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Bicameralism and Its Consequences for the Internal Organization of Legislatures **$

by

Daniel Diermeier*

and

Roger B. Myerson*

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* MEDS, J.L. Kellogg Graduate School of Management, Northwestern University, Evanston, IL 60208-2009.
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Abstract

Formal theories of the internal organization of legislatures have mainly focused on the United States Congress. While these models have been successful in showing why committee systems should emerge in Congress, they fail to explain the variance in internal organization across legislatures in different countries. To analyze the effects of different constitutional features on the organizational choices of legislatures, we adopt a vote-buying model (Groseclose and Snyder 1996) and then consider the incentives to delegate decision rights in a multi-chamber noncooperative game. Our analysis shows how presidential veto power and bicameral separation can encourage a legislative chamber to create internal veto players or super-majority rules, while a unicameral structure provides incentives for legislators to delegate power to a single actor such as a prime minister or party leader.

Introduction

Game theoretic modeling can be applied to political competition as well as to market competition. To be able to evaluate political constitutions we need to understand how constitutional structures may shape the conduct of politicians and policy choice.

As an example consider decision making in legislatures. Legislative voting rules, as specified by the constitutions, are with few exceptions anonymous and egalitarian. It does not matter who votes for a proposal, and each vote counts equally. Yet, actual legislatures are characterized by a variety of organizational structures that lead to significant differences in the influence of individual members on policy choices. Examples include committee chairmen, party leaders, and speakers. These institutions and the norms that support them are rarely mandated by a country's constitution. Rather, legislative majorities choose to design and maintain their internal organizational structure.

The prime example of this phenomenon is, of course, the United States Congress, with its elaborate system of powerful committees and norms. Many other legislatures also exhibit a richness of institutional structure, among them Germany, Italy, Japan, Norway, and Sweden (Huber 1992, Rogowski 1990). Moreover, if we recognize that party leaders and even Prime Ministers and their respective cabinets depend on the (at least implicit) support of a chamber majority,[1] then all major legislatures are characterized by some form of internal organization. However, the forms of internal organization differ widely. While individual committees are comparatively strong in Congress, they are weak in most parliamentary bodies (Lees and Shaw 1979).

To be sure, we are interested only in *de facto*, not in *de jure* powers of legislative institutions. Italian committees have the authority to pass legislation, yet committee discharge is very easy. The consequence is that Italian committees mainly deal with "small legislation" (*leggine)*, administrative issues that in most countries would be handled by the

bureaucracy but must be passed as legislation according to the Italian constitution. With respect to genuine legislative decisions, Italian committees lack the ability to block or ensure the passage of a controversial bill against the will of the chamber majority (D'Onofrio 1979). Congressional Committees, on the other hand, frequently do exhibit genuine *de facto* veto powers. This phenomenon occurs despite the fact that discharge is always possible (but costly) and that rules which govern the deliberation of committee proposals are subject to debate under an open rule and thus can be changed easily by a majority. The solution to this apparent puzzle is that floor majorities may have an incentive to delegate powers to actors such as committees and maintain delegation as equilibrium behavior in an underlying multi-stage game.[2] These incentives, we suspect, vary across legislative systems. Yet there are few theoretical papers that probe the consequences of constitutional features such as bicameralism, government formation, or chamber dissolution rules on the internal organization of legislatures.

Theoretical models of legislative organization so far have mainly focused on committees in the United States Congress. Two formal approaches have been dominant: distributive and informational.

The distributive approach is due to Shepsle (1979), Shepsle and Weingast (1981), and especially Weingast and Marshall (1988). Here, the procedural prerogatives of committee members on their assigned jurisdiction are interpreted as commitment devices that enforce and maintain distributive agreements. Baron and Ferejohn (1989) use a non-cooperative majoritarian bargaining model to identify the (independent) benefits from proposal power. McKelvey and Riezman (1992) use a model that involves both legislative and electoral stages to show that maintaining a seniority system with proposal power encourages the reelection of incumbents.

Gilligan and Krehbiel (1987, 1990) present an informational rationale for granting committees special proposal and amendment prerogatives. Committees are granted proposal prerogatives, because this provides an incentive to acquire costly information and credibly transmit it to the floor.

In order to evaluate the contribution of these approaches to a general theory of legislative organization we have to keep in mind that legislative functions that are exercised by committees in Congress may be fulfilled by other actors in a different setting. In parliamentary democracies, for instance, ministries rather than committees acquire policy expertise. As long as these institutions depend in their existence and their level of resources on majority approval, the very same issues concerning the rational organization of the legislative process emerge. Rather than focusing on semantic similarities one should therefore identify functional equivalents in the legislative decision process.

While we do find committees (either standing or *ad hoc*) in virtually all legislatures, their role in the legislative process varies considerably across legislatures and over time. Consistent with informational theories, these committees typically do have proposal rights in a particular policy area, and committee members are better informed about the policy consequences than their fellow legislators. Yet, in parliamentary systems the real locus of specialization is the respective ministry. Consequently, while committees in parliamentary settings may be important in overseeing government bureaucrats, for instance, their role in actually drafting or significantly changing legislation is very limited compared to the committees of the U.S. Congress. In fact, one of the few "stylized facts" in the comparative study of legislatures is the claim that *ceteris paribus* presidential political systems encourage strong committees (Lees and Shaw 1979) while parliamentary systems are characterized by comparatively weak committees. In particular, Congressional committees have frequently blocked essential legislation against the (apparent) interest of

the chamber majority.[3] The problem is that while both informational and distributive theories provide (competing) explanations for the *existence* of strong committee systems they cannot account for the *variance* in de facto committee prerogatives across different legislatures.

On the other hand, while committees in parliamentary democracies may lack veto rights, cabinets not only have those prerogatives, but essentially dictate policy, provided they can rely on a stable majority in the chamber.[4] Once we recognize the functional equivalence between congressional committees and cabinet ministries the question is not so much why parliamentary committees lack power, but why majorities in parliaments choose to delegate virtually dictatorial policy-making authority to the cabinet while the majority in the U.S. Congress grants at most veto power to *their* most important legislative institution: committees.[5] That is, a comparative theory of legislative institutions has to explain why (at least some) committees in the United States Congress have the negative power to block legislation, but do not have the positive power to ensure the passage of a bill, while a parliamentary cabinet's endorsement of a bill is usually enough to pass it .

A common theory of legislative institutions may not only suggest answers to these puzzles, but may also account for some of the differences of voting discipline in different countries. Shugart and Carey (1992, ch.9), for instance, find a correlation between the president's legislative powers and weak parties. Frequently, the differences in legislative institutions are attributed to the different electoral roles of parties, especially in trying to explain the differences between the United States and Britain. But this view may reverse cause and effect. In his history of the development of British party discipline Cox (1987, p.64) finds that legislative party discipline (MPs voting along party lines in the legislature) developed ahead of electoral party discipline (voters voting on party lines in general elections), and this observation leads him to ask "Why did the House [of Commons] not

develop a committee system in the 1830s along American ... lines?" In the next sections we suggest an answer to such questions by comparing the incentives to delegate legislative prerogatives that are maintained by disciplined voting. Using a non-cooperative model of lobbying we demonstrate how these incentives may be systematically affected by presidential veto powers and the separation of legislative chambers.

The key to this analysis may be to view legislative chambers as competitive organizations in a market for legislation, with internal procedural hurdles functioning like prices for new legislation. But from this perspective, we will see that legislative chambers in a serial bicameral legislature are more like monopolistic producers of complementary goods than like duopolistic producers of a common good. This economic insight will be critical to understanding how a bicameral separation can lead to higher hurdles for legislation within each chamber.

Basic Assumptions

In the following section we present a two-stage game of organizational choice in a legislature. It is instructive to compare our approach to Gilligan and Krehbiel (1987, 1990) who introduced this perspective in the formal political science literature. Both approaches provide rational choice models for the (internal) organization of legislatures. Like Gilligan and Krehbiel (1987) and McKelvey and Riezman (1992), we start with a legislative subgame that provides incentives for legislators to organize their chamber in a particular way. However, in contrast to an informational or electoral motivation, we focus on the interaction with outside agents, "lobbyists", who try to influence legislative outcomes. In particular we adopt a variant of a vote-buying model as presented in Groseclose and Snyder (1996).

The results from the solution of the legislative subgame are then used to analyze the choice problem faced by a chamber's pivotal voter(s) at the organizational stage. Like Gilligan and Krehbiel (1987, 1990) we assume that in this choice the chamber can commit to a particular organizational structure. Following Gilligan and Krehbiel who assume the possibility of commitment to restrictive rules, we consider the case where the chamber can commit to delegate legislative prerogatives to individual members. But while Gilligan and Krehbiel focus on the one-player decision faced by the pivotal voter at the procedural stage, we analyze the incentives emerging from the strategic interaction of (potentially) many procedurally pivotal voters in a multi-chamber setting. So, we interpret the organizational choices of a chamber as a non-cooperative game between chambers.

There are few theoretical papers that probe the consequences of dividing legislators into separate chambers which represent the same voters.[6] To find such consequences in a theoretical model, we need to make simplifying assumptions that focus our attention on the fact of this separation. In particular, our analysis applies two basic assumptions about how members of a legislative chamber make decisions about establishing or reforming the internal institutional structures within their chamber. First, questions of internal institutional change arise independently across chambers and arise infrequently enough that a reform in one chamber can be analyzed under the assumption that other chambers' internal institutions will not change substantially. Second, the members of a chamber approach these basic institutional questions with a shared goal of maximizing the long-run expected average payoff to members of the chamber.

This second assumption is appropriate if members of a legislative chamber anticipate remaining in the chamber with high probability in the significant future, and they anticipate playing different roles in the chamber over the long term of their careers. Alternatively, this assumption of shared interest may be justified by cooperative

agreements among members of the chamber to redistribute the benefits of power among themselves. In any case, if informal institutions are well designed to maximize the expected long-term payoffs of the members of the chamber, then standard repeated-game arguments are sufficient to explain why individual members will not try to circumvent these institutions, even when they have a formal right and short-term incentive to do so.

There are situations where these assumptions are less appropriate, and the application of our theory needs to be appropriately modified. For example, in countries where legislators frequently switch chambers in the course of their careers, each legislator may care about the expected average benefits of power that accrue throughout the legislature, and not just to members of his or her own current chamber. In countries where the electoral system induces strong party control over the nomination process, legislators may be constrained to obey the dictates of a party organization whose interests transcend the boundaries between legislative chambers. In either case, a *de jure* multi-cameral legislature may *de facto* operate as a unicameral system for the purposes of our analysis.

Solving these classification problems in each case is an empirical question. In practice, the multicameral systems that fit our assumptions may be distinguished by relatively high re-election rates within each chamber, and few switches between chambers in typical legislators' careers. Once a given legislature is classified as unicameral or multicameral, our model offers clear testable predictions about the delegation of power in legislatures. As a criterion of adequacy, our model should be consistent with the basic empirical regularities of paradigmatic cases of uni- and multicameral legislatures. That is, it should imply the delegation of negative blocking power to committees in the U.S. Congress and the greater positive power of the cabinet in, say, the Dutch parliament, where ministers can both approve and reject legislation in the name of the whole chamber.

The Legislative Stage - A Simple Model of Lobbying

An analysis of the incentives that may guide legislative organization must begin with some model of how legislative prerogatives generate rewards for individual legislators. In this paper, we adapt the Groseclose and Snyder (1996) model of vote-buying by lobbyists.

In this model, the outside forces that seek to influence the legislature are represented by two agents, whom we may call agent 0 and agent 1. Agent 1 is a lobbyist who wants the legislature to pass a bill that would change some area of law. Agent 0 is a lobbyist who is opposed to this bill and wants to maintain the status quo. Agent 0 is willing to spend up to V dollars to prevent passage of the bill, but agent 1 is willing to spend up to W dollars to pass the bill. We will use female pronouns for these lobbyists, male for legislators.

To promote passage of the bill, agent 1 can promise to pay money[7] to individual legislators conditional on their supporting the bill. Similarly, agent 0 can promise to pay money to individual legislators conditional on their opposing the bill. Following Groseclose and Snyder, we assume that agent 1, the advocate for change, must make the first move and announce her offers first, and agent 1's offers are known to agent 0 when agent 0 makes her offers to induce legislators to oppose the bill. We also assume that the values V and W are known to both agents before either makes any offers in this lobbying game.

The payoff to each legislator in this simple lobbying game is just the monetary payment (if any) that he gets from one of the two lobbyists.[8] Thus, any legislator will support the bill if he has been offered more by agent 1, and he will oppose the bill if he has been offered more by agent 0. In the case of a tie, we assume that a legislator will oppose the bill if neither agent offers him anything, but he will support the bill if both agents offer him the same positive amount.

As Groseclose and Snyder have shown, this lobbying game has a unique subgame-perfect equilibrium. To review their characterization of this equilibrium, let us begin by introducing a general formulation of the lobbying problem faced by agent 1.

Let N denote the set of legislators. (By "legislators" we mean here all individuals who have a constitutional role in the process of passing legislation, including the president if he has veto power.) Let L denote the set of all subsets of N that have the power to block legislation. That is, a set C is in L iff C is a subset of N and the legislators in N\C (the complement of C) cannot pass a bill that is opposed by all the legislators in C. Let x(i) denote the payoff that agent 1 promises to legislator i if he supports the bill. Now consider the linear programming problem for lobbyist 1:

(1) choose $(x(i))_{i\in N}$ so as to

minimize $\sum_{i\in N} x(i)$

subject to $\sum_{i\in C} x(i) \geq V, \forall C \in L,$

and $x(i) \geq 0, \forall i \in N$.

The optimal value of this problem is the least amount that agent 1 must spend to guarantee that, no matter how agent 0 allocates his value V, agent 0 cannot prevent the bill from passing.

The optimal solution to this linear programming problem (1) will be linear in the parameter V, and the constant proportionality may be called the hurdle factor. That is, if r is the hurdle factor then any optimal solution $(x^*(i))_{i\in N}$ to the above linear programming problem satisfies

$$\sum_{i\in N} x^*(i) = rV .$$

Notice that this hurdle factor r must satisfy $r \geq 1$, because the set of all legislators N is itself a blocking coalition in L, and so agent 1 cannot get a bill passed by spending less than V.

Now the subgame-perfect equilibrium of the simple lobbying game can be described. The crucial question is whether rV (the hurdle factor times agent 0's value of the status quo) is more or less than W (agent l's value of passing a bill). If rV<W then agent 1 offers the optimal solution to problem (1) above, and agent 0 offers nothing (because she cannot block the bill without spending more than it is worth to her), and so the bill passes. On the other hand, if rV > W then both agents promise nothing and so the bill is not passed, because agent 1 knows that she cannot afford to pay enough to get the bill passed.

For a unicameral legislature with n members such that any majority can pass a bill, the hurdle factor r is

$$r = 2n/(n+1), \text{ if n is odd,}$$

$$r = 2, \text{ if n is even.}$$

To see why, notice first that a symmetric linear programming problem like this one must have a symmetric solution (by convexity), and so we know that an optimal solution exists in which every legislator gets the same amount x. To prevent agent 0 from blocking the bill, agent 1 must pay at least V to any group of (n+1)/2 legislators if n is odd, or to any group of n/2 legislators if n is even. Thus, if n is odd, we must have $x = 2V/(n+1)$ and $r = nx/V = 2n/(n+1)$. Similarly, if n is even, $x = 2V/n$ and $r = nx/V = 2$. Thus, taking the limit as n goes to infinity, Groseclose and Snyder have shown that the hurdle factor is 2 for a large assembly that operates by simple majority rule.

More generally, consider a large unicameral legislature which has a supermajority requirement that a fraction Q must support a bill to pass it, where $Q < 1$. Then any coalition with more than a 1-Q fraction of the assembly can block a bill, and so agent 1 cannot guarantee passage of the bill unless he promises V to each 1-Q fraction of the assembly. So the total promised to the whole assembly must be V/(1-Q). Thus, in a large

unicameral legislature with a supermajority requirement of Q, the hurdle factor is 1/(1-Q). Notice that for Q = .5 we have 1/(1-Q) = 2, while for the case of Q = 1 (perfect unanimity) the hurdle factor goes to infinity as n goes to infinity.

Consider now an assembly that approves bills by majority rule but requires that the chairman of the relevant gate-keeping committee must approve a bill before it can come to a vote. So agent 0 would block a bill if the committee chairman were paid less than V or if some half of the assembly were paid less than V. Thus, agent 1 must pay 3V to pass a bill, and the hurdle factor of such an assembly is r = 3.

On the other hand, if a single dictator had full authority to pass legislation, then the hurdle factor would be r = 1. In the lobbying game, the dictator sells his legislative power to the highest bidder, and so agent 1 can get the dictator's approval for the bill as long as agent 1's payment is not less than agent 0's value V. Of course, this result also follows from the analysis of finite majority-rule unicameral legislatures in the special case of n = 1.

The concept of hurdle factors thus allows us to classify different legislative processes according to the number and size of blocking coalitions. Intuitively the hurdle factor tells us how difficult it is to pass legislation. Note that the same hurdle factor can be implemented by different institutional arrangements. A 2/3-supermajority rule yields the same hurdle factor (r=3) as simple majority rule with one internal veto player (r=2+1).

When two or more legislative chambers are combined in a multicameral legislature, we define the hurdle factor of a single chamber to be the hurdle factor that would hold if the other chambers were eliminated and laws were passed just by the approval of this chamber. In most cases, the multicameral legislatures that we consider are serial, in the sense that a bill must be approved by all of its chambers to become a law. To pass a bill in a serial multicameral legislature, agent 1 must pay enough in each chamber to guarantee that no blocking coalition gets less than V. Thus, in any serial multicameral legislature, the

hurdle factor of the overall legislature is the sum of the hurdle factors of the separate chambers.

For example, in a large bicameral legislature where each chamber approves bills by simple majority rule, the hurdle factor is 2 + 2 = 4. That is, to pass a bill, agent 1 must promise at least 2V in each of the two chambers, and so she must pay 2V + 2V = 4V across the two chambers. If we add a president with an absolute veto (as a third one-person chamber), then the hurdle factor increases to 2 + 2 + 1 = 5. In this case, agent 1 must pay 2V in each of the two large chambers, plus 1V to the president, to prevent agent 0 from being able to buy either the president or half of one large chamber with V dollars.[9]

In contrast, we might occasionally study a bicameral or multicameral legislature that is parallel, in the sense that a bill is passed into law when it is approved by any one chamber. In such a parallel multicameral legislature, the hurdle factor of the overall legislature would be the minimum of the hurdle factors of the separate chambers. In the simple lobbying game, agent 1 would only pay to pass a bill through the chamber with the lowest hurdle factor.

The Organizational Stage - Manipulating Hurdle Factors by Internal Organization

We reviewed the analysis of Groseclose and Snyder's lobbying game to lay the groundwork for analyzing how changes in the rules of a chamber may affect the expected payoffs to members of the chamber. Now let us consider one chamber in a legislature, which may be unicameral, bicameral, or multicameral. Let us call this selected chamber the "House." We suppose that the constitution specifies that a majority vote is needed to approve a bill in the House, but the constitution also permits the legislators in the House to determine their own procedural rules and to organize themselves into factions or committees. As we have seen in the previous section, a change in these internal rules and

structures can change the House's hurdle factor to be 1 or 2 or any higher number. So now we can address our basic question: When would the expected payoffs of the legislators in the House be increased by raising or lowering the hurdle factor in the House?

Assuming that the House is one chamber in a serial multicameral legislature, let s denote the hurdle factor in the House, and let t denote the total hurdle factor for all other chambers in the legislature. That is, t is the sum of the separate hurdle factors of all other chambers, and the total hurdle factor for the whole legislature is r = s+t. We think of s as a decision variable which the House determines (subject to the general constraint that $s \geq 1$) by the procedural rules and the factional discipline that its members impose on themselves. Finally, let y denote the total payoff to all members of the House. Then

$$y = sV, \text{ if } (s+t)V < W,$$

$$y = 0, \text{ if } (s+t)V > W.$$

That is, agent 1 will pay sV to members of the House if she tries to pass the bill, but she will abandon the bill if the total cost sV + tV is greater than her value W. We may write y = y(s,t,V,W), to indicate that this total payoff y depends on the agents' values and the hurdle factors.

So when (s+t)V < W then a small increase in the House's hurdle factor would increase the total payoff to members of the House; but an increase in the House's hurdle factor above W/V - t would have the opposite effect, decreasing the all legislator's payoffs to 0. Thus, the House's optimal hurdle factor will depend on what is known or believed about the possible values of W and V.

We are assuming that legislative procedures and factional discipline in the House are long-term commitments that will be applied repeatedly to many different legislative opportunities over an extended period of time. That is, the House cannot redesign its internal procedures and institutional structure to fit any one specific bill. So we assume

here that the House chooses the structures that affect the hurdle factor in the House before W and V are drawn from some distribution. Then this hurdle factor must be applied in a sequence of repetitions of the basic lobbying game, each with a new pair of lobbyists with values V and W that are independently drawn from the same distribution. By the law of large numbers, the long-run average of total payoffs to the House in these repeated lobbying games will converge to the expected value for any one version of the lobbying game. So we may assume that the objective for the House is to define its internal structures so as to maximize the expected total payoff to the members of the House in the lobbying game. Thus, given the other chambers' hurdle factor t, the objective of the House in questions of structural reform is to choose its hurdle factor s so as to maximize $E(y(s,t,V,W))$, where V and W are treated as random variables with some specified distribution over the nonnegative numbers.

In this section, for simplicity, let us focus on one specific distributional assumption; then in subsequent sections we will show how the insights from this special case generalize to other distributional assumptions and other bargaining models. So to be specifice, let us assume now that V and W are independent random variables drawn from the same lognormal distribution.

In this lognormal case, $\log(V)$ and $\log(W)$ are independent normal random variables with some mean μ and some standard deviation σ. To simplify the notation, let us consider only the case where this logarithmic mean is μ is equal to zero (which could always be achieved by some change of our monetary units). Then with $\mu = 0$, the formulas $\alpha = \log(V)/\sigma$ and $\beta = \log(W)/\sigma$ yield independent standard normal random variables, such that $V<W/(s+t)$ when $\alpha < \beta - \log(s+t)/\sigma$. So lobbyist 1 will buy votes when $\beta-\alpha$ (which has mean 0 and standard deviation $\sqrt{2}$) is greater than $\log(s+t)/\sigma$, and the probability of this event is

$$P(V<W/(s+t)) = 1 - \Phi((\log(s+t)/(\sigma\sqrt{2}))$$

where Φ denotes the cumulative probability function for a standard normal random variable. More importantly, the expected total payoff to the House can be written as

$$E(y(s,t,V,W)) =$$
$$= \int_{-\infty}^{\infty} \int_{-\infty}^{\beta-\log(s+t)/\sigma} s e^{\alpha\sigma} \cdot \frac{\exp(-(\alpha^2+\beta^2)/2)}{2\pi} d\alpha\, d\beta$$
$$= s \cdot \exp(\sigma^2/2) \int_{-\infty}^{\infty} \int_{-\infty}^{\beta-\log(s+t)/\sigma} \frac{\exp(-((\alpha-\sigma)^2+\beta^2)/2)}{2\pi} d\alpha\, d\beta$$

But the integral in the last expression can be reinterpreted as the probability that $\beta-\alpha > \log(s+t)/\sigma$ when α and β are independent normal random variables such that α has mean σ and standard deviation 1, and β has mean 0 and standard deviation 1. With this reinterpretation, $\beta-\alpha$ has mean $-\sigma$ and standard deviation $\sqrt{2}$. Thus the expected total payoff to the House in our lognormal model is

$$E(y(s,t,V,W)) = s \cdot \exp(\sigma^2/2) \cdot (1 - \Phi((\sigma + \log(s+t)/\sigma)/\sqrt{2})). \quad (2)$$

Given any standard deviation σ and any hurdle factor t for the other serial chambers, we can now numerically find the House's hurdle factor s* that maximizes this expected payoff for the House subject to the constraint that $s \geq 1$. These optimal House hurdle factors are shown for selected σ and t in Table 1.

[Insert Table 1 about here]

Notice in Table 1 that the House's optimal hurdle factor s* increases as the external hurdle t increases, for each given σ. Thus, legislative hurdles outside of the House can induce the House to erect higher internal hurdles to legislation. This observation is the central result of this paper, and it has fundamental implications about how the internal organization of the House may depend on the other legislative institutions that are established by the constitution.

To interpret Table 1 in more detail, let us now focus on the special case of $\sigma = 0.8$ and consider the effects of different constitutional structures.

Unicameral Legislature. Consider first the case of a unicameral parliamentary system, where the House is the only chamber in the legislature. The absence of any other chambers means that t=0. So when the lognormal model with σ=0.8 characterizes legislators' beliefs about how lobbyists will value new legislation, Table 1 tells us that the optimal hurdle factor for the House is s*=1. This optimal hurdle can be achieved by adopting factional discipline in which a majority of the House elects a leader and agrees to vote for any bill that is recommended by the leader. (In a parliamentary system, this leader is probably best interpreted as the prime minister or as the designated minister with exclusive responsibility in his domain.) When a leader in the House has such disciplined majority support, agents for change offer to pay V to the leader whenever $V \leq W$, which has probability 0.5. So in this model with s=1 and t=0, the House should realize gains from half of all legislative opportunities, and the House's expected total payoff from formula (2) is $E(y) = 0.394$.

Without any disciplined majority faction, the hurdle factor would increase to s=2, because agent 1 would lobby for a bill only when $2V \leq W$. So the probability of passing profitable legislation would be decreased, and the House's expected total payoff from formula (2) would decrease to $E(y) = 0.329$. So in this case, the expected gains from additional legislation that is made possible by factional discipline in the House more than compensate for the expected losses due to the halving of payments in the case where an undisciplined House would pass the bill. In effect, streamlining the legislative process in the unicameral legislature can be compared to cutting the price in a market with elastic demand, where the increase in sales more than compensates for the loss in revenue per unit sold.

We may suppose that most or all of the leader's gains are distributed back to the members of the House (or at least to the members of the majority coalition that elected him), so that it is in the interests of everyone in the House to maintain the factional discipline. Notice, however, that discipline really is needed here. Consider, for example, the case where $V < W < 2V$. Suppose that the leader has agreed to distribute the payment V, which he will get from agent 1, equally among all n members of the House, provided that they obey him and pass the bill. Then each member of the House can expect to get V/n. But the deal would fall through if agent 0 could entice away n/2 legislators by offering them slightly more than V/n each if the bill fails (which costs agent 0 only V/2). To deter such deviations, the legislators must understand that breaking discipline in one case could set a precedent for others to break the discipline in the future, so that all legislators' expected payments would be reduced in the long run.

Unicameral with President. Now consider a legislature that consists of one large House and a president who has a veto. In this case, the hurdle factor outside the House is t=1, and Table 1 tells us that with σ=0.8 in the lognormal model, the optimal hurdle factor for the House is 1.57. Such a hurdle factor seems difficult to implement exactly, but an approximately optimal hurdle factor of s=1.5 can be achieved by a disciplined majority of the House approving every bill supported by the majority of an elected central committee of three leaders. (The House could also implement a hurdle of s=1.57 by an internal rule of ratifying any bill that has been endorsed by the president and more than 4/11 of the House members.)

If the House were to only consider only the simple two structural alternatives of full delegation to a single leader (s=1), and no factional discipline (s=2), then the existence of the presidential veto would reverse the House's ranking of these two alternatives, compared to the previous case. Using formula (2) with t=1 and σ=0.8, we get

$E(y) = 0.164$ if $s=1$.

$E(y) = 0.171$ if $s=2$.

Adding factional discipline in the House would decrease the total legislative hurdle $s+t$ from 3 to 2, and would thus increase the probability of passing profitable legislation; but the halving of revenue to the House from each bill that is passed makes this discipline unprofitable in the long run. In effect, the president's veto power makes lobbyists' demand for legislation less elastic with respect to the House's hurdle factor, and so reduces the incentives to maintain factional discipline in the House.

Bicameral Legislature. Now consider a bicameral legislature. If the other chamber operates by simple majority rule, without factional discipline or gatekeeping committees, then the other chamber has a hurdle factor of $t=2$. With $\sigma=0.8$, Table 1 tells us that the expected payoff to the members of the House is then maximized by a hurdle factor of 2.1. So the House would find it approximately optimal to match the other chamber and adopt simple majority rule with no factional discipline.

If we take seriously the optimality of $s = 2.1$ in this situation, then we find some advantage for the House to raise its hurdle slightly higher, say by adopting a supermajority requirement of $Q=52.5\%$ for closing debate and bringing a bill to a vote in the House. (Recall that such a Q-supermajority requirement effectively yields the hurdle factor $s=1/(1-Q)$ in the House.) Such an increase in the House's hurdle would make lobbyists spend more in the House, while the costs of losing some profitable legislation would be partly borne by the other chamber. If the other chamber similarly increased its own hurdle factor slightly above 2, then the House would have an incentive to increase s even a bit further. But Table 1 indicates that this process would converge below 2.25. In fact, for this lognormal model with $\sigma=0.8$, we find an equilibrium for a bicameral legislature in which the hurdle factors of the two chambers are $s = t = 2.20$. This equilibrium could be

implemented by having a supermajority requirement of 54.5% in each chamber to approve legislation, with no factional discipline in either chamber.

Notice that each chamber in a bicameral legislature should prefer to erect its hurdle factors in ways that are less likely to elicit such responses from the other chamber. Thus, we may expect hurdles to be erected under the cover of essential legislative activity such as gathering information or allowing debate.

Bicameral Legislature with presidential veto. Now consider a legislative system in which bills need the approval of two separate legislative chambers and an independently elected president. From the perspective of the chamber that we are calling the House, the external hurdle factor t is now the sum of the other chambers' hurdle factor plus one for the president. In this case, if the other chamber used simple majority rule with no factional discipline then the total hurdle outside the House would be 2+1 = 3. So, by Table 1 (with σ=0.8), the best hurdle factor for the House would be s=2.58, which could be implemented by a 60% supermajority requirement with no factional discipline. But when the House's hurdle is close to 2.5, we find that the other chamber's optimal hurdle increases to about 2.8 (the best response to 1+2.5 = 3.5 in the σ=0.8 column of Table 1).

In this lognormal model with σ=0.8, an equilibrium of hurdle-factors between the two chambers exists when both chambers set their internal hurdle factors near 3 (actually s*=3.03). Then each chamber faces an external hurdle factor of 1+3 = 4 from the other chamber and president, to which 3 is an approximate best reply, according to Table 1. For example, comparing the alternatives of s=2 and s=3 against an external hurdle of t=4, formula (2) tells us that the expected total payoff to House members is

E(y) = 0.0460 if s=3,

E(y) = 0.0435 if s=2.

Lowering the House's hurdle from 3 to 2 would increase the volume of profitable legislation somewhat. But the gains from this additional activity would be shared with the other chamber and the president, while the decreased hurdle would mean that lobbyists would spend less in the House when they pass legislation.

As we have seen, a hurdle factor of 3 in a legislative chamber can be implemented either by a 2/3 supermajority rule, or by majority rule with an internal veto player for legislation in any area. So in this equilibrium, the House can maximize the expected total payoffs to House members by a system in which, for each area of legislation, there is a gatekeeping committee chairman whose approval is required before the House can vote on a bill, and the House members then vote as undisciplined individuals with simple majority rule. So the lobbyist for a bill would have to pay V to the relevant House committee chairman plus another 2V to guarantee that the status-quo agent will not buy a blocking majority on the House floor.

To achieve this s=3 hurdle factor, however, it is important that the gatekeeping committee chairman should have only the negative power to prevent the House from considering a bill that he opposes. The committee chairman must not have the positive power to compel House members to vote on the floor for any bill that he supports, because in that case lobbyists would only have to invest in the chairman and so the hurdle factor would be only s=1. Distributing negative power in different areas of legislation to many different committee chairmen may serve to guarantee that an individual committee chairman is not strong enough to convert his negative power into positive power, by threatening House members who do not support a bill that he has endorsed.

On the other hand, consider what would happen if a majority of House members happened to favor a bill that the relevant committee chairman opposed. The temptation to force a discharge from committee would be deterred by the expectation that doing so could

undermine the committee system that maximizes average payoffs in the House. That is, in a bicameral legislature, a member of House floor should expect that his gains from undermining the chairman's gatekeeping power in one case would be less than his future losses from the erosion of his own gatekeeping power in other legislation. As in the case of central leadership discussed above, this argument relies on the intuition that the gains from committee chairmanship can be distributed among the members of the House, either by a system of favors and transfers to junior members of the House, by a proliferation of gatekeeping subcommittees with rotating chairmen, or by a seniority system in which House members who are not currently committee chairmen can nevertheless anticipate a positive expected payoff from a committee chairmanship later in their careers.[10]

Optimal Hurdle Factors with Other Distributions

The previous section considered only one special distribution for the lobbyists' values V and W: the lognormal distribution. The specific values of optimal hurdles that we found for various constitutional structures obviously depended on this distributional assumption and the value of the parameter σ. But the main insight of our paper, that each chamber's optimal internal hurdle factor s* tends to increases as the external hurdle increases, can be extended to more general distributional assumptions.

Consider first the case where V and W are independent random variables drawn from a uniform distribution on the interval from 0 to 1. In this case, when the House has internal hurdle s and other serial chambers generate the external hurdle t, the expected total payoff to the House is

$$E(y(s,t,V,W)) = \int_0^1 \int_0^{w/(s+t)} sv \, dv \, dw = s/(6(s+t)^2).$$

Given any $t \geq 1$, this expected value is maximized by choosing s such that

$$s = t.$$

(and by $s = 1$ if $t = 0$, because of the constraint that $s \geq 1$).

More generally, if V and W are drawn independently from any probability distribution on the nonnegative numbers that has a finite variance σ^2 and has a positive density f(0) at zero, then for all sufficiently large t, the optimal hurdle $s^*(t)$ will increase approximately as t, just as in this uniform example. This result holds because, when the external hurdle t is large, legislation can pass only when V is small, and a positive density at 0 means that the probability distribution of V looks approximately uniform near 0. Formally, when t is large, the payoff to the House satisfies

$$\begin{aligned} E(y(s,t,V,W)) &= \int_0^{\infty} \int_0^{w/(s+t)} sv\, f(v)\, dv\, f(w)\, dw \\ &\approx \int_0^{\infty} \int_0^{w/(s+t)} v\, s\, f(0)\, dv\, f(w)\, dw \\ &= \int_0^{\infty} 0.5\,(w/(s+t))^2\, s\, f(0)\, f(w)\, dw \\ &= 0.5\, E(W^2)\, f(0)\, s/(s+t)^2. \end{aligned}$$

and this last formula is maximized over s by setting s equal to t.

Legislative Demand Functions and Extensions to Other Bargaining Models

We have focused on a specific model for illustrative purposes, but the basic structure of our analysis can be applied much more generally. We have assumed that, for any given external hurdle factor t from other legislative chambers, the House would choose its own internal hurdle factor s so as to maximize

$$E(y(s,t,V,W)) = s\, D(s+t)$$

where the function D is defined by the formula

$$D(r) = \int_0^{\infty} \int_0^{w/r} v\, f(v)\, dv\, f(w)\, dw$$

for any nonnegative number r. The function D may be called a legislative demand function, because it measures the expected value (from the status-quo agent's perspective) of legislation that will be passed when the overall legislative hurdle factor is r. In the

models considered here, this legislative demand function D(r) is positive and decreasing in r. These functional properties alone are enough to justify a version of our basic claim that bicameral separation tends to increase hurdles within a legislative chamber.

When r is the overall hurdle factor for the entire legislature, the total expected payoff to all legislators in our model is rD(r). If all legislators could act cooperatively as one large chamber, then they could maximize their total expected payoff by choosing the total legislative hurdle factor r so as to maximize rD(r), subject to the constraint $r \geq 1$. Letting r_0 denote such a cooperative optimum r_0, we must have either $r_0=1$ or, at an interior optimum,

$$D(r_0) + r_0 D'(r_0) = 0.$$

Consider now what would happen if the chambers in a serial multicameral legislature tried to implement such a cooperative optimum, with hurdle factors s in the House and t in the other chambers such that

$$s + t = r_0.$$

Then the House, which gets expected payoff sD(s+t), would find

$$\partial / \partial s\,(sD(s + t)) = D(s + t) + sD'(s + t) = -t\, D'(r_0) > 0.$$

So if bicameral separation means that the House actually chooses its procedural hurdles independently of the other chambers, then the House should prefer to deviate from the cooperative optimum (s,t) by raising its hurdle factor s as long as $D'(r_0)$ is negative. (In the boundary case of $r_0=1$, s+t cannot equal r_0 because s and t are each at least 1. So bicameral separation raises hurdle factors above the cooperative optimum in the boundary case as well.) Thus, bicameral separation gives each legislative chamber an incentive to raise its hurdle factor, relative to what the legislators would choose if procedural decisions were centralized in the legislature.

These results can be extended to other models of lobbying in a multicameral legislature, in which the relative difficulty of getting a bill approved by each chamber can be measured by some nonnegative hurdle parameter. To directly extend the preceding argument, we need only that these hurdle parameters satisfy two properties. First, the expected amount that lobbyists must spend in a chamber to get any given piece of legislation approved is proportional to the chamber's hurdle parameter. Second, the expected volume of legislation that lobbyists will attempt to get approved can be written as a strictly decreasing differentiable function of the total of these hurdle parameters over all chambers. These general properties imply that the expected spending by lobbyists in any one chamber can be written (as above) in the form $sD(s+t)$, where s is this chamber's hurdle parameter, t is the total of other the chambers' parameters, and $D(s+t)$ is a decreasing function of $s+t$. In any such legislature, if $s+t$ were chosen to maximize the expected total spending by lobbyists across all chambers, then a unilateral increase of the hurdle parameter in one chamber would increase the expected spending by lobbyists in this chamber.

To see the intuition behind this result, it may be helpful to compare the chambers of a bicameral legislature to monopolistic producers of complementary goods, like left shoes and right shoes. The approval of one chamber in a serial bicameral legislature is as useless as a single unmatched shoe. But if the overall demand for shoes is a decreasing function $D(r)$ of the total price r for a matched pair, then breaking up a shoe monopoly into a monopolistic left-shoe producer and a monopolistic right-shoe producer would increase the equilibrium price for matched pairs of shoes. Such a price increase should occur because the left-shoe producer would be insensitive to the decrease in profits that the right-shoe producer would suffer when the price of left shoes is increased. Our analysis of bicameral separation essentially applies the same logic, because serial legislative chambers are

providing complementary services to the interest groups that want to pass legislation. The Groseclose-Snyder model has served in our analysis only to provide a formal way of quantifying different procedural hurdles as legislative "prices." A different model of legislative decision making might yield different quantitative measures of the relative obstructiveness of various legislative procedures, but we should still find the basic parallel with the complementary monopolists' problem that is expressed in the sD(s+t) formula above. Bicameral separation makes members of the House relatively insensitive to other chambers' losses from decreased legislative activity

Similar results can even be derived in a model of legislative bargaining when lobbyists have a fixed inelastic demand for legislation, as would occur in our model if the legislators knew the lobbyists' valuations in advance. Then the legislative actors face a bargaining problem on how the available wealth should be allocated. In a previous paper (Diermeier and Myerson, 1994) we analyzed this problem by using different bargaining approaches at the legislative stage such as the Shapley value or Baron and Ferejohn's sequential model, and we got similar results. For the intuition behind these results, consider the case of one large chamber and a president with veto powers. If the chamber delegates the authority to agree on a proposal to a "chairman", then the bargaining situation becomes a two-person bargaining problem between the president and the chairman. Symmetric bargaining solutions such as the Shapley value or the Baron-Ferejohn model suggest that the benefits should be shared equally between the president and the chairman, who in turn may distribute (some of) the benefits back to the chamber's members. On the other hand, if the chamber gives only blocking power to its chairman, then the president as well as the chairman still have symmetric powers (each can block a bill), but now the other members of the chamber also have some bargaining power: they have to approve the bill. Consequently, the chamber's total share of the payoff should increase to more than half.

Creating multiple internal veto players could further increase the chamber's total payoff, since all players with blocking power (the president and the chamber's internal veto players) have symmetric bargaining power and thus should receive equal expected payoffs. But the higher the number of internal veto players in the chamber, the smaller is the payoff to the president.

As a theory of legislative organization, our analysis here has relied on the assumption that monitoring compliance and allocation benefits among legislators requires the close daily relationship that is shared by members of the same chamber but not across chambers.[11] In the Federalist 51, Madison suggests that one purpose of dividing the legislature into different chambers is to achieve such separation that makes it more difficult for a collusive faction to control the whole legislature. ("to render them, by ... different principles of action, as little connected with each other as their common functions and their common dependence on the society will admit.") So assuming some greater disconnection between chambers seems appropriate in a theory that seeks to understand the consequences of bicameralism.

The result that multi-cameral legislatures encourage the existence of internal veto players, however, applies only to serial multicameral chambers. For a contrast, consider a legislature, consisting of a president and two large chambers, such that a bill can be passed by approval of the president and a majority of either one of the two large chambers. In our lobbying game, such a legislature creates a competition between the two parallel chambers to lower their hurdles. Given the lobbyists' values V and W, the agents for change will want to invest in the least costly legislative coalition that the status-quo advocates cannot block. So if the House has a higher hurdle factor than the other parallel chamber, then proponents of legislation will ignore the House and only invest in the other chamber. The competition among such parallel chambers to have the lower hurdle factor should

ultimately lead, in each chamber, to the formation of a disciplined faction that follows the legislative directions of its leader. We may then predict that, if the U.S. Congress were changed to a parallel legislature in which a bill could be passed by approval of the president plus a majority of either the Senate or the House, then the current system of separate gate-keeping committees in each chamber would cease to exist.

Conclusions

Our simple model shows how overall legislative structures can be ranked according to the incentives to centralize decision powers. The greatest incentive to delegate legislative authority to a coherent leadership was found in a simple unicameral legislature. The addition of a president with veto powers, who in effect constitutes a one-person second legislative chamber, can provide incentives for the first chamber to dismantle a system that delegates legislative power to a single leader. Increasing the membership of the second chamber from 1 to some large n can then create stronger incentives for the first chamber to introduce internal veto players and super-majority requirements. Adding other serial chambers or a president with veto powers further increases this incentive to raise internal legislative hurdles in the first chamber.

We have shown that the important distinction between the power to pass a bill unilaterally and the power to block it can be formally captured by the concept of hurdle factors. We did not uniquely specify how any given hurdle factor must be implemented, however. Indeed, super-majority requirements and majority rule with internal veto players may yield the same hurdle factor. This has the rather surprising conclusion that the existence of super-majority requirements in one chamber may lead to the establishment of internal veto players in the other chamber(s). Explanations can be offered as to why one

legislative structure should be chosen rather than another with the same hurdle factors, but this question goes beyond the scope of our simple model.

Our general approach could also be applied to the related question of the internal organization of legislative parties. As an example consider the case of a unicameral legislature that is divided into a set of factions whose membership has been externally fixed, e.g. for electoral reasons. Suppose that these parties are disciplined in the sense that on the floor every party member must support the party caucus' decision (again, say, for electoral reasons). Then each party caucus can be interpreted as a "chamber," thus leading to a particular form of "multicameralism," determined by the number of parties and by their majority status. Note that this case is in-between our notion of serial and parallel legislatures. We can then ask whether such exogenous legislative parties would have an incentive to introduce internal veto players and how these incentives depend on the number of parties and their respective seat shares.

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Table 1.

Optimal hurdle factor s for House in lognormal model.

External hurdle t:	Standard deviation of log(V) and log(W): $\sigma = 0.6$	$\sigma = 0.8$	$\sigma = 1.0$	$\sigma = 1.2$
0	1.00	1.00	1.24	1.85
1.00	1.00	1.57	2.41	3.67
1.25	1.05	1.71	2.64	4.03
1.50	1.12	1.84	2.87	4.38
1.75	1.18	1.97	3.09	4.71
2.00	1.25	2.10	3.30	5.03
2.25	1.31	2.22	3.50	5.34
2.50	1.38	2.34	3.70	5.65
2.75	1.44	2.46	3.89	5.94
3.00	1.50	2.58	4.08	6.23
3.25	1.56	2.69	4.27	6.52
3.50	1.62	2.80	4.45	6.79
3.75	1.68	2.91	4.63	7.07
4.00	1.73	3.02	4.80	7.33
4.25	1.79	3.13	4.98	7.60
4.50	1.85	3.23	5.15	7.86
4.75	1.90	3.33	5.32	8.12
5.00	1.96	3.44	5.48	8.37
5.25	2.01	3.54	5.65	8.62
5.50	2.07	3.64	5.81	8.87
5.75	2.12	3.74	5.98	9.12
6.00	2.17	3.83	6.14	9.36
6.25	2.23	3.93	6.29	9.60

ENDNOTES

[1] This was already observed by Bagehot (1867;p.9). "By [the cabinet] we mean a committee of the legislative body selected to be the executive body".

[2] McKelvey and Riezman (1992) provide such a model using an electoral story; Diermeier (1995) relies on an informational framework in an overlapping generations model.

[3] It is important to distinguish between a majority decision *on a specific bill* and the long-term interest of the chamber majority to maintain a strong committee system. Here we mean the former.

[4] See Rogowski (1990) for a persuasive argument that cabinets (a) should be interpreted as legislative institutions and (b) have considerably more power than Congressional committees.

[5] Note that in the multi-party case both informational and distributive theories would still predict similar organizational structures for both Congress and parliamentary democracies. In the two-party case, the *de facto* decision making body is the majority party caucus. But then the standard theories implying the emergence of strong *party* committees. This conclusion, however, is at odds with empirical reality. While we do frequently find party committees, they do not possess any of the veto powers associated with Congressional committees (Lees and Shaw 1979).

[6] The political science literature has mainly focused on studying the institutions regulating conflict resolution between the chambers, such as conference committees or *navette* procedures. (Tsebelis and Money 1997).

[7] We follow the terminology of Groseclose and Snyder (1996). Here we wish to emphasize that this notion should not be taken literally. Rather it stands for a variety of distributional benefits including a lucrative job after retirement from the chamber. In the Groseclose-Snyder framework legislators have preferences over both policy and the divisible benefits. For any pair of suggested policy and status we can then calculate the amount of money it

would take a legislator to switch his vote. Our analysis starts with these (policy-) induced preferences over money. Similar remarks apply to the notion "lobbyist".

[8] Groseclose and Snyder (1996) show how this basic model can be extended to include policy consequences.

[9] The U.S. Congress does not quite fit the definition of a serial multicameral legislature because of the possibility of a veto-override by 2/3 majorities of the House and Senate. From the perspective of this simple model, however, this veto-override provision is not significant. The 2/3 veto-override option allows that agent 1 can get a bill passed by paying 3V in the House and 3V in the Senate, rather than by paying 1V to the president plus 2V in the House and 2V in the Senate. So the alternative legislative path that is allowed by the 2/3 veto-override has a hurdle factor of 6, which is higher than the hurdle factor of 5 that is available without it. Thus our analysis predicts that lobbyists for change should generally ignore the more expensive option of overriding a presidential veto, and should lobby just as they would if the Congress were a purely serial bicameral legislature with a presidential veto. According to our analysis, the veto-override provision would become relevant only if the veto-override quota were decreased below 3/5 as in some Latin American countries (Shugart and Carey 1992).

[10] For an example of a model of deference to a committee using an overlapping generation model see Diermeier (1995).

[11] Indeed, this is what we mean by a multi-cameral system. See also the discussion of our basic assumptions above.