(t) \geq 0$. The first condition ensures that the lobby opposing the proposal cannot create a majority in the legislature against it. The second condition implies that the best implementable policy proposal yields higher utility than the best non-implementable policy proposal.

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[19]We assume that if $2\,l_Y = S$, the agenda-setter chooses the status quo.

5 The Role of Interest-Group Size

In this section, we examine how interest-group size affects the policy outcome. This leads to the paper's main result: an increase in the size of the second-mover lobby may lead to adverse policy outcomes for this interest group. This result takes two forms. First, if $\tau_X^I \neq \emptyset$, a larger size for Y may induce the policy proposer to introduce an implementable policy change in favor of X rather than effectively maintaining the status quo by proposing a non-implementable pro-Y policy. That is, when the group Y that opposes the policy change is small, the Y-type agenda-setter effectively maintains the status quo. However, if Y grows larger, he will propose a policy change to the benefit of lobby X. Second, if the implementable policy set contains pro-Y policies, an increase in the size of lobby Y that is in favor of a pro-Y policy change may lead the proposer to introduce a non-implementable pro-Y policy rather than an implementable one. Via such policy changes or status-quo persistence, the second-mover lobby unambiguously loses in utility even though this lobby has become stronger in terms of its budget.

Before we explain the two results in detail, we begin our discussion with the following proposition that gives the effects of lobby group size on the utility gains of the agenda-setter with respect to the relevant best proposals within each set. This reveals how the agenda-setter's proposal choice at the second stage of his optimization problem is influenced by the size of the interest groups.

Proposition 4 (Comparative statics – interest-group size)

(i) If $\emptyset \neq \tau_Y^I \subsetneq \tau_Y$, then $\frac{dV_Y(t_Y^I)}{dl_Y} > 0$, and $\frac{dV_Y(t_Y^I)}{dl_X} < 0$.

(ii) If $\tau_Y^{-I} \neq \emptyset$, then $\frac{dV_Y(t_Y^*)}{dl_Y} > 0$, and $\frac{dV_Y(t_Y^*)}{dl_X} = 0$.

(iii) Suppose condition (8) is satisfied.

(a) If $\tau_X^I = \tau_X$ and $F(t_X^*) > 0$, then $\frac{dV_Y(t_X^*)}{dl_Y} > 0$, and $\frac{dV_Y(t_X^*)}{dl_X} = 0$.

(b) If $\emptyset \neq \tau_X^I \subsetneq \tau_X$, then $\frac{dV_Y(t_X^I)}{dl_Y} \gtreqqless 0$, and $\frac{dV_Y(t_X^I)}{dl_X} > 0$.

The proof can be found in the appendix. The situation where $F(t_X^*) = 0$ is a bit more complex than that in Proposition 4 (iii) (a) and (b).[20] As it is not essential to our main

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[20]The only complication is that t_X^I is not differentiable with respect to l_i if $F(t_X^*) = 0$. Loosely speaking, the effects of changes in l_i are a mixture between those in (iii)(a) and (b).

results or the intuition behind them, we have not included this situation in Proposition 4. Instead we address this case in an extension of Proposition 4 that is provided in the appendix.

The size of the lobbies directly determines their budgets available in the lobbying subgame. While the budget of the first-mover lobby only matters for the resulting partition of the policy space, the budget of the second mover additionally influences the amount of payments made to the legislators. The reason is that a greater size of interest group Y implies that it becomes more expensive for lobby X to outcompete Y.

Item (i) of Proposition 4 focuses on the situation where $\tau^I \neq \emptyset$ but not the entire set τ_Y is implementable. Then a growing lobby Y increases the set of implementable policies that are pro-Y. Thus, it becomes more attractive for the agenda-setter to propose t_Y^I. However, as given in item (ii) of the proposition, a larger interest group Y makes it also more attractive to choose a pro-Y policy that is not implementable. This is due to the higher amount of payments associated with it. By contrast, an increase in the budget of X does not affect the payments made to legislators in this case. The reason is that first, the optimal policy choice in $\tau_Y^{\neg I}$ remains unaffected, and second, the lobby only pays the amount necessary to secure a winning majority in the legislature. This amount is not affected by a change in the size of X.

The same line of argument applies in (iii) with respect to a potential proposal t_X^* when $\tau_X^I = \tau_X$ (and $F(t_X^*) > 0$). In contrast, if τ_X^I is a strict subset of τ_X, an increase in l_Y has two effects: an increase in payments for a given policy and an increase in t_X^I (as the set of implementable policies favoring X becomes smaller). The latter implies lower payments, as we can infer from equation (2). Hence, whether the payments for the policy proposer increase is ambiguous, and consequently, so is the utility gain from proposing t_X^I.

Proposition 4 contains another interesting result for the case $\emptyset \neq \tau_X^I \subsetneq \tau_X$. In contrast to the situation where $\tau_X^I = \tau_X$, the utility gain of the policy proposer increases with the size of the first mover X. The reason is that the larger size of X increases the set of implementable pro-X policies. Hence, worse policies from Y's perspective can be implemented. These are associated with higher payments.

5.1 Policy changes induced by greater opposition

Consider the case where $\tau_X^I \neq \emptyset$. Then lobby X seeks policy change that Y opposes. The trade-off for the agenda-setter is as follows. On the one hand, he can propose t_Y^* in expectation of payments from lobby X while effectively maintaining the status quo. On the other hand, he can propose t_X^I, which involves payments from interest group X but also involves the implementation of a pro-X policy change. As discussed in Section 4.4, the policy proposer will propose a policy change in favor of X if and only if $I(t_X^I) \geq 0$. This condition can be written as

$$
\begin{aligned}
I_Y(t_X^I) &= v_Y(t_X^I) + b(t_X^I) - b(t_Y^*) \\
&= v_Y(t_X^I) - \frac{2\,l_Y}{S}[v_Y(t_X^I) + v_Y(t_Y^*)] \geq 0
\end{aligned}
\tag{9}
$$

Inspection of (9) establishes one of the central propositions of the paper.

Proposition 5 (Policy change)

Suppose $\tau_X^I \neq \emptyset$. The policy proposer will introduce a pro-X policy if and only if

(i) $-v_Y(t_X^I) > v_Y(t_Y^*)$ and

(ii) $l_Y \geq \frac{S\,v_Y(t_X^I)}{2\,[v_Y(t_X^I)+v_Y(t_Y^*)]}$.

The intuition of Proposition 5 can be described as follows. According to (9), the policy proposer only introduces a policy change in favor of X if the expected payments associated with it are sufficiently larger than those associated with proposing the non-implementable pro-Y policy. Once the proposal is put up for voting, lobby X spends the smallest amount of money necessary to outcompete Y. Hence, payments associated with the implementable pro-X policy can only be higher than those for a non-implementable pro-Y policy if (i) interest group Y's willingness to lobby against t_X^I is sufficiently larger than that to lobby for t_Y^* and (ii) the budget available as reflected by the interest-group size l_Y is large enough.

Let us consider the implications and intuition of Proposition 5 in greater detail. We start with the case where $\tau_X^I = \tau_X$. We can infer from (9) that as long as $\tau_X^I = \tau_X$ and $-v_Y(t_X^*) > v_Y(t_Y^*)$ are satisfied, the policy proposer's implementation bias with respect to t_X^I is strictly increasing with l_Y. This is the main insight of the paper: although an increase in the size of Y increases the costs for X to ensure a majority in the legislature, it may still benefit X as the policy proposer's incentive to propose a

policy tilted towards X increases. This implies that an increase in size for lobby Y may actually trigger a policy change in favor of X introduced by a pro-Y policy proposer. In particular, there will be no policy change if $l_Y = 0$ because in this case, condition (ii) cannot be satisfied.[21] This result offers an explanation for the observation reported in the introduction: that no opposition can be bad for the lobby seeking policy change. In contrast, policy change occurs only if the interest group opposing policy change is sufficiently large.

Now consider the case where $\emptyset \neq \tau_X^I \subsetneq \tau_X$. Then, changes in the lobby sizes also affect the partition of the policy space. According to Proposition 4(iii) case (b), an increase in l_Y has two opposing effects on the incentives of the policy proposer. First, the payments associated with each implementable pro-X policy increase. Second, however, the set of implementable pro-X policies becomes smaller. Consequently t_X^I increases, which reduces the amount of payments achievable by the agenda-setter from proposing this policy. In cases where the first effect dominates, we obtain the result that in the case $\tau_X^I \subsetneq \tau_X$ as well, a policy change towards X can be induced by an increase in the size of lobby Y.

Now we ask whether an increase in the size of the interest group seeking policy change will help this lobby to achieve change. From Proposition 4, we can infer that this is possible if $\tau_X^I \subsetneq \tau_X$ but not if $\tau_X^I = \tau_X$. The intuition is that in our set-up, X only spends the amount necessary to outcompete interest group Y once the proposal is introduced. If $\tau_X^I = \tau_X$, an increase in lobby X's budget will neither change the partition of the policy space nor influence the payments for the legislators. Hence, $V_Y(t_X^*)$ and $V_Y(t_Y^*)$ and, consequently, $I_Y(t_X^*)$ remain unchanged by an increase in l_X. In the case where $\emptyset \neq \tau_X^I \subsetneq \tau_X$, the set of implementable pro-X policies increases, and if (8) is satisfied, this increases the utility from proposing t_X^I. Since the utility gain associated with the alternative non-implementable proposal t_Y^*, $V_Y(t_Y^*)$, is unaffected by the larger size of X, we obtain that the implementation bias $I_Y(t_X^I)$ increases. The important insight of this paragraph is that if $\tau_X^I \neq \emptyset$, an increase in the size of the first-mover lobby may not help to attain a policy change in its favor, but it also does not have adverse effects on the policy outcome for this lobby.

We summarize our observations in the following proposition:

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[21]The reason is that (t_X^I) is bound from below by $v(t_X^*)$ for decreasing levels of l_Y and that as a consequence, the right-hand side of (ii) will be strictly positive.

Proposition 6 (Implementation bias when $\tau_X^I \neq \emptyset$)

Suppose condition (8) is satisfied and $-v_Y(t_X^I) > v_Y(t_Y^*)$.

(i) *If $\tau_X^I = \tau_X$ and $F(t_X^*) > 0$, then $\frac{dI_Y(t_X^*)}{dl_Y} > 0$, and $\frac{dI(t_X^*)}{dl_X} = 0$.*

(ii) *If $\emptyset \neq \tau_X^I \subsetneq \tau_X$, then $\frac{dI_Y(t_X^I)}{dl_Y} \gtreqless 0$, and $\frac{dI(t_X^I)}{dl_X} > 0$.*

The proof can be found in the appendix. An extension of Proposition 6 for the case where $F(t_X^*) = 0$ is also provided in the appendix. To state it explicitly, if the second-mover lobby grows larger and the policy proposer's most favorable proposal thereby changes from the non-implementable policy t_Y^* to the implementable policy t_X^I, the utility of the members of Y declines and that of the members of X increases as a result. The utility loss of lobby Y results from the worse policy's being implemented when it grows larger. In contrast, interest group X saves payments $T_X(t_Y^*)$ and additionally obtains a utility gain of $l_X v_X(t_X^I) + 2 l_Y v_Y(t_X^I) \geq 0$.

5.2 Status-quo persistence induced by stronger lobby in favor of policy change

In this section, we show that even if the implementable policy set is a non-empty subset of τ_Y and hence no pro-X policy changes are possible, increases in the size of the second-mover lobby Y can still involve detrimental effects for it. In particular, the increase in l_Y may lead to a persistence of the status quo even if a policy change in favor of Y is implementable.

If $\emptyset \neq \tau_Y^I \subsetneq \tau_Y$, the policy proposer faces the trade-off between proposing an implementable pro-Y policy and receiving no payments or proposing the non-implementable policy t_Y^* that is associated with payments of lobby X, which opposes a pro-Y policy change. Consequently, the implementation bias of the policy proposer is $I_Y(t_Y^I) = v_Y(t_Y^I) - b(t_Y^*)$. Note that unlike in the situation wherein $\tau_X^I \neq \emptyset$, a positive implementation bias favors Y. How the incentive to propose an implementable pro-Y policy depends on the lobby group sizes can be directly inferred from Proposition 4. An increase in size of lobby Y increases both the set of implementable policies in favor of Y and the payments associated with the non-implementable proposal. The former positively affects the proposer's implementation bias, whereas the latter exerts a negative influence. If the second effect dominates, we obtain the result that an increase in the

size of interest group Y induces the persistence of the status quo rather than a policy change for the benefit of Y.

With regard to an increase in l_X, a similar line of argument as in the situation where $\tau_X^I \subsetneq \tau_X$ applies. An increase in l_X reduces the implementable policy set pro Y but leaves the payments associated with proposal t_Y^* unchanged. Hence, the proposer's implementation bias unambiguously declines with l_X. We can conclude that in the situation where $\tau_Y \neq \emptyset$ an increase of its size will also not involve negative effects on the policy outcome for the first mover. The next proposition summarizes the discussion.

Proposition 7 (Implementation bias when $\emptyset \neq \tau_Y^I \subsetneq \tau_Y$)
If $\emptyset \neq \tau_Y^I \subsetneq \tau_Y$, then $\frac{dI_Y(t_Y^I)}{dl_Y} \gtreqless 0$, and $\frac{dI_Y(t_Y^I)}{dl_X} < 0$.

The proof of Proposition 7 follows directly from Proposition 4. Interestingly, in case the policy proposer's most preferred proposal changes from t_Y^I to the non-implementable policy t_Y^* as the result of an increase in l_Y, both lobbies are worse off. That Y loses in utility is obvious because with the smaller size l_Y, the members will enjoy $v_Y(t_Y^I) > 0 \ \big(= v_Y(t_s) \big)$. Since the status quo by itself is more favorable than t_Y^I for X, the members of lobby X seem to profit from the increase in l_Y. However, they have to make payments in the amount of $T_X(t_Y^*) = 2l_Y v_Y(t_Y^*)$ to prevent the implementation of t_Y^* when l_Y is large. If l_Y is small, each member of X suffers $v_X(t_Y^I)$. Since $2l_Y v_Y(t_Y^*) > 2l_Y v_Y(t_Y^I) \geq -l_X v_X(t_Y^I)$, lobby X loses in utility if l_Y becomes larger. Note that the last inequality holds because t_Y^I is implementable – i.e., because $F(t_Y^I) = l_X v_X(t_Y^I) + 2l_Y v_Y(t_Y^I) \geq 0$.[22]

5.3   Example

This section provides an example to illustrate the results and sharpen their intuition. For simplicity, we use a discrete policy set $\tau = \{1, 2, 3, 4, 5\}$. A numerical simulation with a continuous set of policies is provided in Appendix A. We assume symmetric utility functions for both types. In particular, we choose the quadratic form $u_i(t) = -(t - t_i^*)^2, i \in \{X, Y\}$, which is often used in the literature. The bliss point of X is $t_X^* = 1$, and that of Y is $t_Y^* = 5$. Let the status quo be $t_s = 3$. Consequently, $\tau_X = \{1, 2\}$ and $\tau_Y = \{4, 5\}$. Table 1 provides the two types' utility gains relative to the status quo and the values of $F(t)$, $b(t)$, and $I_Y(t)$, depending on policy t. Note however

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[22]Of course, the pure benefit of the better policy t_s would accrue to X-types that are not organized in lobby X. They free-ride on the lobbying activities of interest group X.

t	1	2	3	4	5
$v_Y(t)$	-12	-5	0	3	4
$v_X(t)$	4	3	0	-5	-12
$F(t)$	$4\,l_X - 24\,l_Y$	$3\,l_X - 10\,l_Y$	0	$-5\,l_X + 6\,l_Y$	$-12\,l_X + 8\,l_Y$
$b(t)$	$24\frac{l_Y}{S}$	$10\frac{l_Y}{S}$	0	$6\frac{l_Y}{S}$	$8\frac{l_Y}{S}$
$I_Y(t)$	$4(4\frac{l_Y}{S} - 3)$	$2\frac{l_Y}{S} - 5$	$-$	$3 - 8\frac{l_Y}{S}$	0

Table 1: Example with discrete policy space.

that in equilibrium the payments $b(t)$ only accrue to the legislators if $t \in \tau_X^I \cup \tau_Y^{\neg I}$. Furthermore, $I_Y(t)$ is only defined for $t \in \{t_X^I, t_Y^I\}$. Hence the last line reads: given $t \in \{t_X^I, t_Y^I\}$ the policy proposer's implementation bias is $I_Y(t)$ as depicted in the last row of the table. The function $F(t)$ characterizes the partition of the policy space. A policy is implementable if and only if $F(t) \geq 0$, which ultimately depends on the relative size of the interest groups. Using the values in Table 1, we obtain the following partitions:

- If $\frac{l_Y}{l_X} \leq \frac{1}{6}$, then $\tau_X^I = \tau_X = \{1, 2\}$, $\tau_Y^{\neg I} = \emptyset$, $\tau_Y^I = \emptyset$, $\tau_Y^{\neg I} = \{4, 5\}$, and $t_X^I = 1$.

- If $\frac{1}{6} < \frac{l_Y}{l_X} \leq \frac{3}{10}$, then $\tau_X^{\neg I} = \{1\}$, $\tau_X^I = \{2\}$, $\tau_Y^I = \emptyset$, $\tau_Y^{\neg I} = \{4, 5\}$, and $t_X^I = 2$.

- If $\frac{3}{10} < \frac{l_Y}{l_X} < \frac{5}{6}$, then only the status quo is implementable.

- If $\frac{5}{6} \geq \frac{l_Y}{l_X} < \frac{3}{2}$, then $\tau_X^I = \emptyset$, $\tau_X^{\neg I} = \{1, 2\}$, $\tau_Y^I = \{4\}$, $\tau_Y^{\neg I} = \{5\}$, and $t_Y^I = 4$.

- If $\frac{3}{2} \geq \frac{l_Y}{l_X}$, then $\tau_X^I = \emptyset$, $\tau_X^{\neg I} = \{1, 2\}$, $\tau_Y^I = \{4, 5\}$, $\tau_Y^{\neg I} = \emptyset$, and $t_Y^I = 5$.

For a policy to actually be implemented, not only $F(t)$ needs to be non-negative but also the policy proposer's implementation bias $I_Y(t)$. It can be observed in the table that whether the proposer is willing to introduce an implementable policy (i.e. whether $I_Y(t) \geq 0$) depends on the relation of the second-mover lobby size and the size of the legislature, $\frac{l_Y}{S}$. For given utilities, this relation can be interpreted as a measure for the amount of bribes paid to each legislator. In Figure 2, we depict the policy proposals dependent on $\frac{l_Y}{S}$ and $\frac{l_Y}{l_X}$. Consider a very small second-mover lobby. Then we find ourselves in the lower left rectangle of the graph in Figure 2. There the first-mover lobby is sufficiently strong to form a majority for its most preferred policy given it is proposed. That is, policy 1 is implementable. However, because the second-mover
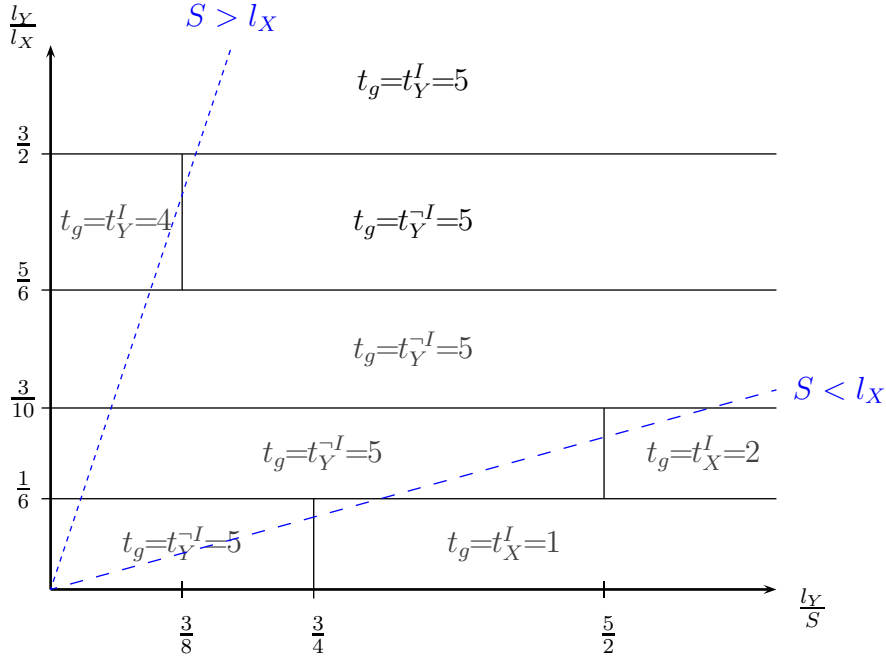
Figure 2: Illustration of policy proposals depending on $\frac{l_Y}{l_X}$ and $\frac{l_Y}{S}$.
The dashed lines illustrate examples for the function $\frac{l_Y}{l_X}\left(\frac{l_Y}{S}\right)$ when (1) S is larger than l_X, and (2) S is smaller than l_X.

lobby is very weak, there will not be sufficiently large bribes associated with this proposal to compensate the Y-type policy proposer for the utility loss when $t_X^I = 1$ is implemented. Thus, the agenda-setter introduces the non-implementable pro-Y policy. In the figure, we can now observe what will happen when l_Y grows larger. The *expansion path* of l_Y indicates how much $\frac{l_Y}{l_X}$ and $\frac{l_Y}{S}$ change by an increase in l_Y. This depends on the relation between the size of the first-mover lobby, l_X, and that of the legislature, S.[23] Suppose that $S < l_X$. Then, for example, we move along the lower dashed line with the larger dashes when increasing l_Y. As depicted in Figure 2, when l_Y/S becomes larger than $3/4$ but l_Y/l_X still remains below $1/6$, the payments have grown sufficiently large that it becomes attractive for the policy proposer to change his proposal to the lowest implementable pro-X policy. Moving further along the expansion path, l_Y/l_X grows larger than $1/6$. Now $t = 1$ is not implementable anymore because Y is strong enough to prevent a majority in favor of it. $t = 4$ is still implementable, but as long

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[23]Formally, what we call the expansion path is the function $\frac{l_Y}{l_X}\left(\frac{l_Y}{S}\right) = \frac{S}{l_X} * \frac{l_Y}{S}$. Consequently, the slope of the expansion path of l_Y is $\frac{S}{l_X}$. Intuitively, the relation between l_X and S indicates the relative changes of the implementation bias and implementability by an increase of l_Y.

as l_Y/S is smaller than $5/2$, the bribes associated with it will be too low for the policy proposer. A further change in the policy proposal occurs when l_Y/S grows larger than $5/2$. When leaving the rectangle where $t_g = 2$, no policy will be implementable until the relative size of Y exceeds $l_Y/l_X = 3/2$. Then $t = 5$ is both implementable and introduced by the agenda-setter.

If $S > l_X$, the expansion path of l_Y moves steeper as, e.g., indicated by the line with the smaller dashes.[24] According to the figure, the increase in Y's size does not induce policy changes towards X. However if $\tau_Y^I \neq \emptyset$ – i.e., if $l_Y/l_X > 5/6$ – an increase in l_Y can lead to status-quo persistence. This occurs when l_Y/S has grown larger than $3/8$ but l_Y/l_X is still smaller than $3/2$.

6 Discussion

In this section, we will first examine how our results change if the agenda-setter's type coincides with that of the first-mover lobby. Then we address the welfare implications of both, policy changes induced by greater opposition and status-quo persistence. The following subsection studies the robustness of the model with respect to greater heterogeneity of preferences among the legislators and the members of the interest groups. Furthermore, we discuss extensions of the model that include lobbying at the proposal stage and how the results are affected when using different lobbying subgames. Finally, we explain why a second-mover advantage in the Groseclose and Snyder (1996) model with an exogenous proposal may turn into a second-mover disadvantage when the policy proposal is endogenous.

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[24]When interpreting S literally as the size of the legislature, the condition that $S > l_X$ may seem to be relatively unrealistic. This changes however, if S is interpreted more broadly to also reflect institutional details such as accountability in office. Suppose, e.g., that there is a certain probability $\hat{\mu}$ that a legislator will be caught when taking bribes and, if so, that he loses all of the bribes he has been paid. Then, in the table, we need to add a factor $(1 - \hat{\mu})$ – i.e., the probability of not being caught – to all terms with l_Y/S in the proposer's implementation bias. For example, in the fourth column, we would have $3 - 8(1 - \hat{\mu})\frac{l_Y}{S}$. Defining $\mu = \frac{1}{1-\hat{\mu}}$, we could write $3 - 8\frac{l_Y}{\bar{S}}$, where $\bar{S} = \mu S$. Note that if it is very likely for someone to be caught taking bribes (i.e., $\hat{\mu} \to 1$), $\bar{S}$ approaches infinity. Hence, with this broader interpretation the situation wherein $\bar{S} > l_X$ seems very realistic for well developed democracies. A more detailed discussion on this issue can be found in Schneider (2009).

6.1 Preferences of policy proposer aligned with first-mover lobby

Suppose that the policy proposer is of type X. We stay with the previous set-up of the lobbying subgame where lobby Y is the second mover. Our main result is that if the policy proposer's preferences accord with those of the first-mover lobby, an increase in an interest group's strength will not induce adverse effects on the policy outcome for this lobby.

As the the budgets of the lobbies and the sequence of their offers are unaffected by the preferences of the agenda-setter, the partition of the policy space remains unchanged. The only difference from our previous set-up is that the policy proposer values implementable policies differently. As with (4), the objective of the X-type policy proposer is to maximize $V_X(t) := U_X(t) - U_X(t_s) = 1_{t \in \tau^I} v_X(t) + 1_{t \in \tau_X^I \cup \tau_Y^{-I}} b(t)$. The following lemma summarizes the proposer's most preferred policies within the relevant implementable and non-implementable sets.[25]

Lemma 5 (Candidates for policy proposal of type-X agenda-setter)
If the proposer possesses X-type preferences, we obtain:

   (i) If $\tau_X^I \neq \emptyset$, then $t_X^I = \min \tau_X^I$,

   (ii) If $\tau_Y^{-I} \neq \emptyset$, then $t_Y^{-I} = \max \tau_Y^{-I}$,

   (iii) If $\tau_Y^I \neq \emptyset$, then $t_Y^I = t_s$.

The proof can be found in the Appendix. As the payments associated with the non-implementable pro-Y policies do not depend on the proposer's preferences, we can define the X-type proposer's implementation bias in the same way as that of the Y-type proposer. The X-type agenda-setter introduces the implementable policy $t \in \{t_Y^I, t_X^I\}$ if and only if $I_X(t) := V_X(t) - V_X(t_Y^*) \geq 0$. Investigating the implementation bias yields the following results:

Proposition 8 (Implementation bias of type-X agenda-setter)
   (i) If $\emptyset \neq \tau_Y^I \subsetneq \tau_Y$, then $I_X(t_Y^I) < 0$.

   (ii) If $\tau_X^I \neq \emptyset$ and $-v_Y(t_X^I) \geq v_Y(t_Y^*)$, then $I_X(t_X^I) > 0$.

   (iii) If $\tau_X^I \neq \emptyset$ and $-v_Y(t_X^I) < v_Y(t_Y^*)$, then $I_X(t_X^I) \gtreqless 0$, $\frac{dI_X(t_X^I)}{dl_X} \geq 0$, and $\frac{dI_X(t_X^I)}{dl_Y} < 0$

   .

A proof is provided in Appendix B.7. The proposition says that a policy proposer with preferences tilted towards the first-mover lobby will never introduce an implementable policy favoring the second-mover interest group. The reason is that the X-type legislator derives negative utility from a pro-Y policy and there are no payments associated with such a proposal. In contrast, if the set of implementable pro-X policies is non-empty and $-v_Y(t_X^I) \geq v_Y(t_Y^*)$, an X-type proposer will always propose his most preferred implementable pro-X policy. The condition that $-v_Y(t_X^I) \geq v_Y(t_Y^*)$ ensures that the payments associated with the non-implementable pro-Y policy are lower than or equal to those associated with the implementable pro-X policy. If this condition is not satisfied, the bribes for a non-implementable pro-Y proposal may be sufficiently high to push the proposer's implementation bias into the negative. However, the X-type proposer's implementation bias cannot become negative as a consequence of an increase in the size of lobby X (see item (iii) of Proposition 8). The proposition also states that the implementation bias with respect to t_X^I strictly decreases as a consequence of a stronger second mover Y. Hence, when the proposer's preferences are aligned with the first-mover lobby, greater opposition detrimentally affects policy change.

6.2 Efficiency and welfare

A prevalent question in the literature is whether lobbying leads to efficient outcomes, respectively whether it improves welfare. In our model, lobbying does not lead to Pareto-improvements as the lobbies' payments accrue to the legislators and are not used to compensate the members of the losing lobby. When using a utilitarian welfare measure that sums the utilities of all interest-group members and all legislators, we can easily construct examples where lobbying improves or decreases welfare relative to the situation where lobbying does not take place.

However, one of the main points of this paper is that an increase in its size may result in worse policy outcomes for this lobby. Concerning the welfare consequences of this result, we make the following thought experiment. Consider a society consisting of X-types and Y-types. Other than the legislators, all X-types are organized in lobby X, but not all Y-types are members of interest group Y. Now the non-organized Y-types join lobby Y. As our analysis showed, if $\tau_X^I \neq \emptyset$, this increase in l_Y may cause a policy change from t_s to t_X^I. Further, if $\tau_Y^I \neq \emptyset$, the policy may change from t_Y^I to t_s as a consequence. If they occur, do these policy changes involve welfare improvements?

Proposition 9 (Welfare implications)

(i) Let $\tau_X^I \neq \emptyset$. The policy change from t_s to t_X^I caused by the increase in l_Y leads to higher welfare if $l_Y \geq \lambda_Y S$.

(ii) The welfare implications of a policy change from t_Y^I to t_s caused by the increase in l_Y are ambiguous.

To prove the proposition, note that 'money'-transfers are neutral for welfare as they enter the utility functions linearly. Hence, the welfare effect depends on the utility changes induced by the policy change. A welfare improvement results if $\big(l_X + (1 - \lambda_Y)S\big)|v_X(t_X^I)| > (l_Y + \lambda_Y S)|v_Y(t_X^I)|$. The left-hand side of this condition represents the utility gain of the X-types (interest-group members and legislators) and the right-hand side reflects the utility gain of the Y-types. If t_X^I is implementable, we know that $l_X |v_X(t_X^I)| \geq 2l_Y |v_Y(t_X^I)|$.[26]   As a consequence, given $l_Y \geq \lambda_Y S$, we obtain $l_X|v_X(t_X^I)| \geq (l_Y + \lambda_Y S)|v_Y(t_X^I)|$. This implies that the above condition for a welfare improvement is satisfied.

With respect to status-quo persistence – i.e., a change from t_Y^I to t_s – we only know that with the initial size of lobby Y, l_Y^o, we had $l_X|v_X(t_Y^I)| \leq 2l_Y^o|v_Y(t_Y^I)|$.[27] From this condition we are not able to infer whether $(l_X + (1 - \lambda_Y)S)|v_X(t_Y^I)| > (l_Y + \lambda_Y S)|v_Y(t_Y^I)|$ is satisfied or not. Indeed, one can easily find examples where the former condition is satisfied and the latter condition either also holds or does not hold.

6.3   Heterogeneity of preferences

So far, we have considered two different types of individuals. Now we discuss how robust our results are with respect to a greater heterogeneity of preferences regarding policies. In particular, we additionally consider types $j \in \mathcal{J}$ characterized by utility $u_j(t)$. $\mathcal{J}$ is a compact set that also includes the types X and Y. For all j, $u_j(t)$ is strictly concave over τ. We denote the types' utility gain relative to the status quo as $v_j(t)$. The total utility of an individual of type j writes $U_j(t) = u_j(t) + d$.

In the following, we want to illuminate two cases. The first is where the legislators possess heterogeneous preferences but the members of the interest groups are still either an X-type or a Y-type. In the second case, we consider heterogeneous members of the two interest groups.

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[26]This condition is equivalent to $F(t_X^I) \geq 0$.
[27]This is because t_Y^I was implementable and hence $F(t_Y^I) \geq 0$.

6.3.1 Heterogeneity of legislators' preferences

Consider the same model structure as in the main text, with the only difference being that all of the legislators may have different utility functions. Since in the model the legislators are non-pivotal in the legislative vote, only the preferences of the policy proposer matter. The key point that we make in this section is that the results derived from the basic model carry over as long as the preferences of the agenda-setter are sufficiently tilted towards either of the types X or Y.

Because we still assume that X is the first mover and Y the second mover, the partition of the policy space remains unaffected by the legislators' preferences.[28] Again, we denote the policy proposer's best proposals within the different implementable and non-implementable sets by $t_i^a, i \in \{X, Y\}, a \in \{I, \neg I\}$. Given that τ_X^I is non-empty, the proposer introduces t_X^I if and only if $v_j(t_X^I) > b(t_Y^{\neg I}) - b(t_X^I)$, where $v_j(t)$ denotes the policy proposer's utility gain from policy t. Note that now, t_X^I may also be in the interior of τ_X^I. As in the main analysis, if $\emptyset \neq \tau_Y^I \subsetneq \tau_Y$, the proposer introduces t_Y^I if and only if $v_j(t_Y^I) > b(t_Y^{\neg I})$.

These conditions reveal that – by the same mechanics as in the basic model – an increase in the size of lobby Y can lead a policy proposer with bliss point substantially higher than the status quo to introduce an implementable policy that is substantially lower than the status quo. Similarly, such a policy proposer may choose a non-implementable pro-Y policy rather than an implementable one as a consequence of a stronger second-mover lobby. Of course, with a policy proposer with preferences sufficiently tilted towards those of the first-mover lobby, we could obtain the results in Section 6.1.

6.3.2 Heterogeneity of preferences of interest-group members

Let us consider the basic model set-up with the only difference being that there are more than two types of individuals who may join either of the two interest groups. This is interesting because now, the size of the lobbies is endogenous. The moderate types with bliss points around the center of the policy interval switch interest-group

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[28]The reason is that the equilibrium in the lobbying subgame is not (crucially) affected by the preferences of the legislators. It may now be the case that the majority of legislators will not vote in favor of the second-mover lobby Y without payments. However, in case that X has not offered any payments, Y only needs to pay a minimal amount ε to a sufficient number of legislators to ensure a majority in its favor. These minimal payments are insignificant for the resulting partition of the policy space.

membership depending on the policy proposal. In the following, we argue that it may be exactly this 'swinging' behavior of the politically moderate that can cause policy outcomes to their disadvantage.

We begin the formal argument by determining the budgets of the interest groups. For this purpose, we define $\theta_i(t) \equiv \{\, j \mid \text{sign}(v_j(t)) = \text{sign}(v_i(t))\}$, where $i \in \{X, Y\}$. The definition is interpreted as follows. Given a policy proposal t, the set $\theta_Y(t)$ encompasses all types that suffer a utility loss if an individual of type Y does. The equivalent interpretation applies to $\theta_X(t)$. Furthermore, we assume that the distribution of types is described by the measure $P(j)$, with $P(Y), P(X) > 0$. This means that given policy proposal t, all individuals of types in $\theta_Y(t)$ form an interest group $\hat{Y}$ of size $l_{\hat{Y}} = \int_{\theta_Y(t)} dP(j)$ that lobbies for the proposal if $v_Y(t) > 0$ and against it otherwise. The opponent of $\hat{Y}$ is $\hat{X}$, which comprises a measure $l_{\hat{X}} = \int_{\theta_X(t)} dP(j)$ of members. Consequently, the budgets of the lobbies write

$$B_{\hat{i}} = \int_{\theta_i(t)} v_j(t)\, dP(j)\,, \ i \in \{X, Y\}\,, \ j \in \mathcal{J}.$$

We assume that lobby $\hat{X}$ makes the first offer and that lobby $\hat{Y}$ moves second.[29] Then the partition of the policy space is described by

$$F(t) = \int_{\theta_X(t)} v_j(t)\, dP(j) + 2 \int_{\theta_Y(t)} v_j(t)\, dP(j), \tag{10}$$

where $F(t) \geq 0$ indicates the implementable policies. It is not possible to further characterize the function $F(t)$ without additional assumptions regarding the different utility gains $v_j(t)$ and the distribution of types given by $P(j)$. An interesting aspect, however, is that the interest-group sizes directly depend on the policy proposal t. In this way, lobby size is not exogenous anymore. In fact, the closer the policy proposal is to the ideal point of the X-types, the larger the lobby $\hat{Y}$ that opposes this proposal. The same is true with proposals close to the ideal point of the Y-types. This seems to suggest that it is now harder to implement a certain policy. However, using similar reasoning as in the basic model, it is precisely this 'swing' of the politically moderate interest-group members that may lead to an implementable policy proposal opposite to these swing lobbyists' policy preferences. To be specific, consider a policy proposer of type Y. Given the status quo policy t_s, we still use τ_i to denote the policy sets favoring type $i \in \{X, Y\}$ relative to the status quo. Assume that there exists a non-empty implementable policy

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[29]According to Section 3.3, a possible interpretation is that the majority of the legislators is of type Y.

set favoring type X (i.e., τ_X^I non-empty). The proposer's utility associated with a proposal $t \in \tau_X^I$ reads $V_Y(t) = v_Y(t) + b(t)$, where $b(t) = \frac{2}{S} \int_{\theta_Y(t)} |v_j(t)| \, dP(j)$. Consider now a decrease in t within τ_X^I and denote by $d\,\theta_Y(t)$ the increase in the set of types additionally joining lobby $\hat{Y}$. Then the bribes increase according to

$$\frac{db(t)}{dt} = \frac{2}{S} \left[\int_{\theta_Y(t)} \left| \frac{dv_j(t)}{dt} \right| \, dP(j) + \int_{d\,\theta_Y(t)} |v_j(t)| \, dP(j) \right]. \qquad (11)$$

The first integral subsumes the greater willingness to lobby against the proposal by the 'old' members of lobby $\hat{Y}$, and the second integral represents the willingness of the 'new' members to lobby against the proposal. The total utility of the policy proposer changes according to

$$\frac{dV_Y(t)}{dt} = \frac{dv_Y(t)}{dt} + \frac{db(t)}{dt}.$$

Let t_Y denote the proposer's best proposal outside of τ_X^I, which yields utility $V_Y(t_Y)$. It is possible to find examples where $V_Y(t_X^I) > V_Y(t_Y)$ results from the effect that the closer the proposal gets to t_X^*, the smaller the supporting lobby $(\hat{X})$ and the larger the opposing lobby $(\hat{Y})$ are. Thus, we obtain the results of Section 5.1 even with endogenous interest-group sizes. In fact, it may be exactly the 'swinging' of the politically moderate that makes t_X^I an attractive proposal for the policy proposer. The reason is that the agenda-setter expects the politically moderate to join the lobby against the proposal, which results in higher bribes. As a consequence, the politically moderate individuals would be better off if they did not organize. In Appendix A.1, we provide an example wherein a higher level of organization of the politically moderate in interest groups leads to less desirable policy outcomes for them.

6.4 Lobbying at the proposal stage

So far have we assumed that there is no lobbying at the proposal stage. However, the data on, e.g., campaign contributions to members of the U.S. Congress as provided by the Center for Responsive Politics suggests that committee members receive more money than 'ordinary' legislators.[30] The simplest way to extend our model to account for this observation is to add another vote-buying subgame concerning the decision to introduce a particular bill to the floor of the respective chamber. More precisely, at the first stage, the median legislator in the committee proposes a bill, and the committee

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[30]See www.opensecrets.org.

members vote as to whether it will be introduced for a vote in the legislature. If the policy proposal is accepted by the committee, the lobbying subgame as depicted earlier is played. If the proposal is rejected by the committee, the game ends and the status quo remains in place. Assuming that the committee member proposing the policy is of type Y, the additional lobbying subgame raises the hurdle factor for X to achieve a policy change but makes it cheaper to prevent a proposal as t_Y^* from implementation. The reason is that X has to buy two voting bodies for implementation but only one for rejection. In the latter case, X will lobby the committee because it is smaller than the legislature. For further detail on the structure of this lobbying subgame, we refer to the paper by Diermeier and Myerson (1999). A result of this extension is that the partition of the policy space changes. However, qualitatively the extended model yields the same results as the basic version – with the difference, of course, that now committee members receive higher payments than do ordinary legislators: for a policy that is approved, they collect bribes twice, and for a non-implementable policy, they are the only ones to receive payments.

That non-implementable bills are rejected at the proposal stage rather than by a floor vote is a realistic aspect of this model extension. For example, as reported by Baumgartner et al. (2009), many of the issues that have failed without opposition have not been considered for a legislative vote. The extended model can account for this observation.[31]

Another question is whether our results change if the policy proposer can be influenced directly by the lobbies with respect to the proposal he makes. Explicitly modeling such an extension is beyond the scope of this paper. Our discussion is based on the argument that independent of the specific formulation of the lobbying game played at the proposal stage, as long as the agenda-setter is able to reject all offers by the interest groups, the utility derived in the political game without lobbying at the proposal stage defines the outside option that need to be overbid by the lobbies.

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[31]The critical reader may think that the cases without opposition that did not make it to the legislative vote were of minor importance relative to other political issues. However, these political issues include, for example, "Parity in Health Insurance Coverage for Mental Illness", "Medicare Payments for Clinical Social Workers", or "The Government Pension Offset and the Windfall Elimination Provision". In terms of monetary value involved or the urgency of the problems at play, they do not appear to less critical than issues like the "Bear Protection Act", "Eliminating Budgetary Support for USDA's Predator Control", or the "Distribution of Low Power FM Radio Licenses". The latter three issues faced substantial opposition and have been considered for a legislative vote. Descriptions of the cases can be found on the website http://lobby.la.psu.edu.

Suppose that $\tau_X^I \neq \emptyset$. As discussed earlier, if interest group Y is relatively small, the Y-type policy proposer has a negative implementation bias – i.e., $I_Y(t_X^I) < 0$. Suppose that with this implementation bias on the part of the policy proposer, interest group Y manages to avoid a pro-X policy proposal in the proposal lobbying subgame. According to Proposition 5, an increase in the size of lobby Y may induce a change in the policy maker's outside option regarding the proposal lobbying subgame from $I_Y(t_X^I) < 0$ to $I_Y(t_X^I) > 0$. Hence, although interest group Y has grown stronger, the situation it faces in the proposal lobbying subgame has worsened because the policy maker's ex ante implementation bias has changed in favor of a pro-X policy proposal. Whether the pro-X policy will be introduced depends on whether the higher budget of interest group Y can make up for the less favorable position with respect to the policy-maker's implementation bias. It seems plausible that one can also find situations in which there is lobbying at the proposal stage where policy changes towards X are induced by an increase in the size of lobby Y.

More directly, our model reflects there being considerably larger commitment problems at the proposal stage than with respect to the floor vote. Reasons for this may be as follows:

- Getting a bill to the floor can take several years.[32] During this time major actors on both sides, the lobby groups and the committee, may be substituted for others or change their opinion.

- There is high uncertainty as to whether the proposal will make it to a legislative vote at all. Also, it is oftentimes not obvious which role different committee members play in the process of crafting a bill. This can lead to differences in the perceptions of the lobby and the legislator with regard to the influence exerted by a certain legislator. In contrast, at least in the case of roll-call votes, the contribution of each legislator to the passage of the bill can be readily observed.

- The interaction between the interest groups and the policy maker oftentimes does not involve explicit discussion of a quid pro quo arrangement: rather influence is bought by subtle exchange in which both sides recognize what is expected of them. This is, e.g., suggested by Grossman and Helpman (2001). Explicit discussions are avoided because the policy maker may be concerned that influence-peddling involves high political costs if the deals become known to voters. Also, an explicit

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[32]See e.g. Baumgartner et al. (2009).

offer of contributions in exchange for policies might irritate politicians because they do not like to think of themselves as being for sale. Instead, the contributions the lobby is willing to pay for different proposals might be conveyed in a general discussion about the strength of the interest group's feelings about an issue and its relative preferences regarding the alternative possible outcomes. Such implicit coordination appears to be much easier to effect for a vote for or against a certain proposal than in an attempt to influence the exact formulation of the bill.

This paper emphasizes the importance of assumptions regarding the commitment and lobbying possibilities at the proposal stage as they can lead to major differences in theoretical predictions.

6.5   Different lobbying subgames

The lobbying subgame of the Groseclose and Snyder (1996) type is the simplest model that includes the central mechanics behind our results. That is, for policy proposals that are associated with payments to legislators, the agenda-setter's expected bribes as paid by the winning lobby increase with the budget of the losing lobby.

Two recent papers, Dekel et al. (2008) and Dekel et al. (2009), examine a lobbying game where the bidding process does not end at a pre-determined stage. Instead, the alternating bidding process ends when two consecutive offers go by without any change in who would win if the game ended in those rounds. In these papers, the results with respect to the total amount and the distribution of payments to legislators[33] depend on the specifics of the vote-buying model.

If the votes need to be bought via up-front payments – or if in the presence of exogenous bidding costs, binding promises can be made to the legislators whose voting behavior is observable – then for each given policy proposal, the lobby with the higher budget wins the majority at negligible cost.[34] The important point for our discussion is that in this case, the legislators' expected payments do not change with the strength of the losing lobby.

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[33]Dekel et al. (2008) investigates general elections, so it is the voters that receive bribes. It is possible to reinterpret their model as a legislative lobbying model for a given proposal. In this paper, we use this interpretation and, hence, speak of legislators rather than voters.

[34]In Dekel et al. (2009), it is assumed that legislators care about their voting behavior, not the outcome of the vote. In this case, the winning lobby may have to make compensatory payments to offset a preference disadvantage.

This is different if payments to legislators cannot be made contingent on their votes but promises of a lobby are instead fulfilled only if this lobby wins.[35] Then the winning lobby's total payments to the legislators are slightly higher than the losing lobby's budget. However, only legislators with preferences close to the median may obtain payments, and the distribution of bribes across the legislators is not uniquely determined.[36] Hence, the total amount of payments by the winner increases with the losing lobby's budget. In principle, this makes it possible to obtain results similar to those obtained using our basic model if the agenda-setter has a sufficiently high probability of being among the bribed.

Hence, the discussion suggests that this paper's results are not specific to the Groseclose and Snyder (1996)-type lobbying subgame but can also be obtained with other lobbying subgames. As a consequence, our main results are not necessarily associated with particular features of the Groseclose and Snyder (1996) model, such as super-majorities or very high payments to the legislators. For example, as argued above, our results may be obtained with a specification of the lobbying subgame as in Dekel et al. (2009), where a lobby's promises are only fulfilled if this lobby wins. Then, the winning lobby always buys a minimal winning majority of legislative votes. Moreover, total payments to the legislators by the winning lobby are lower by a factor of two than in the basic model presented in this paper.[37]

6.6   Second-mover disadvantage

In the literature, the asymmetry in the bidding process of the Groseclose and Snyder (1996) model is interpreted as giving the second-mover a substantial advantage. As the present paper highlights, this advantage may turn into a second-mover disadvantage when the policy proposal is endogenous. The second-mover disadvantage can be interpreted in two ways.

First, within our model, the second mover has a disadvantage if it would be better off when moving first. Such a situation occurs in the basic model if $\tau_X^I = \tau_X$ and l_Y is such

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[35]Additionally, there are no bidding costs.

[36]A similar result should be obtained when vote-contingent promises are possible and there are no bidding costs but the lobbies experience some uncertainty about their opponent's budget. Then the bidding process would be similar to an English auction.

[37]Note that our model does not necessarily involve extremely high payments of the lobbies relative to their benefit. l_i may also reflect how well the interest group solves its public good problem and thus may only reflect a small share of the Y-type population. This introduces a wedge between the interest group's budget and the corresponding social group's welfare.

that t_X^* will be implemented. Then, the second mover will be better off when moving first because – according to the analysis in Section 6.1 – the Y-type agenda-setter will be aligned with the first-mover lobby and propose t_s rather t_X^*. The reason is that when Y is the first mover, the payments associated with t_X^* will fall to a minimum and thus will not be able to compensate for the type-Y proposer's utility loss from this policy's being implemented. It follows that lobby Y will be better off because in neither situation will it have to make payments. However, when Y is the first mover, the status quo remains, whereas as a second mover, it will suffer from t_X^*.

Second, the second-mover lobby of our subgame may be better off with a more symmetric specification for the bidding process like the ones suggested by Dekel et al. (2008) and Dekel et al. (2009). As described in the previous section, there are specifications of the lobbying subgame where bribes paid in equilibrium are negligible and independent of the losing lobby's budget. In this case, an increase in the losing interest group's budget only changes the partition of the policy space in favor of this lobby; it does not increase the attractiveness of any policy proposal due to higher expected bribes. In this way, when the preferences of the policy proposer are tilted towards the weaker lobby, the latter will never end up with a policy favoring its opponent relative to the status quo. That is to say, this lobby will not lose relative to the status quo. As we have shown, a utility loss relative to the status quo is possible for the second mover in our model.

7   Conclusions

This paper examines the role of interest-group size on policy outcomes in a legislative lobbying model that extends the Groseclose and Snyder (1996) model via endogenously derived policy proposals.

The main insight of the paper is that the incentive of the agenda-setter to propose a favorable policy for one lobby may increase with the relative strength of the opposing lobby. As a consequence, it may be bad for a lobby seeking policy change if there is no opposition. This is consistent with recent empirical findings on lobbying and policy change and also provides another explanation as to why some interests in society are not organized.

The model offers several avenues for future research. Some interesting extensions of the

model, such as allowing for greater heterogeneity of preferences or including different lobbying subgames, have been noted in the previous section. In particular, the paper offers a framework that can be extended to study how different forms of lobbying at the proposal stage interact with vote-buying in the legislature and how this affects policy outcomes. As the model in the present paper is static, it would also be interesting to examine a dynamic version of the model where the policy chosen in the current period is the status quo in the next. This extension allows one to study which policies are stable in the long term and how this depends on the interest groups' size.

Appendix

A Example with continuous policy space

In the text, we have given an example with a discrete set of policies. There the implementable sets change in discrete steps rather than continuously in response to a change in relative interest-group size. In this section, we provide a numerical simulation that shows that the effects and intuition explained in the discrete example carry over to the continuous policy space.

As specified in Section 5.3, the utility functions are described by $u_i(t) = -(t - t_i^*)^2$, where $t_X^* = 1$ and $t_Y^* = 5$. The policy interval ranges from 1 to 5 – i.e., $\tau = [1,5]$. The status quo is $t_s = 3$. To illustrate the effect of an increase in second-mover lobby size, l_Y, we consider two scenarios with respect to the size of the legislature relative to that of the first-mover lobby, $\frac{S}{l_X}$. These scenarios reflect the two expansion paths of l_Y considered in the discrete policy space example.

We start with the scenario where S/l_X is low. For the simulation, we choose $S = 20$ and $l_X = 200$, i.e. $S/l_X = 1/10$.[38] In the figures, we depict the implementable sets, the agenda-setter's most preferred policy proposals within the implementable sets, and his bias to implement them, depending on relative interest-group size, $\frac{l_Y}{l_X}$. The function denoted by t^I is the agenda-setter's best choice within the implementable set.[39] For a given value of $\frac{l_Y}{l_X}$, the implementable set is the interval between t^I and the horizontal

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[38]For example there are 535 legislators in the 111th US-Congress. According to our assumption interest group X would then comprise 5350 members. This does not appear to be unrealistic.

[39]Note that condition 8 is satisfied for all $\frac{l_Y}{l_X} > 0.05$. This implies that $t_X^I = \min \tau_X^I$.
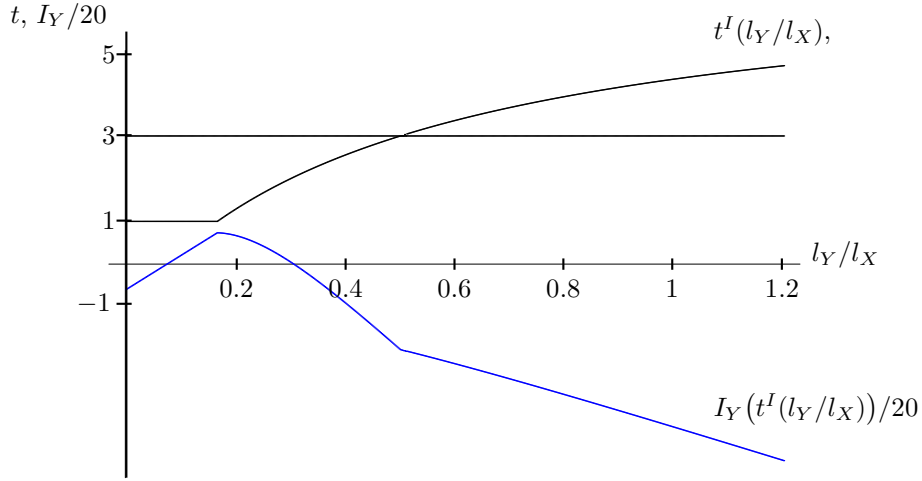
Figure 3: Implementable sets and implementation bias of the policy proposer for different relative interest-group sizes l_Y/l_X when S/l_X is low.

line at $t = 3$ which depicts the status quo. The proposer's bias to implement t^I is indicated by the blue curve $I_Y(t^I)$. Since only the sign of $I_Y(t^I)$ is of interest, the value of $I_Y(t^I)$ has been divided by 20 for illustrative purposes in Figure 3. Suppose, for example, that the relative size of Y is $\frac{l_Y}{l_X} = 0.25$. Then the implementable set is $\tau^I = [1.7, 3)$, and within τ^I, the proposer most prefers policy $t^I(0.25) = 1.7$. We also observe that $I_Y(1.7) > 0$. Thus, the policy proposer will introduce $t = 1.7$, which will finally be accepted by the legislative vote. As discussed in the text, we can also observe that if the second-mover lobby is sufficiently small – in this example if $l_Y/l_X < 0.08$ – all policies favored by X will be implementable but the associated payments for the agenda-setter will be too low to make the proposal $t^I = 1$ attractive. Furthermore, Figure 3 illustrates that in the particular scenario with $S < l_X$, the implementation bias is negative if $\emptyset \neq \tau_Y^I \subsetneq \tau_Y$. For example, if both lobbies are of equal size, the implementable set will be $\tau^I = (3, 4.5]$. But instead of $t^I = 4.5$, the proposer rather introduces the non-implementable policy $t = 5$ because this proposal is associated with high bribes.[40]

Now we consider the case where S is large relative to l_X. In particular, we use $S/l_X = 2.5$.[41] In Figure 4, we see that the implementation bias is positive only if $t^I > t_s$ (i.e, if $\tau_Y^I \neq \emptyset$). In particular, $I(t^I) > 0$ if the relative interest-group size is approximately between 0.66 and 1.22. If Y grows larger, we will observe that the implementation

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[40]This is similar to the exemplary expansion path for $S < l_X$ in the example with the discrete policy space.

[41]More precisely, we use the values $S = 100$ and $l_X = 40$. In a footnote concerning the discrete-policy-space example in Section 5.3, we have explained why $S > l_X$ may be a realistic scenario.
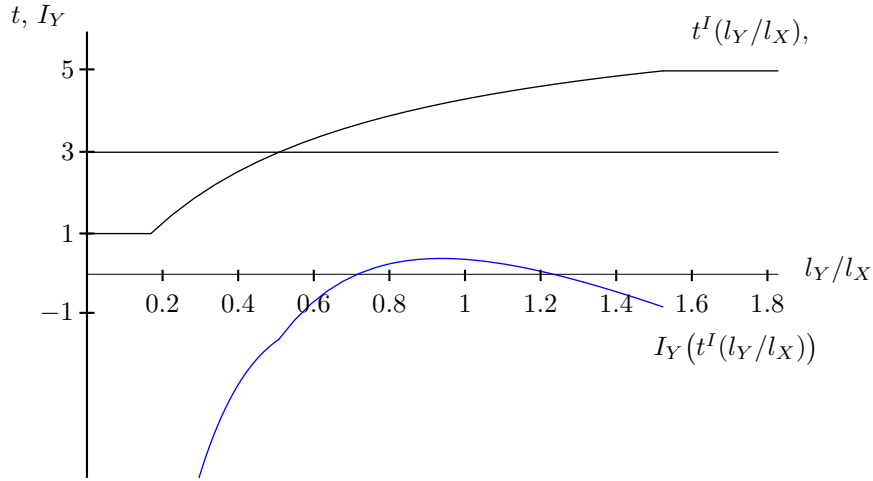
Figure 4: Implementable sets and implementation bias of the policy proposer for different relative interest-group sizes l_Y/l_X when S/l_X is high.

bias becomes negative. Then, the payments associated with the non-implementable policy $t = 5$ have grown sufficiently faster than the utility associated with the best implementable pro-Y policy. Hence, we observe status-quo persistence as a result of an increase in the relative size of lobby Y. Only if l_Y/l_X exceeds 1.5, the entire set of pro-Y policies will be implementable and the agenda-setter will introduce the ideal pro-Y policy.

A.1 Example with endogenous interest groups

In this section, we give an example where the organization of the politically moderate into interest groups leads to a less desirable policy outcome for them. To make the point as simple as possible, we use the example with the discrete set of policies and introduce a third type of individuals Z with bliss point $t_Z^* = 3$. The distribution of types is given by the measure $P(j) = l_j$, $j \in \{X, Y, Z\}$. Table 2 gives the different types' utility gains, the lobbies' budgets, and the values for $F(t)$, $b(t)$, and $I_Y(t)$, associated with different policies t.

Individuals of type Z are entirely happy with the status quo. Hence, in case of a pro-Y policy proposal, they will join the X-types and organize in interest group $\hat{X}$ to lobby against the proposal. With respect to a pro-X proposal, they will support interest group $\hat{Y}$. As we can see in the table, this makes it less likely that the pro-X proposal is implementable – i.e., that $F(t) \geq 0$. But if it is implementable, the payments associated with the pro-X proposal increase and thus the policy proposer's implementation bias

t	1	2	3	4	5
$v_Z(t)$	-4	-1	0	-1	-4
$v_Y(t)$	-12	-5	0	3	4
$v_X(t)$	4	3	0	-5	-12
$B_{\hat{X}}$	$4l_X$	$3l_X$	0	$-5l_X - l_Z$	$-12l_X - 4l_Z$
$B_{\hat{Y}}$	$-4(3l_Y + l_Z)$	$-5l_Y - l_Z$	0	$3l_Y$	$4l_Y$
$F(t)$	$4(l_X - 6l_Y - 2l_Z)$	$3l_X - 10l_Y - 2l_Z$	0	$-5l_X + 6l_Y - l_Z$	$4(-3l_X + 2l_Y - 2l_Z)$
$b(t)$	$8\left(3\frac{l_Y}{S} + \frac{l_Z}{S}\right)$	$10\frac{l_Y}{S} + 2\frac{l_Z}{S}$	0	$6\frac{l_Y}{S}$	$8\frac{l_Y}{S}$
$I_Y(t)$	$4(4\frac{l_Y}{S} + 2\frac{l_Z}{S} - 3)$	$2\frac{l_Y + l_Z}{S} - 5$	$-$	$3 - 8\frac{l_Y}{S}$	0

Table 2: Example with endogenous interest groups.

increases.

Now consider the following situation: $\frac{l_Y}{l_X} = \frac{1}{4}$, $\frac{l_Y}{S} = \frac{9}{4}$, $\frac{l_Z}{S} = 1$. Then policy $t = 2$ is implementable as $F(2) = \frac{5}{18}l_X > 0$. The policy proposer's implementation bias is $I_Y(2) = \frac{1}{2} > 0$. Consequently, there will be a policy change to $t = 2$.[42] However, if the politically moderate Z-types do not organize – i.e., $l_Z = 0$ – we will obtain $F(2) = \frac{1}{2}l_X > 0$ and $I_Y(2) = -\frac{1}{2}$. Therefore, when the Z-types remain passive, their most preferred policy, the status quo prevails. In contrast, if they organize, they will end up with the less favorable policy $t = 2$. Note that the Z-types' lobbying can also lead to the even worse outcome $t = 1$. This occurs, for example, if $\frac{l_Y}{l_X} = \frac{1}{10}$, $\frac{l_Y}{S} = \frac{2}{3}$, and $\frac{l_Z}{S} = \frac{1}{5}$.

B Proofs

B.1 Proof of Proposition 2

As stated in the text, the function $F(t)$ is strictly concave and possesses a root at t_s. From the concavity, we infer that $F(t)$ has at most two roots in τ. The conditions in Proposition 2 – i.e., the value of $F'(t_s)$ and whether $F(t_Y^*) \geq 0$ or $F(t_X^*) \geq 0$ – indicate whether the second root of $F(t)$ is greater or smaller than t_s, respectively whether it is an element of τ. Consider the case where $F'(t_s) > 0$. $F'(t_s) > 0$ indicates that the second root of $F(t)$ is larger than t_s and, consequently, the set of policies for which

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[42]Note that $t = 1$ is not implementable in the given situation.

$F(t) \geq 0$ is a subset of τ_Y. If $F(t_Y^*) \geq 0$ is also satisfied, the second root of $F(t)$ will not be an element of τ. This implies that $F(t) \geq 0$ for all $t \in \tau_Y$. If $F(t_Y^*) \geq 0$ does not hold, the second root will be an element of τ_Y. Denote this root by $\hat{t}_Y$. Then, $F(t) \geq 0$ for all $t_s < t \leq \hat{t}_Y$ and $F(t) < 0$ for all $\hat{t}_Y < t \leq t_Y^*$. The same reasoning applies for the case $F'(t_s) < 0$ and the condition $F(t_X^*) \geq 0$. In the special case that $F(t)$ reaches its maximum at t_s, both implementable sets τ_Y^I and τ_X^I are empty. Consequently, the status quo will remain in place. $\qquad\square$

B.2   Proof of Proposition 4

(i) An increase in the size of lobby Y affects the agenda-setter's utility from proposing an implementable pro-Y policy as follows:

$$\frac{dV_Y(t_Y^I)}{dl_Y} = \frac{dv_Y(t_Y^I)}{dt_Y^I}\frac{dt_Y^I}{dl_Y}.$$

According to Proposition 2 and Lemma 3, $t_Y^I = \max\tau_Y^I = \hat{t}_Y$.[43] Hence, the change in t_Y^I due to an increase in l_Y corresponds to

$$\frac{dt_Y^I}{dl_Y} = -\frac{\left.\frac{\partial F(t)}{\partial l_Y}\right|_{t=t_Y^I}}{\left.\frac{\partial F(t)}{\partial t}\right|_{t=t_Y^I}} = -\frac{v_Y(t_Y^I)}{\left.\frac{\partial F(t)}{\partial t}\right|_{t=t_Y^I}}.$$

The proof of Proposition 2 gives us $\left.\frac{\partial F(t)}{\partial t}\right|_{t=t_Y^I} < 0$. As a consequence, $\frac{dt_Y^I}{dl_Y} > 0$. Now it follows directly that $\frac{dV_Y(t_Y^I)}{dl_Y} > 0$.

With respect to an increase in l_X, the proposer's utility from introducing an implementable policy favoring Y changes according to

$$\frac{dV_Y(t_Y^I)}{dl_X} = \frac{dv_Y(t_Y^I)}{dt_Y^I}\frac{dt_Y^I}{dl_X}.$$

Using the implicit function theorem, we obtain

$$\frac{dt_Y^I}{dl_X} = -\frac{\left.\frac{\partial F(t)}{\partial l_X}\right|_{t=t_Y^I}}{\left.\frac{\partial F(t)}{\partial t}\right|_{t=t_Y^I}} = -\frac{v_X(t_Y^I)}{\left.\frac{\partial F(t)}{\partial t}\right|_{t=t_Y^I}}.$$

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[43]Recall that $\hat{t}_Y$ is defined by $F(\hat{t}_Y) = 0$ and $\hat{t}_Y \neq t_s$.

As $v_X(t_Y^I) < 0$ and by the same line of argument as above $\left.\frac{\partial F(t)}{\partial t}\right|_{t=t_Y^I} < 0$, it follows that $\frac{dt_Y^I}{dl_X} < 0$. Consequently, $\frac{dV_Y(t_Y^I)}{dl_X} < 0$.

(ii) $V_Y(t_Y^*)$ can be written as $V_Y(t_Y^*) = b(t_Y^*) = \frac{2l_Y}{S} v_Y(t_Y^*)$. Hence, we obtain $\frac{dV_Y(t_Y^{-I})}{dl_Y} = \frac{2}{S} v_Y(t_Y^*) > 0$.

Concerning changes in l_X, we have $\frac{dV_Y(t_Y^*)}{dl_X} = \frac{db(t_Y^*)}{dl_X} = 0$.

(iii) Suppose (8) holds. According to (7), the utility from proposing an implementable pro-X policy is $V_Y(t_X^I) = v_Y(t_X^I)\left[1 - \frac{2l_Y}{S}\right]$. The difference between the cases (a) and (b) is whether t_X^I changes in response to a marginal increase in the size of one of the interest groups.

(a) As $F(t_X^*) > 0$, $t_X^I = t_X^*$ is not affected by a marginal change in the size of either lobby. Thus, we obtain

$$\frac{dV_Y(t_X^I)}{dl_Y} = -\frac{2}{S} v_Y(t_X^*) > 0$$

and

$$\frac{dV_Y(t_X^I)}{dl_X} = 0.$$

(b) If $\emptyset \neq \tau_X^I \subsetneq \tau_X$, then t_X^I declines if l_Y becomes larger and it increases in response to an increase in l_X.

First consider the case where l_Y increases. According to the proof of Proposition 2 and Lemma 3, $t_X^I = \min \tau_X^I = \hat{t}_X$. Concerning the agenda-setter's utility from proposing an implementable policy in favor of X, we can write

$$\frac{dV_Y(t_X^I)}{dl_Y} = \frac{dv_Y(t_X^I)}{dt_X^I}\frac{dt_X^I}{dl_Y}\left[1 - \frac{2l_Y}{S}\right] - \frac{2}{S} v_Y(t_X^I). \qquad (12)$$

To determine the sign of the first summand, we need to determine the sign of

$$\frac{dt_X^I}{dl_Y} = -\frac{\left.\frac{\partial F(t)}{\partial l_Y}\right|_{t=t_X^I}}{\left.\frac{\partial F(t)}{\partial t}\right|_{t=t_X^I}} = -\frac{v_Y(t_X^I)}{\left.\frac{\partial F(t)}{\partial t}\right|_{t=t_X^I}}. \qquad (13)$$

We infer from the proof of Proposition 2 that $\left.\frac{\partial F(t)}{\partial t}\right|_{t=t_X^I} > 0$. Consequently, $\frac{dt_X^I}{dl_Y} > 0$. As (8) is satisfied, $1 - \frac{2l_Y}{S} < 0$. Furthermore, we know that

$\frac{dv_Y(t_X^I)}{dt_X^I} > 0$. Taken altogether, the first summand in (12) is negative. Since $\frac{2}{S} v_Y(t_X^I) < 0$, the sign of $\frac{dV_Y(t_X^I)}{dl_Y}$ depends on the particular size of the summands and cannot be determined unambiguously.

Concerning the change in utility from an increase in l_X, we obtain

$$\frac{dV_Y(t_X^I)}{dl_X} = \frac{\partial v_Y(t_X^I)}{\partial t_X^I} \frac{dt_X^I}{dl_X} \left[1 - \frac{2\,l_Y}{S} \right], \tag{14}$$

where

$$\frac{dt_X^I}{dl_X} = - \frac{\left. \frac{\partial F(t)}{\partial l_X} \right|_{t=t_X^I}}{\left. \frac{\partial F(t)}{\partial t} \right|_{t=t_X^I}} = - \frac{v_X(t_X^I)}{\left. \frac{\partial F(t)}{\partial t} \right|_{t=t_X^I}} < 0. \tag{15}$$

It follows directly that $\frac{dV_Y(t_X^I)}{dl_X} > 0$. $\qquad \square$

B.3   Extension of Proposition 4 and Proof

Extension of Proposition 4

Suppose condition (8) is satisfied. If $F(t_X^*) = 0$, then

(i) $\frac{dV_Y(t_X^I)}{dl_Y} \gtreqless 0$ *when l_Y marginally increases.*

(ii) $V_Y(t_X^I)$ *decreases when l_Y marginally decreases.*

(iii) $\frac{dV_Y(t_X^I)}{dl_X} = 0$ *when l_X marginally increases.*

(iv) $V_Y(t_X^I)$ *increases when l_X marginally decreases.*

Proof. Let us first consider (i) and (ii) – i.e., changes in l_Y. We write the resulting change in $V_Y(t_X)$ according to (12) as

$$\frac{dV_Y(t_X^I)}{dl_Y} = \frac{dv_Y(t_X^I)}{dt_X^I} \frac{dt_X^I}{dl_Y} \left[1 - \frac{2\,l_Y}{S} \right] - \frac{2}{S} v_Y(t_X^I).$$

The only difference to the case where $F(t_X^*) \neq 0$ is that t_X^I is not differentiable with respect to interest-group size at the point t_X^*. Consequently, depending on whether we are interested in the effect of an increase or a decrease of l_Y, we insert the right-hand derivative, $\left(\frac{dt_X^I}{dl_Y} \right)^+$, or the left-hand derivative, $\left(\frac{dt_X^I}{dl_Y} \right)^-$, into (12). The right-hand derivative is given by (13), whereas the left-hand derivative is zero. In this

way, the result with the left-hand derivative, reflecting a decrease of l_Y, is identical to the one regarding $\frac{dV_Y(t_X^I)}{dl_Y}$ in Proposition 4 (iii) (a). The result when using the right-hand derivative, depicting an increase of l_Y, corresponds to that regarding $\frac{dV_Y(t_X^I)}{dl_Y}$ in Proposition 4 (iii) (b). This verifies items (i) and (ii) of the extension of Proposition 4.

The line of argument with regard to the cases (iii) and (iv) is similar. Now the right-hand derivative is $\left(\frac{dt_X^I}{dl_X}\right)^+ = 0$ and the left-hand derivative, $\left(\frac{dt_X^I}{dl_X}\right)^-$, is given by (15). Thus, the effect of a marginal increase of l_X on $V_Y(t_X^I)$ is zero as one can infer from inserting the right-hand derivative into (14). With respect to a marginal decrease of l_X, we insert the left-hand derivative into (14) and obtain the same result regarding $\frac{dV_Y(t_X^I)}{dl_X}$ as in Proposition 4 (iii) (b). This completes the proof. $\qquad\square$

B.4 Proof of Proposition 6

Suppose condition (8) is satisfied and $-v_Y(t_X^I) > v_Y(t_Y^*)$. If $\tau_X^I \neq \emptyset$, we can write the implementation bias as

$$I(t_X^I) = v_Y(t_X^I) - \frac{2\,l_Y}{S}(v_Y(t_X^I) + v_Y(t_Y^*)).$$

(i) If $\tau_X^I = \tau_X$ and $F(t_X^*) > 0$, t_X^I remains at t_X^* in response to changes in interest-group size. Since $v_Y(t_X^*) + v_Y(t_Y^*) < 0$ by assumption, we obtain

$$\frac{dI(t_X^*)}{dl_Y} = -\frac{2}{S}(v_Y(t_X^I) + v_Y(t_Y^*)) > 0.$$

The claim that $\frac{dI(t_X^*)}{dl_X} = 0$ follows directly from Proposition 4.

(ii) If $\emptyset \neq \tau_X^I \subsetneq \tau_X$, the derivative of $I(t_X^I)$ with respect to l_Y reads

$$\frac{dI(t_X^I)}{dl_Y} = \underbrace{\frac{dv_Y(t_X^I)}{dt_X^I}\frac{dt_X^I}{dl_Y}\left[1 - \frac{2\,l_Y}{S}\right]}_{<0} - \underbrace{\frac{2}{S}\left(v_Y(t_X^I) + v_Y(t_Y^*)\right)}_{<0}. \qquad (16)$$

The first term reflects that now t_X^I increases with l_Y. This effect reduces $I_Y(t_X^I)$ as $1 - \frac{2\,l_Y}{S} < 0$ implied by condition (8). The second term (after the minus sign) is also negative since $v_Y(t_X^I) + v_Y(t_Y^*) < 0$. Consequently, the aggregate effect is ambiguous.

The second statement, $\frac{dI(t_X^I)}{dl_X} > 0$, can be directly deduced from Proposition 4. $\qquad\square$

B.5 Extension of Proposition 6 and Proof

Extension of Proposition 6

Suppose condition (8) is satisfied and $-v_Y(t_X^I) > v_Y(t_Y^*)$. If $F(t_X^*) = 0$, then

(i) $\frac{dI_Y(t_X^I)}{dl_Y} \gtreqless 0$ *when l_Y marginally increases.*

(ii) $I_Y(t_X^I)$ *decreases when l_Y marginally decreases.*

(iii) $\frac{dI_Y(t_X^I)}{dl_X} = 0$ *when l_X marginally increases.*

(iv) $I_Y(t_X^I)$ *increases when l_X marginally decreases.*

Proof. The proof is similar to the proof of the extension of Proposition 4. We obtain the result in (i) by inserting the right-hand derivative, $\left(\frac{dt_X^I}{dl_Y}\right)^+$ (given by (13)), into (16). The result in (ii) follows from inserting the left-hand derivative, $\left(\frac{dt_X^I}{dl_Y}\right)^- (= 0)$, into (16). Items (iii) and (iv) follow directly from the items (iii) and (iv) of the extension of Proposition 4. $\square$

B.6 Proof of Lemma 5

(i) For $t \in \tau_X^I$, $V_X(t) = v_X(t) - \frac{2\,l_Y}{S}v_Y(t)$.
The derivative with respect to t reads $\frac{dV_X(t)}{dt} = \frac{dv_X(t)}{dt} - \frac{2\,l_Y}{S}\frac{dv_Y(t)}{dt} < 0$. Thus, the smallest $t \in \tau_X^I$ maximizes $V_X(t)$.

(ii) For $t \in \tau_Y^{\neg I}$, $V_X(t) = b(t) = \frac{2\,l_Y}{S}v_Y(t)$. We obtain for the derivative with respect to t $\frac{dV_X(t)}{dt} = \frac{2\,l_Y}{S}\frac{dv_Y(t)}{dt} > 0$. Consequently, the largest $t \in \tau_Y^{\neg I}$ maximizes $V_X(t)$.

(iii) For $t \in \tau_Y^{\neg I}$, $V_X(t) = v_X(t)$.Since $\frac{dV_X(t)}{dt} = \frac{dv_X(t)}{dt} < 0$, the smallest $t \in \tau_Y^I$ maximizes $V_X(t)$. $\square$

B.7 Proof of Proposition 8

(i) For t_Y^I, the X-type proposer's implementation bias writes

$$I_X(t_Y^I) = v_X(t_Y^I) - \frac{2\,l_Y}{S}v_Y(t_Y^*) < 0.$$

Note that the first term is negative. Hence the implementation bias is unambiguously negative.

(ii) For t_X^I, we obtain

$$I_X(t_X^I) = v_X(t_X^I) - \frac{2\,l_Y}{S}[v_Y(t_X^I) + v_Y(t_Y^*)]. \tag{17}$$

When $-v_Y(t_X^I) \geq v_Y(t_Y^*)$, the second term is either negative or zero, and thus $I_X(t_Y^I) > 0$.

(iii) It follows directly from inspection of (17) that $I_X(t_Y^I)$ might be positive, zero, or negative, if $-v_Y(t_X^I) < v_Y(t_Y^*)$. The derivative of the implementation bias with respect to l_X reads

$$\frac{dI_X(t_Y^I)}{dl_X} = \left[\frac{dv_X(t_X^I)}{dt_X^I} - \frac{2\,l_Y}{S}\frac{dv_Y(t_X^I)}{dt_X^I}\right]\frac{d\,t_X^I}{d\,l_X}\ .$$

We know from the proof of Proposition 4 and its extension that $\frac{dt_X^I}{dl_X} \leq 0$. Note that $\frac{dt_X^I}{dl_X} = 0$ if $t_X^I = t_X^*$. As the term in brackets is negative, we obtain $\frac{dI_X(t_Y^I)}{dl_X} \geq 0$. Taking the derivative with respect to l_Y yields

$$\frac{dI_X(t_Y^I)}{dl_Y} = \left[\frac{dv_X(t_X^I)}{dt_X^I} - \frac{2\,l_Y}{S}\frac{dv_Y(t_X^I)}{dt_X^I}\right]\frac{dt_X^I}{dl_Y} - \frac{2}{S}[v_Y(t_X^I) + v_Y(t_Y^*)].$$

Again we infer from the proof of Proposition 4 and its extension that $\frac{dt_X^I}{dl_Y} \geq 0$. Consequently, the first term is either negative or zero. If $-v_Y(t_X^I) < v_Y(t_Y^*)$, the second term is positive and, thus, $\frac{dI_X(t_Y^I)}{dl_Y} < 0$.

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