Why Legislatures Elect and Empower Leaders

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September 3, 2014

Abstract

Theories of representation posit that the legislature is a body of equals, yet legislatures everywhere are organized into hierarchies and give their leaders powers to govern the body. This paper develops a theoretical argument that time constraints create the need to choose a legislative calendar—the set of bills brought to the floor—and that the calendar-setting process offers the legislature an opportunity and incentive to develop a hierarchy that benefits a majority of its members. Using a formal model where a busy legislature chooses between two calendar-setting processes, an egalitarian process without a leader and a centralized process where a leader proposes the calendar, I show that the legislature will vote to delegate the calendar-setting power to a single leader rather than set the calendar collectively. I also consider the impact of legislative efficiency and the ability of legislators to make binding commitments on the election of leaders.

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The U.S. House of Representatives was designed to be a fundamentally egalitarian legislature; each legislator holds equal power in the chamber and no member's vote carries more weight than any other member's vote. However, the members of the House organized themselves into a hierarchical body with an unequal distribution of power. The Speaker of House presides over the chamber, and with the Rules Committee wields nearly complete power over the legislative calendar. Committee chairmen have similar agenda control over their committees, and party leaders also influence some power over their caucuses. We observe similar hierarchies in most other legislatures and other collective decision-making bodies, such as committees, commissions and boards. Why do the members of egalitarian legislatures elect some of their members as leaders and give these leaders inegalitarian powers over the chamber?

The legislative studies literature primarily explains legislative hierarchies and leaders as the product of parties, which elect leaders to coordinate party efforts to the benefit of their members (Cox and McCubbins 2005, 2007; Aldrich and Rohde 2001). However, leadership does not require legislative parties, and non-partisan bodies often have leaders and hierarchies as well. For example, the House elected and empowered a Speaker prior to the development of party leadership and partisan organization (Jenkins and Stewart 2013).[1] Furthermore, the legislative parties literature generally takes the existence of leadership positions as exogenous, but legislatures choose to organize themselves endogenously. Recent work has offered some models for the endogenous creation of leadership positions and legislative hierarchies. Diermeier and Vlaicu (2011) unites the different views of legislative parties offered by Cox and McCubbins (2005, 2007), Krehbiel (1998), and Aldrich and Rohde (2001) with a model of the endogenous formation of political parties through the allocation of proposal power. Diermeier, Prato, and Vlaicu (2014) extends this model to explain the endogenous choice of legislative procedure by altering legislators' recognition probabilities for offering policy proposals. Čopič and Katz (2014) examines the emergence of parties and legislative leaders through a "scheduling auction" bargaining model where a designated leader chooses among budget allocations proposed by the rank-and-file.

[1] While the Constitution (Article I, Section 2) required the House of Representatives to elect a Speaker, the Constitution did not require the House to give the Speaker any real power; the House could have created a Speaker who was no more than a figurehead.

In this paper I propose a new theory for the endogenous creation of leadership positions, driven not by bargaining and the allocation of policy proposal power, but from setting the legislative calendar. Legislatures, like all complex organizations, are constrained by limited time. They face many different policy tasks, but only have time to work on a subset. Choosing the legislative calendar—the set of policy issues for the legislature to work on—is a hard problem when legislators have different policy priorities. I argue that the challenge of setting the legislative calendar for a time-limited legislative session motivates the legislators to create a leadership position—the "Speaker", and then to empower this leader to select the calendar. I develop a formal model of legislative organization and calendar setting where the legislature chooses between two different structures: an unorganized but egalitarian legislature where every legislator has equal influence over the calendar, and an organized legislature where one legislator, subject to majority approval, selects the calendar for the session.

Busy legislatures are those that are constrained in what they can accomplish by finite plenary time (Cox 2006; Adler and Wilkerson 2012), such that they face more potential policy questions and bills to work on in the session than they have time to take up on the floor. Cox (2006) argues that legislatures respond to time constraints by adopting procedures that limit members' access to the floor and prevent them from adding additional items to the agenda. Cox and McCubbins (2011) and Döring (1995) both study a large sample of modern national legislatures and show that they are all busy and have developed various mechanisms to control access to plenary time. Taylor (2012) argues that floor rights were restricted in the U.S. House in the 19th century due to expanding workloads. Overall, this literature describes how increased workloads have forced legislatures to restrict access to the floor, but it does not explain why majorities in egalitarian legislatures vote to give up control over the floor to legislative leaders. This last step, majoritarian approval (Krehbiel 1999), is key for understanding the endogenous development of leadership institutions.

The literature offers many models for understanding how individual bills or tasks are treated by legislatures, but generally does not consider legislatures as institutions that confront and select multiple tasks within a finite and constrained system. For example, Cox and McCubbins' (2005) procedural cartel theory predicts which bills a majority party will bring to the floor, but, under this model, we would expect that *all* bills that meet the specified conditions will reach the floor. Cox and McCubbins (2007, ch. 9) discusses general time constraints in legislative scheduling, but does not formally model the tradeoffs of scheduling one bill at the expense of not having the time to work on some other bill. Diermeier and Vlaicu (2011) recognizes that legislating occupies limited plenary time and addresses this by assigning an opportunity cost to each proposal made in the legislative bargaining model. The opportunity cost in this model incentivizes legislators to come to an agreement quickly, but the focus on a single policy issue ignores that choosing to bargain on one issue has a tangible effect on the time remaining for the legislature to bargain on other issues. In contrast to these works, I develop a theory of legislative organization and agenda setting based on limited time and explicit tradeoffs from choosing between bills through the calendar-setting process. This theory more closely approximates the actual behavior of legislatures, which convene to address multiple policy questions during a legislative session rather than meet to accomplish a single task.

Calendar setting is the process of selecting the policies to be worked on in a finite legislative session (Patty and Penn 2008). It is a special case of agenda-setting procedures in which the choices available to the agenda setter are constrained not just by institutional procedures and rules but also by finite plenary time. Generally, we think of the agenda-setting power as the power to control and limit access to the floor. The agenda setter controls which bills get voted on and which amendments are allowed and offered, and this power is generally focused on a single bill at a time (Cox and McCubbins 2005; Diermeier and Vlaicu 2011). In contrast, the calendar-setting power is the power to choose the complete set of bills that can go to the floor given time constraints. While these two powers are closely related, they can be decoupled into two separate powers and can even be split between different legislators. First, the calendar setter chooses which issues will be taken up by the floor, taking into account time constraints and any party or institutional rules, such as the Hastert Rule (support by a majority of the majority party). Second, an agenda setter controls debate over each individual bill when it is on the floor, choosing which legislators are recognized to offer amendments. When a time constraint does not bind the legislature, calendar setting is unimportant because all bills that meet the other floor criteria can by addressed. However, when the legislature faces a time constraint, calendar setting is critical because the legislature must prioritize.

The calendar-setting model developed in this paper considers a legislature in a non-institutionalized setting. There are no exogenous parties or party leaders, committees, or other institutions which may shape collective decision making other than each legislator's preferences. While this setting somewhat limits the applicability of the model to understanding the modern Congress, it also highlights an important aspect of leadership and agenda setting. Leadership and agenda-setting powers are not dependent on or the product of committee systems, political parties, and other institutions; calendar setting is fundamental to the efficient operation of a legislature regardless of its institutional structures.

In the model, the legislature must solve three collective choice problems. First, the legislature much choose whether to organize or to proceed to a legislative session without any centralized control. Second, if it chooses to organize, the legislature must choose the calendar, the subset of issues that it will address given its time constraint. The legislature faces a social choice problem in determining the calendar, as different legislators have different priorities. Some legislators will want to work on a specific policy, expecting that the outcome of working on that policy will be beneficial to them, while other legislators will want to prevent work on that policy, since the outcome will be worse for them. Consequently, the mechanism used to choose the set of policies that will be worked on (and the set of policies that will not be worked on) in the session is highly important to each legislator. Third, regardless of whether it organizes or not, for each issue the legislature takes up during the session it must choose the policy outcome. The legislature's process of selecting a calendar is also a process for selecting a leader ("Speaker"). When the legislature chooses to organize, calendars are proposed by a selected legislator and adopted by majority rule. When a calendar is adopted, the proposer (calendar setter) is recognized as the Speaker. The only job of the Speaker is to select the calendar; she has no other powers or control over the legislative process.

The paper proceeds as follows. First I introduce the base model. Second, I develop existence results for the special case in which all legislators have one-dimensional preferences over all policy issues and I characterize equilibrium calendars. Third, I introduce a variant of the model with repeat play, and consider the effects of two extensions of the model: legislative efficiency and legislative commitment. Finally, I conclude with a short discussion of the implications of the model for legislative leadership and organization.

The Model

Assume a majority-rule legislature with $N = 2k + 1$ members, where k is a positive integer. Let $\mathcal{N}$ denote the set of legislators.

The legislature faces a set of size S one-dimensional separable policy issues on which it can legislate. Let $\mathcal{S}$ denote the set of policies, numbered from 1 to S, $\mathcal{S} = \{1, 2, \ldots, S-1, S\}$. Each policy has an existing status quo point $q_s \in \mathbb{R}$. Let $Q \in \mathbb{R}^S$ denote the set of status quo points. The assumption of separable one-dimensional policy issues is common in the legislative institutions literature (Austen-Smith and Banks 2005; Krehbiel 1998; Patty and Penn 2008). This assumption can be thought of as the legislative process "division-of-the-question," in which bills spanning multiple policy domains are divided into separate bills (Patty and Penn 2008).

For each issue dimension s, legislator i has an ideal point $I_{is} \in \mathbb{R}$. The preferences of legislator i over policy outcome γ_s on issue s is represented by the utility function:

$$u(I_{is}, \gamma_s) = v(|I_{is} - \gamma_s|) \tag{1}$$

where $v(\cdot)$ is symmetric, single peaked, strictly decreasing from 0, $v(0) = 0$, and $v(x) < 0$ for all $x \neq 0$.

The preferences of legislator i over the set of policy outcomes on all policy dimensions in $\mathcal{S}$ is the sum of the of the utility from each individual policy outcome. Let Γ denote the set of policy outcomes.

$$U(I_i, \Gamma) = \sum_{s \in S} u(I_{is}, \gamma_s) \tag{2}$$

The legislature is constrained by finite plenary time such that it cannot address every policy issue in $\mathcal{S}$. Assume that addressing each issue occupies one period of plenary time. Let T be the number of periods of plenary time, where T is a positive integer, $0 < T < S$.

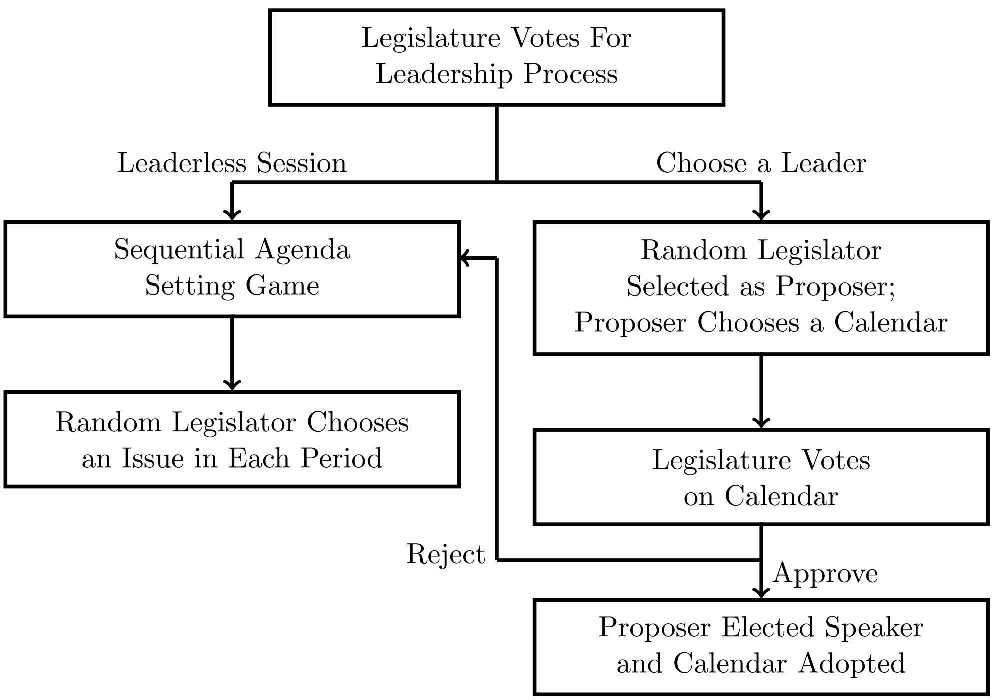
Define a calendar, C, as a subset of S of size T. The order of elements in C is irrelevant.

Therefore, there are $\binom{S}{T}$ unique calendars in $\mathcal{C}$, the set of all feasible calendars. For every calendar C, let C' represent the set of policies not taken up by the legislature when calendar C is selected: $C' \equiv \{s \in S | s \notin C\}$.

Assume that the ideal points of each legislator, the status quo points for each policy issue, and the amount of plenary time are all common knowledge. Each legislator knows their own preferences and those of the other legislators, and therefore they can calculate the utility of each legislator from any set of policy outcomes Γ.

Play of the Game

Figure 1: The Legislative Session



The game proceeds in four stages. Figure 1 outlines the play of the game. In the first stage, the legislature votes by majority rule to either (a) proceed with a leaderless session or (b) elect a leader for the session. If the legislature votes for a leaderless session, then in the second stage the legislature proceeds to the Sequential Agenda Game, in which a random legislator is selected in each time period to choose the issue to be worked on in that period. In each time period, the legislature then works on the selected issue, as in stage four. If the legislature chooses to elect a leader for the session, they proceed to the Calendar-Setting Game. In this case, in the second stage, one legislator is randomly selected to propose a calendar for the legislative session, and the proposer chooses her calendar. The calendar must contain T different policies from $\mathcal{S}$. In the third stage, the legislature votes using majority rule on whether to adopt the proposed calendar. If the vote for the calendar passes, the proposer becomes the "Speaker," and, in each time period, the Speaker brings to the floor one of the items on her calendar to be worked on. The Speaker is required to commit to her passed calendar and must bring every policy on it to the floor.[2] In this model, calendar-setting is a one-shot game; if the proposer's calendar is rejected, the legislature loses the opportunity to organize and reverts to a leaderless session in which the calendar is determined using the sequential agenda game.[3] In the fourth stage, the legislature bargains over each policy issue on the calendar. Payoffs for each legislator are then determined based on the policy outcomes for the policies on the calendar, and the status quo points for the policies not on the calendar.

The solution concept of the game is subgame-perfect Nash equilibrium. Equilibria are characterized by a strategy profile for legislator i, $\sigma_i = (v_{1i}, \vec{p}_i, C_i, \vec{v}_{2i}, \vec{B}_i)$. v_{1i} is legislator i's vote in the first stage, where his choices are $\{Leaderless, Leader\}$. $\vec{p}_i$ is a vector where each entry corresponds to the issue that legislator i would choose to work on if selected as the proposer at every possible node in the sequential agenda game. C_i is the calendar proposed by legislator i if she is selected in the first stage of the calendar-setting game. $\vec{v}_{2i}$ is a vector of length $|\mathcal{C}|$ where each item v_{2i}^C is an action from the set $\{Yes, No\}$ corresponding to legislator i's vote choice if calendar C is proposed by the calendar setter in the first stage. $\vec{B}_i$ specifies legislator i's voting behavior during the bargaining stage. Legislator i votes "Yes" on any proposal γ_s on issue s if $u(I_{is}, \gamma_s) \geq u(I_{is}, q_s)$, and votes "No" if $u(I_{is}, \gamma_s) < u(I_{is}, q_s)$.

[2]Below, I consider alternatives in which the Speaker cannot credibly commit to a calendar or to carrying out the complete calendar.

[3]Below, I consider an alternate model in which calendar setting is a repeated game.

Bargaining Over Policies

The outcomes of the final stage of the game are simple to solve. Each policy issue taken up by the legislature is debated under an open rule for one period of plenary time. Assume that one period of plenary time is sufficient for a bill to be proposed and for each legislator to offer an amendment to the bill if they desire to do so. As shown in Baron (1996), with sufficient frictionless amendment bargaining the ultimate policy outcomes will be at the ideal point of the median legislator.[4] Therefore, the outcome for every policy issue taken up by the legislature will correspond to the issue median's ideal point. Let I_{ms} denote the ideal point of the median voter on issue s. For any calendar C, the set of policy outcomes from taking up this calendar on the floor is $\Gamma_C = \{I_{mj} \, \forall j \in C\}$.

For any policy in C', the set of policies not taken up on the floor when calendar C is used, the policy outcomes are the same as the initial status quo points, $\Gamma_{C'} = \{q_j \, \forall j \in C'\}$. Bringing these sets together, the utility to legislator i of the policy outcomes stage is:

$$U_i^C = \sum_{j \in C} u(I_{ij}, I_{mj}) + \sum_{k \in C'} u(I_{ik}, q_k) \, . \tag{3}$$

Given the finite set of calendars $\mathcal{C}$ and the utility function in Equation 3, it is straightforward to calculate the utility to each legislator for every calendar in $\mathcal{C}$.

The Sequential Agenda Game

In a legislature without a leader, no single member or group of members has more power over the agenda than any other. As a result, I model the procedure of a leaderless legislature using a game in which every legislator has equal agenda power at every point where the agenda needs to be set. For each of the T time periods of the legislative session, a random legislator is selected to choose an issue from S on which the legislature will work. The proposer must select an issue to work on, even if there are not any remaining issues in which the policy change benefits him. The legislature

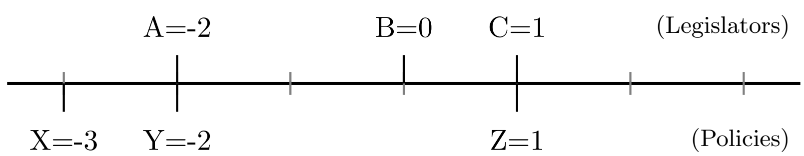
[4] If we instead assume that one period of time is not long enough for each legislator to offer an amendment, but only enough for some $x < N$ legislators to do, we can determine the distribution of outcomes and each legislators' expected utility from this set.

then spends that time period bargaining on the selected issue, resulting in a policy change from its status quo point to the ideal point of the legislative median on that issue. After working on the issue, it cannot be selected again in a future round. In the first round there are S possible issues that could be selected, in the second there are $S-1$, and in the final round there are $S-T+1$ issues from which the proposer can choose.

In any round, the legislator chosen as the proposer must select the issue to work on carefully, fully anticipating how his choice affects the choices that proposers will make in future rounds. The optimal choice is determined using backward induction, and the proposer must consider how his choice in round t affects the choices that will be made in all future rounds. Unlike the selection of a calendar by a leader, in which order does not matter, the order in which issues are selected in the sequential game is important because proposers can select issues strategically by looking ahead to what future proposers will choose in later rounds given their current selection. Thus, the equilibrium behavior of legislator i of the sequential game is given as a vector of proposals $\vec{p_i}$ which specifies the optimal proposal to be made if the legislator is the proposer at every decision node. Two examples illustrate how this game is played:

Example 1: Suppose there are three legislators, and denote them by letter: $\mathcal{N} = \{A, B, C\}$. For simplicity, let the legislators have one-dimensional ideal points, such that $I_{ij} = I_i \, \forall j \in \mathcal{S}$, and quadratic utility function $U_i = \sum_{j \in \mathcal{S}} -(I_i - \gamma_j)^2$. The legislators face a legislative session in which they can work on three different policies: $\mathcal{S} = \{X, Y, Z\}$. Figure 2 specifies the values of the ideal points and status quo points. Given the one-dimensional ideal points, B is the median legislator on all of the issues, and any issues worked on will therefore end up at 0.

Figure 2: A Simple One-Dimensional Example

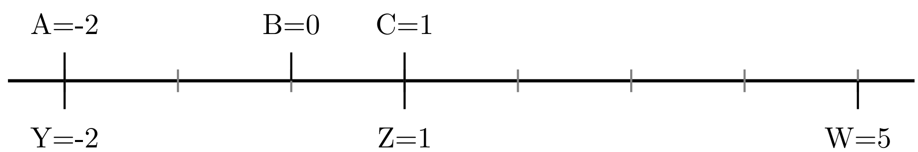


Suppose that $T = 2$. There are nine possible proposer orderings of the three legislators. If A gets to pick in round $t = 1$, then A will select issue Z. Following this, if A gets to pick in round

$t = 2$, he will next choose X. If B or C follow A in round 2, both will choose X as well. If B or C gets to pick in round 1, both will choose X in this round. In the following round, if B or C is chosen again, both would select Y as the second issue to work on. However, if X is chosen in round 2 after B or C, he will select Z. There are four cases in which calendar $\{X, Y\}$ is the result of the session (the cases where only B and C get to pick issues), and five cases in which calendar $\{X, Z\}$ is the result (all of the cases where A gets to pick at some point). The equilibrium of this sequential game is given by a set of vectors of the form $\vec{p_i} = \{j_0, j_X, j_Y, j_Z\}$, where j_0 is the issue picked in the first round, and j_X, j_Y, and j_Z are the issues picked in the second round if X, Y, or Z, respectively, are picked in the first round. $\vec{p}_A = \{Z, Z, Z, X\}$, $\vec{p}_B = \{X, Y, X, X\}$, and $\vec{p}_C = \{X, Y, X, X\}$.

Example 2: As a second example, we will use the same assumptions as above, but with issue status quo points as defined in Figure 3. Instead of issue X, the legislature now faces W, a far right policy. All of the legislators agree that W is their top priority; working on W produces the largest individual utility gain for all three legislators.

Figure 3: Example — Opportunities for Strategic Ordering



This common top priority creates opportunities for all three legislators to be strategic if they are nominated as the proposer in round 1. A's most preferred calendar is $\{W, Z\}$, and B and C's most preferred calendar is $\{W, Y\}$. Suppose that A gets to go first in round 1. If he picks W, then in round 2 there is only a $1/3$ probability that Z is picked in round 2 (it only happens if A is selected as the proposer again), and a $2/3$ chance that Y is selected. However, if he picks Z in round 1, A's most preferred calendar is guaranteed, regardless of who is selected as the proposer in round 2; in the final round, all three legislators would choose W. By the same logic, both B and C would pick Y in round 1, guaranteeing their most preferred calendar in the end. The equilibrium is therefore $\vec{p}_A = \{Z, Z, W, W\}$, $\vec{p}_B = \{Y, Y, W, W\}$, and $\vec{p}_C = \{Y, Y, W, W\}$, where the entries in $\vec{p_i}$ correspond to the first round pick and the second round picks following W, Y, and Z, respectively.

The expected utility of the sequential agenda game is simple to compute based on the equilibrium behavior of each legislator. Given each legislator's actions at each stage of the game, we can determine the probability that each issue $j \in \mathcal{S}$ will end up on the calendar at some point, ρ_j. The sum of these individual probabilities is equal to the number of time periods in the session, $\sum_{j\in\mathcal{S}} \rho_j = T$. Using these probabilities, the expected utility of the game is for legislator i is:

$$\bar{U}_i^S = \sum_{j\in\mathcal{S}} \rho_j u\left(I_{ij}, I_{mj}\right) + (1-\rho_j)u(I_{ij}, q_j) \tag{4}$$

For Example 1, $\rho_X = 1$, $\rho_Y = 4/9$, and $\rho_Z = 5/9$, resulting in expected utilities of $\bar{U}_A^S = -12$, $\bar{U}_B^S = -2.67$, and $\bar{U}_C^S = -7$.

The Calendar-Setting Game

The calendar-setting game is a one-shot game with three stages. In the first, nature randomly chooses a legislator to serve as the proposer and select a calendar. In the second, the legislature as a whole votes by majority rule to accept or reject the calendar. If accepted, each policy on the calendar is separately brought to the floor in the third stage. If rejected, the legislature fails to elect a leader and reverts to the sequential game.

Proposing and Voting On Calendars

Each legislator decides whether to vote for a proposed calendar by comparing the utility he receives from the legislature taking up the calendar on the floor to the utility he receives from a legislative session without a leader, as defined in Equation 4.

When voting on calendar C, voter i casts his vote based on the following rule:

$$v_{2i}(C) = \begin{cases} Yes & \text{if } U_i^C \geq \bar{U}_i^S \\ No & \text{if } U_i^C < \bar{U}_i^S \end{cases} \tag{5}$$

This voting rule captures the choice that the legislator is making between a legislative session under the proposed calendar and facing a legislative session without a calendar setter, in which the policies that the legislature works on are sequentially determined. Given equations 3, 4, and 5, it is possible to calculate with certainty how each legislator would vote on each calendar, and therefore which calendars would be approved by majority rule if proposed by the calendar setter.

When the selecting the calendar, the proposer knows the entire set of possible calendars, $\mathcal{C}$, and the set of calendars which would pass the legislature by majority rule, $\mathcal{M}$:

$$\mathcal{M} \subset \mathcal{C} \equiv \left\{ C \in \mathcal{C} | \#\{i \in N \,|\, U_i^C \geq \bar{U}_i^S\} > \frac{N}{2} \right\} \tag{6}$$

Given $\mathcal{C}$ and $\mathcal{M}$, how does the proposer choose a calendar to put to the legislature for approval? First, it is possible under some sets of ideal points, status quo points, and utility functions that $\mathcal{M}$ is empty. In this case, there does not exist a majority supported calendar, and therefore the calendar setter can propose any calendar in equilibrium, the legislature will reject this calendar, and the session will proceed with the sequential agenda-setting process. Assuming that $\mathcal{M}$ is non-empty, the proposer's choice is simple. The proposer compares the utility she receives from her most-preferred calendar in $\mathcal{M}$, M_i^*, to her utility from the sequential game.[5] If $U_i(M_i^*) \geq \bar{U}_i^S$, then in equilibrium the proposer will offer M_i^*, the legislature will approve it, and the calendar will be carried out during the session. Choosing any other calendar would be off the equilibrium path because either the proposer would select an inferior calendar from $\mathcal{M}$, reducing her utility from selecting the calendar, or the proposer would choose an unpassable calendar resulting in the inferior outcome of the sequential game.[6]

If $U_i(M_i^*) < \bar{U}_i^S$, this means that the proposer prefers the sequential game to all passable calendars. In this case, the proposer will deliberately choose an unpassable calendar. Choosing any unpassable calendar is a weakly undominated strategy, but choosing her most preferred unpassable calendar is the trembling hand perfect strategy because if a pivotal legislator who opposed the proposed calendar were to vote "Yes" due to a tremble, the proposer would maximize her utility by having her favorite calendar adopted (Selten 1975).

Proposition 1. *In equilibrium, a legislature will organize and adopt a calendar if and only if there*

[5] $M_i^* = \{C \in \mathcal{M} \,|\, U_i^C = \max\{U_i^B \,\forall\, B \in \mathcal{M}\}, U_i^C \geq \bar{U}_i^S\}$

[6] In some cases there may be more than one calendar in $\mathcal{M}$ that provides maximum utility to the proposer. In this case choosing any such calendar is a weakly undominated strategy.

exists at least one calendar that provides equal or greater utility to both the proposer and a majority of the legislature than the expected utility of the sequential agenda setting process.

Proof. From equation 6, only calendars that provide equal or greater utility to a majority of the legislature than the sequential game as passable. Any other calendar will not pass. The proposer will only choose a passable calendar if she personally weakly prefers it to her expected utility from the sequential game. If there is no such calendar, she will not choose a passable calendar. Therefore, these two conditions must be met for a passable calendar to be proposed and selected. $\square$

Choosing to Organize

Given the sequential agenda and calendar-setting models described above, will a majority of the legislature vote in favor or organizing at the start of the game? The vote choice here is simple. Each legislator will vote in favor of organizing if her expected utility from the calendar-setting game, $\bar{U}_i^C$, is greater than her expected utility from the sequential agenda game, $\bar{U}_i^S$. However, this ultimate decision is dependent on all the parameters of the model: the ideal points of each legislator, the status quo points for each issue, and the amount of time available. One important assumption of this model is that attempting to organize is costless.[7] As a result, if the legislature chooses to try to elect a leader through calendar-setting game and fails to do so, they are no worse off than if they did not try at all. However, such a path is only beneficial if there exists at least one majority-supported calendar that could be proposed by some legislator if they were selected as the proposer.

Example 1 (cont.): Continuing from Example 1 introduced above, with a time constraint of two periods and three issues, there are only three possible calendars that each legislator must evaluate: $\mathcal{C} = \{\{X, Y\}, \{X, Z\}, \{Y, Z\}\}$. Table 1 gives the utility that each legislator receives from each calendar, as well as the expected utility from the sequential game calculated above. If selected as the proposer, A prefers both $\{X, Z\}$ and $\{Y, Z\}$ to the leaderless game, but neither B nor C would vote in favor of either proposal. Since A does not prefer $\{X, Y\}$ to the sequential game, he would not choose that calendar if selected as the proposer. Therefore, A cannot offer a passable calendar

[7]Below, I consider the impact of costly organization.

if selected. Legislators B and C, however, will both propose their favorite calendar, $\{X, Y\}$, and will both vote for it if proposed. If either is selected to be the proposer, that calendar is passed by majority rule and implemented. Overall, in this scenario there is a $1/3$ probability that the leadership game will fail, leading to the sequential agenda-setting process, and a $2/3$ probability that a Speaker will be successfully elected. Given this, A will vote against organizing, and B and C will vote in favor of organizing, such that the legislature will choose to play the calendar-setting game.

Table 1: Example — Utilities Received by Calendar, Expected Utilities, and Leadership Votes

	Calendar			Exp. Util.		Leadership
Legislator	$\{X, Y\}$	$\{X, Z\}$	$\{Y, Z\}$	$\bar{U}^S$	$\bar{U}^C$	Vote
A	-17	-8	-9	-12	-15.3	*No*
B	-1	-4	-9	-2.7	-1.6	*Yes*
C	-2	-11	-18	-7	-3.7	*Yes*

Existence Results with One-Dimensional Preferences

The existence of equilibria in which the calendar setter is able to propose and pass a calendar is dependent on the choice of ideal points, status quo points, utility function, amount of plenary time, and the choice of calendar setter. The following section examines the equilibria of the game under specific conditions.

1. One-Dimensional Preferences: legislators have the same ideal point on each separable issue.
   $I_{is} = I_i \, \forall \, s \in S$.

2. Risk-Averse Legislators: legislators have the same concave utility function.
   Let $U_i^C = \sum_{j \in \mathcal{S}} -(I_i - \gamma_s)^2$.

One-dimensional preferences offer a distinct theoretical advantage for analyzing calendar-setting outcomes. While the median on each issue is clearly defined regardless of the number of dimensions, when there is only one dimension, the median on each issue is the same legislator. This means that we can analyze cross-issue legislative outcomes, such as the effect of the calendar-setting process, relative to the preferences of the median and the outcomes that would result from the median controlling the legislature.

Proposition 2. *With one-dimensional preferences and quadratic utility functions, all majority coalitions supporting a calendar include the median legislator. Majority coalitions contain a continuous subset of the set of legislators sorted by ideal point and include at least all of the legislators from the median through one extreme of the policy dimension.*

Proof. Let the ideal points and status quo points be standardized such that the ideal point of the median legislator is 0. The outcome point for all policy issues placed on the calendar will be 0. For a legislator with ideal point x:

$$U_x^C = \sum_{i \in C} -(x-0)^2 + \sum_{j \in C'} -(x-q_j)^2 = -Sx^2 + 2x \sum_{j \in C'} q_j - \sum_{j \in C'} (q_j^2) \tag{7}$$

$$= -Sx^2 + 2x \sum_{j \in \mathcal{S}} (1-\phi_j^C) q_j - \sum_{j \in \mathcal{S}} (1-\phi_j^C) q_j^2 \tag{8}$$

where U_x^C is the utility function of the calendar C for a legislator with ideal point x, derived from Equation 3 and $\phi_j^C \in \{0,1\}$ is a binary indicator for if issue j is on calendar C. The expected utility from the sequential agenda game can be written similarly, based on Equation 4:

$$\bar{U}_x^S = \sum_{j \in \mathcal{S}} - \left[\rho_j (x-0)^2 + (1-\rho_j)(x-q_j)^2\right] =$$

$$= -Sx^2 + 2x \sum_{j \in \mathcal{S}} (1-\rho_j) q_j - \sum_{j \in \mathcal{S}} (1-\rho_j) q_j^2 \tag{9}$$

Solving for $U_x^C = \bar{U}_x^S$ shows that these two curves intersect exactly once, at $\hat{x}_C$:[8]

$$\hat{x}_C = \frac{1}{2} \frac{\sum_{j \in \mathcal{S}} (1-\phi_j^C) q_j^2 - \sum_{j \in \mathcal{S}} (1-\rho_j) q_j^2}{\sum_{j \in \mathcal{S}} (1-\phi_j^C) q_j - \sum_{j \in \mathcal{S}} (1-\rho_j) q_j} = \frac{1}{2} \frac{\sum_{j \in \mathcal{S}} (\rho_j - \phi_j) q_j^2}{\sum_{j \in \mathcal{S}} (\rho_j - \phi_j) q_j} \tag{10}$$

[8]There are also special cases where these two curves never intersect, in which case either $U_x^C > \bar{U}_x^S \, \forall x$ or $U_x^C < \bar{U}_x^S \, \forall x$. Additionally, there is a trivial case where $U_x^C = \bar{U}_x^S$ for all values of x. In this case all legislators would support the calendar C.

$\hat{x}_C$ partitions the legislators by ideal point. Either all legislators i with $I_i \leq \hat{x}_C$ will vote for C and all legislators j with $I_j > \hat{x}_C$ will vote against C, or all legislators i will vote against C and all legislators j will vote for C. More generally, this is the result of order restriction over the set of calendars and the lottery of calendars resulting from the sequential game. Cho and Duggan (2003) show that with quadratic utilities, individual preferences over lotteries are order restricted, such that coalitions favoring one lottery over another are grouped together. Thus, the set of legislators voting in favor of C consists of a continuous set of legislators by ideal point. If there is a least one legislator voting for C, the set of legislators voting for C also must include one of the two most extreme legislators at either end of the ideological spectrum.

Given that the set of legislators voting in favor of calendar C is continuous and includes one end of the ideological spectrum, in order to have majority support for the calendar, the median legislator must support C. It is not possible for a calendar to have the support of legislators to either side of the median without the median supporting the calendar as well. $\square$

Proposition 3. *With one-dimensional preferences and quadratic utility functions, the support of the median legislator is necessary and sufficient for the existence of a majority coalition supporting a given calendar. Given median support, the cutoff point dictates the "direction" of the coalition—"left" or "right", and the absence of a cutoff point results in an unanimous coalition supporting the calendar.*

Proof. From order restriction (Cho and Duggan 2003), if the median prefers her utility U_m^C for some calendar C to her reservation utility $\bar{U}_x^S$, then there exists a majority coalition including the median and extending either left or right to the end of the ideological dimension of at least $\frac{n+1}{2}$ legislators i where $U_i^C \geq \bar{U}_x^S$. If the median does not prefer C, then no such coalition exists. Therefore, the median's preference over calendar C is both necessary and sufficient for the existence of a majority coalition supporting calendar C. $\square$

Proposition 3 simplifies the process of determining if a calendar has majority support. The only necessary criteria is the support of the median legislator. Without his support, no coalition will have a majority, and with his support, the coalition is guaranteed the majority. The calendar setter does not need to evaluate each legislator's preferences regarding the calendar to determine if her calendar will win majority approval; she simply needs to evaluate the median legislator's preferences.

Proposition 4. *With one-dimensional preferences and quadratic utility functions, there always exists at least one majority-supported calendar—the calendar most preferred by the median legislator. Given this calendar, there always exists a minimum of* $\frac{N+1}{2}$ *legislators who can propose a majority-supported calendar if selected as calendar setter by proposing this calendar.*

Proof. Given a set of calendars $\mathcal{C}$, and the expected utility of the sequential agenda game, $\bar{U}_x^S$, then either all calendars $C \in \mathcal{C}$ provide equal utility to the median ($U_m^C = \bar{U}_x^S \,\forall\, C \in \mathcal{C}$) or there exists at least one calendar $C^* \in \mathcal{C}$ such that $U_m^{C^*} > \bar{U}_x^S$. If there is more than one such calendar, let C^* be the median's most preferred calendar. Following proposition 3, C^* is a majority supported calendar. Thus there is always at least one majority-supported calendar. Any of the legislators in the majority coalition in C^* can therefore *at least* offer the median's most preferred calendar if there does not exist a more preferable majority-supported calendar to offer. $\square$

The intuition behind proposition 4 is that the median's most preferred calendar is always passable, and, as a result, there is always a majority of the legislature who prefer the median's favorite calendar to a leaderless session. If no other calendar is passable, all of the members of the majority coalition supporting the median's most preferred calendar could and would propose that same calendar if selected as the calendar setter. Consequently, at the absolute minimum, for every possible set of ideal points on one dimension, status quo points, and periods of time, at least half of the legislature could serve as Speaker.

Characterizing Passable Calendars

The results above establish the existence of passable calendars, but they do not indicate what the policies on passable calendars look like compared to the complete set of possible issues and the policies that are likely to show up on the calendar produced by the sequential agenda game. From Equation 7, the utility to a legislator with ideal point x is $U_x^C = -Sx^2 + 2x\sum_{j \in C'} q_j - \sum_{j \in C'} q_j^2$. The first component, $-Sx^2$, is common to all calendars and can be ignored when comparing calendars. The second component, $2x\sum_{j\in C'} q_j$, measures the degree to which legislator x is happy with the status quo points for the policies left off of the calendar. Holding all else equal, a legislator with a positive ideal point prefers a calendar in which the average of the status quo points for policies not on the calendar is higher. The third component of this equation, $-\sum_{j\in C'} q_j^2$, captures the common preference of all legislators that the polices on the calendar are those with status quo points towards the extremes of the ideal point distributions and that the policies left off of the calendar are closer to the median of the distribution.

From Equation 7, the calendar preferences of the median legislator are simple. With an ideal point $x = 0$, the median's utility from a calendar C is simply $U_0^C = -\sum_{j\in C'} q_j^2$, the negative sum of the squared deviations of the status quo points for the issues left off of the calendar. The median legislator does not care about the direction of the policy changes from left or right; his only preference is that the most extreme issues from either side make it onto the calendar. Furthermore, from Equation 9, the median's utility from the sequential game is $\bar{U}_0^S = -\sum_{j\in\mathcal{S}}(1-\rho_j)q_j^2$. This is simply the average of the negative squared deviations for every status quo point, weighted by the likelihood that each policy is ultimately left off of the calendar in the sequential game. For all of the other legislators with ideal points $x \neq 0$, the average of the status quo points for all of the issues is also part of determining calendar preferences. This comes from the middle terms in equations 8 and 9, $2x\sum_{j\in C'} q_j$ and $2x\sum_{j\in\mathcal{S}}(1-\rho_j)q_j$, respectively. This factor represents that as a legislator's ideal point moves away from the median, he is increasingly biased towards working on policies where the status quo is on the opposite side of the median. Non-median legislators must weigh both this factor and the sum of squared deviations compared to these parameters for all of the policy issues when evaluating a calendar compared to the leaderless session.

The two factors discussed above are important for characterizing legislative preferences between both a calendar and the sequential game and between two specific calendars. For simplicity of notation, let μ be the average of all of the status quo points for all policies in S, and let μ'_C be the average of the status quo points for all policies left off of calendar C. Let φ be the average of all squared deviations for all policies in S, and φ'_C be the average of all squared deviations for all policies left off of calendar C. (If we assume that S is large and the status quo points are drawn from some distribution with mean $\mu = 0$ and variance σ^2, then $\varphi^2 \approx \sigma^2$.) When comparing any two calendars C_1 and C_2, the median prefers C_1 if $\varphi'_1 < \varphi'_2$ and C_2 if $\varphi'_1 > \varphi'_2$. As the ideal point of legislator x moves away from the median, the μ' term becomes more important. Legislator x prefers C_1 if $2x\,\mu'_1 - \varphi'_1 > 2x\,\mu'_2 - \varphi'_2$ and C_2 in the opposite case. Therefore, for legislators with ideal points close to the median, φ' is the most important part of the calendar preference calculation, and as the magnitude of the ideal points increase, μ' takes greater weight. This means that near-median legislators are mainly concerned with working on policies from both extremes of the policy space, while extreme legislators care more about protecting policies with status quo points near their ideal points and working on policies with status quo points at the opposite end of the policy space.

A Repeated Calendar-Setting Game

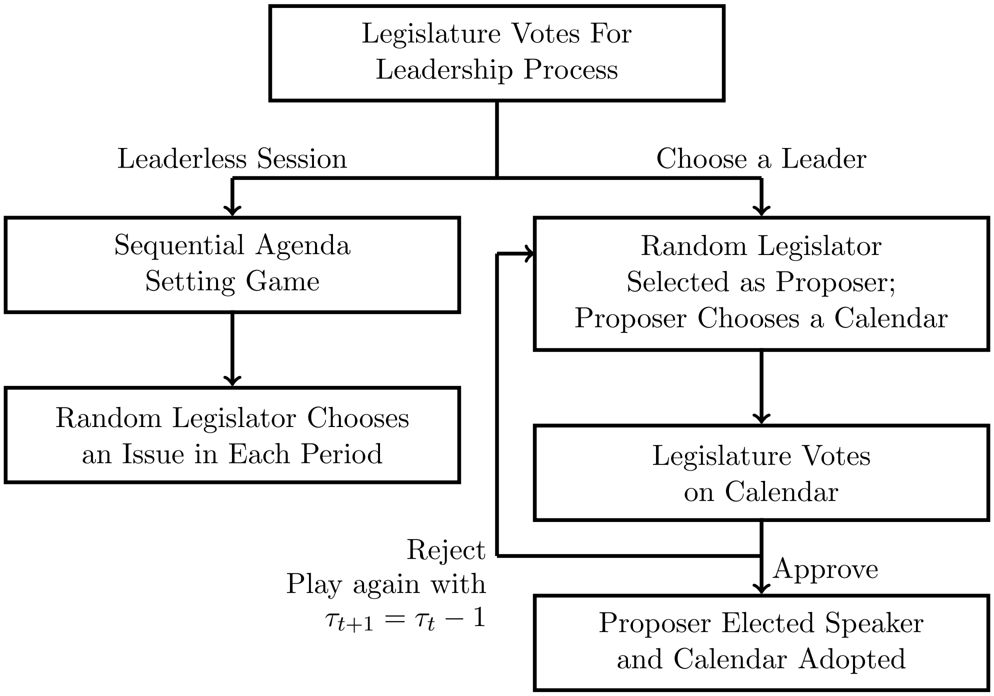
An alternate way to model calendar setting is as a repeated game.[9] As in the base model, this game has three stages: (1) nature randomly picks a legislator who proposes a calendar; (2) the legislature votes on the calendar; (3) if accepted, each policy on the approved calendar is brought to the floor. Unlike the base model, if a proposed calendar is rejected in this game, the game is played again, but one period of time is lost due to the failed proposal. Figure 4 illustrates the play of the game.

Let t denote the stage of the game, and τ_t the number of time periods left in the legislative session (the length of the calendar). In the first round, $t = 1$ and $\tau_1 = T$. If the proposal in this round is rejected, in the next round $t = 2$, $\tau_2 = T - 1$. The game repeats in this fashion until round $t = T$, where $\tau_T = 1$. If a proposal in this final round were to be rejected, the game ends with no legislative business accomplished; no policies are changed, and utilities are based on the status quo points for all issues.

In any stage of the game t, a legislator will vote in favor of some proposed calendar C if the utility that he receives from that calendar is equal to or higher than his expected utility from the

[9]Hereafter, the game discussed above will be referred to as a the base model or game, and this game as the repeated model or game.

Figure 4: The Legislative Session with a Repeated Calendar-Setting Game



calendar being rejected, which results in the game being played again with one less period of time. The expected utility from rejecting the calendar is therefore based on the calendars that would be offered in the next period by each legislator if they are selected as the proposer and the likelihood that each proposed calendar would pass.

Using backward induction, we can identify the calendar offered by each legislator at each round t of the game if the game were to reach that round. Suppose that the game reaches stage $t = T$, such that there is only one time period remaining to work on a policy issue, $\tau_T = 1$. In this round, every possible calendar will pass because there is a majority supporting policy change on every single individual issue, and this majority will prefer a one-item calendar to ending the session without accomplishing anything. Every legislator, if selected as the proposer in round $t = T$, will propose a calendar only consisting of their most preferred issue to work on, and that calendar will be accepted by majority rule and implemented. Given this, we can work backwards to round $t = T - 1$, where $\tau_{T-1} = 2$. Here, each calendar consists of two policy issues. Given the expected utilities that each legislator would receive from reaching round $t = T$, the proposer can anticipate how each legislator would vote on any possible calendar C, and therefore choose a calendar that will pass, assuming that there exists such a calendar that is both passable and that the proposer prefers to his own expected utility from round $t = T$. When there is more than one such calendar that is both passable and preferred by the proposer to her expected utility from round $t = T$, the proposer's dominant strategy is to propose her most preferred of these calendars. Following this same logic, we can work back to round $t = 1$, where $\tau = T$, and determine the calendars proposed by each legislator in the initial round.

Formally, the equilibrium strategy for each legislator is $\sigma_i^* = (\vec{v}_i, \vec{C}_i)$, where $\vec{v}_i$ specifies how legislator i will vote on every possible calendar proposed at any stage of the game, and $\vec{C}_i$ lists the calendars that legislator i would propose in each round t. The vector of vote choices $\vec{v}_i$ has $\sum_{t=1}^{T} \binom{S}{t}$ entries, to cover the vote choice made in response to any possible calendar being proposed. The vector of calendar proposals has T values, one for each round. $\vec{C}_i = \{C_i^T, C_i^{T-1}, \ldots, C_i^2, C_i^1\}$, where the superscript indicates the length of the calendar.

Given this equilibrium behavior, we can compute the expected utility of each legislator at the start of this game.

$$\bar{U}_i^R = \sum_{j \in S} \rho_j u\left(I_{ij}, I_{mj}\right) + (1 - \rho_j) u(I_{ij}, q_j) \tag{11}$$

The expected utility is identical to the formula for the sequential game (Equation 4), but the probabilities of each policy issue appearing on the calendar are different. In the sequential game, the sum of these weights equals the length of the calendar, $\sum_{j \in \mathcal{S}} \rho_j = T$. In this game, the sum of these weights may be less than T if there are cases where a calendar of length $\tau < T$ is possible in equilibrium.

Example 1 (cont.): Revisiting Example 1, developed above, we can see how the repeated game produces different results than the base game.[10] There are two time periods, and therefore two rounds to consider. Table 2 shows the utilities that each legislator receives from each possible calendar in the two possible rounds, the expected value of the calendar-setting game prior to each round, and the expected value of the leaderless game. If the game were to reach $t = 2$, then A would propose $\{Z\}$, and B and C would propose $\{X\}$. Given this, in round $t = 1$, the legislators look

[10] Legislators: $A = -2$, $B = 0$, $C = 1$; Status Quo Points: $X = -3$, $Y = -2$, and $Z = 1$.

ahead when deciding which calendars to propose and how to vote on proposed calendars. As in the base model, B and C would propose calendar $\{X, Y\}$ if selected as the proposer, and this calendar would pass because B will vote for it. Unlike in the base model, however, where A could not offer a passable calendar if selected, A this time can offer his favorite calendar, $\{X, Z\}$, and it will pass. The sequential game, by changing the value of rejecting a calendar, enables A to be the Speaker, which he could not have been in the base game. However, the initial vote between leadership and a leaderless session remains the same. A continues to prefer the sequential game, where he gets his favorite calendar with probability $5/9$, to the repeated calendar-setting game, where he gets his favorite calendar with probability $1/3$.

Table 2: Example — Utilities Received by Calendar

	Cals. in $t = 1$			Cals. in $t = 2$			Exp. Util.	Exp. Util	Leaderless
Legislator	$\{X, Y\}$	$\{X, Z\}$	$\{Y, Z\}$	$\{X\}$	$\{Y\}$	$\{Z\}$	$t = 2$	$t = 1$	Game
A	-17	-8	-9	-13	-14	-5	-10.3	-14	-12
B	-1	-4	-9	-5	-10	-13	-7.7	-2	-2.7
C	-2	-11	-18	-10	-17	-26	-15.3	-5	-7

Passable Calendar Existence

As in the base model above, if we adopt one-dimensional preferences and quadratic utility functions, majority-passable calendars exist in every round t of the game.

Proposition 5. *With one-dimensional preferences and quadratic utility functions, in every round t of the repeated game there exists at least one majority-passable calendar.*

Proof. The result follows from the order restriction over lotteries of sets of calendars discussed above. In round $t = T$, where calendars have length $\tau = 1$, it is trivial to see that every possible calendar is passable. In any round $t < T$, let $\bar{U}_x^{t+1}$ be the expected utility for a legislator with ideal point x from advancing to the next round $t = t + 1$. $\bar{U}_x$ is a weighted lottery of the calendars available in round $t + 1$, based on what each legislator would choose if selected as the proposer. In round $t + 1$, there exists some calendar C_{t+1}^* that is the median legislator's favorite calendar given the time limit τ_{t+1}. The median legislator therefore prefers this calendar to $\bar{U}_0^{t+1}$, his expected utility at the start of round $t+1$. Let C_t^* be C_{t+1}^* with the addition of any one policy issue that is not in C_{t+1}^*. The median prefers this calendar to C_{t+1}^* because he wants to work on as many issues as possible. Therefore, $U_0(C_t^*) \geq U_0(C_{t+1}^*) \geq \bar{U}_0^{t+1}$. By order restriction, if the median prefers this calendar to advancing to the next round, a majority of the legislators must share this preference as well. Thus, there exists at least one calendar in every round that is majority-preferred to advancing to the next round, and therefore at least one calendar that is passable if proposed. □

Unlike in the base model, however, there is no guarantee that a majority will prefer this calendar-setting game to the sequential agenda game. Choosing to organize is no longer "risk-free," because the game does not revert to the sequential game if the legislature fails to elect a leader in the first round. Instead, there is now a tangible cost—the loss of one period of legislative time and ability to work on one policy issue—associated with rejecting a Speaker. The legislature must therefore balance the advantages of organizing with the potential cost of losing time when making this decision.

Extensions: Efficiency Costs and Commitment

The calendar-setting models above make some important assumptions about the operation of the legislature and the behavior of its members. In this section, I briefly consider the implications of two different extensions: adding time costs to organizing and to leaderless sessions, and loosening the commitment assumptions that bind legislators when proposing and voting on calendars.

Time Costs

The base model outlined above offers the legislature the opportunity to try to organize without any time cost or penalty if the calendar proposed in the leadership game fails. As a result, if passable calendars exist (as in the one-dimensional case), a majority of the legislature will weakly prefer the calendar-setting game to the sequential game. However, if we add a time cost to the calendar-setting game, such that it costs a period of time if the calendar is rejected (as in the repeated game), before reverting to the sequential game, then the decision to try to organize is more complicated. Now, legislators must compare the tradeoff in their expected utilities from the calendar-setting game with a full calendar of T policies to their expected utilities from the sequential game with $T-1$ policies. This simple loss of one time period can significantly change the voting decisions made in the first stage of the game. In the one-dimensional case, it is no longer guaranteed that a majority of the legislators will vote in favor of trying to organize. However, by making the reversion less desirable to the median legislator (who always wants to work on more issues), this cost may increase the set of majority-passable calendars and the set of legislators who could be Speaker. Ultimately, this change may decrease the probability that the legislature will vote to organize in the first stage, but increase the probability of approving a calendar if the legislature votes to try the calendar-setting game.

Similarly, we could also consider the possibility that initiating the calendar-setting game costs one period of time. This has a similar effect, as legislators must compare the expected utility of a set calendar with $T-1$ policies to the expected utility of the sequential game with T policies. In the one-dimensional preferences case, this change would decrease the value of setting the calendar to the median legislator, and therefore decrease the probability that the legislature will vote to organize in the first stage.

In addition to examining the costs of organizing, we can also think about the costs of choosing not to organize. Suppose that a legislature without a Speaker or centralized leader operates less efficiently than a legislature with a Speaker, and therefore will accomplish less. In this case, choosing to organize may become more attractive to many legislators. Let $\omega \in [0, T]$ be the number of time periods wasted due to the absence of the Speaker. In the sequential agenda game, the legislature will only be able to work on $T - \omega$ policies. With one-dimensional preferences, as ω increases the expected utility from the sequential game decreases for the the median legislator (and a majority of the legislature). This increases the probability of voting for the leadership game, even when there is some cost to organizing as suggested above or as in the repeated game. In the base model, a positive ω also increases the set of passable calendars, the number of possible Speakers, and the probability of passing a calendar. As ω approaches T, a disorganized legislature will accomplish less (and could even accomplish nothing), increasing the appeal of organizing.

Overall, we can think about the time-costs of organizing and the efficiency losses of not organizing as key levers that drive the choice to organize. When organizing is time-consuming, busy legislatures may be more likely to avoid it. However, if a leaderless session is inefficient and leads to delay and loss productivity, then greater inefficiency increases the legislative preference for leadership.

Commitment

The models introduced above assume that legislators must commit to their previous proposals and decisions as the game progresses. Relaxing these commitment decisions changes the results of the game by changing the calendars that are proposed, the set of legislators that can be elected Speaker, and the voting decisions of the legislators when choosing whether to organize and when approving or rejecting proposed calendars.

First, consider the possibility that each legislator cannot credibly commit to carry out their proposed calendar if elected Speaker. Once elected, the Speaker can change the issues on her calendar without legislative approval, and the legislature must work on the revised calendar instead of the approved calendar. In this case, the proposer can only be trusted to carry out her favorite calendar if elected Speaker. As a result, the set of passable calendars will decrease in size to the set of calendars that are both passable and some legislator's most preferred calendar, and the set of legislators who can propose a passable calendar may also decrease. In the one-dimensional case, this will generally result in the reduction of the set of possible Speakers, eliminating Speakers with more extreme ideal points and favoring Speakers with ideal points closer to the median. A smaller set of possible Speakers also reduces the probability that a Speaker will be elected in the base model and the probability of electing a Speaker in the first round of the repeated game. When failing to elect a Speaker is costly, as in the repeated game or in the alternate specifications, the inability to credibly commit decreases the probability of a legislature choosing to organize.

A further extension of this commitment problem is whether elected Speakers can cut the session short, rather than being forced to fill the calendar with policy issues. In the models, the Speaker must choose T (or τ_t in the repeated game) policy issues for their calendar, such that no remaining time is wasted. However, this may require a Speaker to put a policy change that they don't like on the calendar. If the Speaker can cut the session short, this possibility is eliminated, and further reduces the set of passable calendars and electable Speakers. In the one-dimensional case, the set of electable Speakers continues to converge towards the median.

A third commitment decision to consider is that legislators are locked into their organizational decision after each vote. In both models, after a calendar is adopted, the legislature cannot vote to depose the Speaker, replace her with someone else, or revert to a leaderless session. If this possibility is added, then the order of the calendar becomes extremely important; the Speaker must order her the bills on the calendar such that a majority wants to continue to follow the calendar as items are completed. This problem and the question of the existence of stable calendars that will persist as items are removed is discussed in Patty and Penn (2008). Additionally, in the repeated game, legislators are committed to electing a leader if they choose the leadership game at the start of the session. If we relax that assumption, and instead allow legislators to vote on reverting to the sequential game, rather than continuing with the calendar-setting game when a proposed calendar is rejected, then proposed calendars and legislative votes over them may change. For some values of τ, the time remaining in the game, a majority may prefer to revert to the sequential agenda game rather than continue with the calendar-setting game. Similarly, in the sequential agenda game, there may be cases in which, after accomplishing some set of policy issues through sequential selection, a majority of the legislature prefers to organize mid-way through the session and elect a leader to choose the calendar for the remaining time periods.

All of these commitment variations highlight that the ability of leaders to commit to their proposed calendars and the ability of the legislature to commit to an organizational structure (or lack thereof) is important to successful organization and leadership. When Speakers cannot commit to their calendars, the odds of organizing and of electing a Speaker decrease, and Speakers become more moderate. When the legislature cannot commit to organizing (or not organizing), or to keeping the same Speaker for the whole session, the calculus of organizing and the process of selecting the calendar and implementing it become much more complex.

Implications and Conclusions

Consider the general outcome of this model in the case in which the legislature votes to organize and then successfully elects a leader. A legislator becomes Speaker by proposing a calendar that is approved by a majority of the legislature. This procedural vote therefore defines two coalitions: a majority coalition voting in favor of the Speaker and her agenda, and a minority coalition who oppose them. After this election, the Speaker than carries out her agenda by bringing the bills on her calendar to the floor, where they are worked on by the legislature and voted on using majority rule, and each policy ultimately converges to the ideal point of the median legislator. In general, the majority and minority coalitions for each policy vote are similar to the majority and minority coalitions for the procedural vote electing the Speaker because those who support the Speaker generally support the policy changes resulting from her calendar, and those who oppose the Speaker generally oppose these policy changes. As a result, we see a majority coalition voting together in favor of a procedural motion and then mostly voting together in favor of a sequence of policy changes, and a minority coalition mostly voting together in opposition. From a party-government perspective, this configuration is immediately recognizable and matches Cox & McCubbins' (1993, 2005) predictions about the behavior of political parties, but this behavior is generated by a model without any political party institutions or partisan affiliation of the legislators. Given the appearance of party organization without any party institutions that affect legislators' behavior, this result supports Krehbiel's (1993, 1998) critique of strong legislative parties in Congress.

However, the results of the model suggest a path for the endogenous creation of legislative leadership and parties by a primitive legislature. The process of selecting a calendar leads to the selection of a Speaker and to the existence of coalitions that have the appearance of political parties. These coalitions are not formal parties and do not have their own rules or institutions, but they have the appearance of primitive political parties and resemble American political parties before the development of the party caucus system.[11] The Speaker in this model is likewise weak, possessing only the procedural power over the calendar. In many ways, this captures some important elements

[11] Čopič and Katz (2014) finds a similar result in their model of legislative organization, which they call *proto-parties.*

of legislative organization in the early U.S. Congress. For example, in the first Congress, political parties were generally non-entities, and the first Speaker, Frederick Muhlenburg, generally operated in a non-partisan manner while presiding over the House, despite his partisan positions as a politician (Jenkins and Stewart 2013). Additionally, Muhlenburg was replaced as Speaker in the second Congress by Jonathan Trumbull, not because of partisan changes or Muhlenburg's performance as Speaker, but due to "the principle of rotation in office" (Jenkins and Stewart 2013). This suggests that many different legislators could serve as Speaker. The initial elections for Speaker were generally non-partisan affairs, but they quickly became partisan as legislative parties developed. Furthermore, the office of the Speaker was based upon Speakers in the British House of Commons and the state legislatures, but the explicit duties of the Speaker of the House of Representatives was not well defined (Green 2010; Squire 2012). While the Constitution required the House to have a Speaker, the legislators of the first session were free to define the powers of the office as they saw fit. The need to prioritize bills given time constraints incentivizes legislatures to initially create leadership institutions, but we might expect that such institutions become more complex and receive additional powers over time.[12]

The calendar-setting model has several significant implications for our understanding of agenda power and leadership. First, the set of legislators who could serve as the Speaker can be large, and can even be the set of all legislators in some cases. In the base model of legislative organization, a minimum of $\frac{N+1}{2}$ legislators can serve as Speaker, but that number can be much closer to N depending on the distribution of ideal points and status quo points. This result differs from other common predictions about which legislators can serve as leaders, such as that the median will always be the leader or that the leader must be the median of the majority in a world with strong parties. Most importantly, any member of a majority coalition could serve as Speaker if they are chosen to propose a calendar.

Additionally, this model shows that calendar-setting coalitions are not necessarily minimum winning coalitions of size $\frac{N+1}{2}$. While some coalitions will be minimally inclusive, coalitions can be

[12]This follows the concept proposed by Shepsle (1986) that initially endogenous institutions that arise from a structure induced equilibrium (Shepsle 1979; Shepsle and Weingast 1981) will persist as they grow more complex because legislators will be uncertain about the effect of modifying these institutions in future periods.

larger than this (or even unanimous). This is the result of the discrete choices that the calendar setter must make. Unlike divide-the-dollar and other distributive games, the calendar setter faces a problem with a large but discrete number of choices. There do not necessarily exist calendars that neatly divide the legislature to create a minimal winning coalition, and such calendars may not be optimal. The Speaker is indifferent between any size coalition that supports her preferred calendar as long as it includes at least a majority of the legislators.

Another interesting result of the model is that there is real value to serving as Speaker. The Speaker can receive a higher utility than other legislators (even those in the majority coalition). When more than one calendar can pass with majority approval, the Speaker can choose her favorite, and therefore maximize her own utility. The other legislators do not have this ability, only to make a binary choice between the proposed calendar and the sequential agenda game (or the next round of the calendar-setting game in the repeated model). As a result, there is a utility benefit to being Speaker, even though there are not any side payments or other explicit benefits to being selected as the proposer and elected as Speaker. However, if the ability to credibly commit to a calendar is removed, the set of passable calendars is reduced and the Speaker may not benefit more than the other members of the majority coalition.

There are many extensions and applications of this model that will further contribute to the study of legislative organization and endogenous legislative institutions. Extending the model to a bicameral legislature may increase our understanding of how dividing the legislature into two separate chambers alters not only legislative outcomes, but the set of legislation that is considered. Is one chamber able to dictate the calendar of the other chamber by setting their own calendar first, or is calendar setting for each chamber a simultaneous or cooperative process? A second extension is including an executive who engages with the legislature, with powers such as vetoing bills, proposing a calendar to the legislature (such as through a "State of the Union" speech), or adding bills to the calendar by calling a special session (a common power of Governors). An executive who can influence the legislative calendar may incentivize legislators to develop different leadership institutions to resist the executive's power. Third, filibustering and other delay tactics are recognized as important factors in determining policy outcomes. How does the power of a single legislator (or coalition of legislators) to waste time affect calendar setting? Wasting time allows legislators to reduce the amount of legislation that can be considered and has important implications for the calendar-setting power. Finally, this model offers a starting point for a different way to model legislative activity, agenda setting, and calendars. Legislatures are not institutions concerned with a single task, but busy, time-constrained institutions that choose and prioritize legislative actions from a large and complex set of possibilities.

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