Asymmetric Information and Legislative Rules: Some Amendments

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We reexamine the major tenets of the informational theory of legislative rules, focusing on the informational efficiency of rules with varying degrees of restrictiveness. When committees are heterogeneous, full efficiency is attainable under the unrestrictive open rule as well as the somewhat restrictive modified rule. In contrast, the restrictive closed rule always leads to inefficiencies. When committees are homogeneous, the situation is different. All equilibria are inefficient regardless of legislative rules, but the closed rule leads to greater informational efficiency than does the open rule. Furthermore, the efficiency gains under the closed rule more than offset distributional losses regardless of the degree of preference divergence. We also examine the incentives provided by the different rules for information acquisition and committee specialization.

It is universally acknowledged that the process of legislation can have a dramatic effect on policy. Legislative rules determine how bills are introduced, amended, and voted upon. Since the mid-nineteenth century, specialized standing committees have come to play an important role in the U.S. congressional process, because almost all bills are drafted in committee before being sent to the floor for a vote. The House of Representatives has eighteen committees specializing in a range of issues, including the important Rules Committee. It sets the rules under which each bill is considered, and these determine whether and how the bill may be amended. The closed rule is a restrictive procedure that does not permit amendments to be offered on the floor, whereas the open rule allows amendments to be freely offered. Currently, some intermediate type of restrictive rule is used for most bills. Sinclair (1994) points out that restrictive rules are used with increasing frequency. They were applied to only 15% of the bills in the 95th Congress, compared to 66% in the 102d Congress.[1] A practical effect of these amendment limitations is to give considerable power to committees in guiding the final form of the bill to the House floor.

Why does the House adopt restrictive amendment procedures, thereby ceding substantial authority to the committees? Theoretical explanations fall into two major categories, and the debate about them has been termed the institutional design controversy (Sinclair 1994). Distributive theories postulate that the legislative process is organized so as to facilitate rent extraction on the part of members. As a result, a committee is likely to be the subset of the legislature with the most to gain from the actions of the committee, and restrictive rules allow these members to appropriate rents from legislation. Informational theories postulate that the role of the committee is to gather information relevant to the legislation. The legislative process itself is a device for conveying information from the committee to the legislature, and restrictive rules may be more effective at this than unrestrictive rules. This article reexamines the major tenets of informational theories.

In two important works, Gilligan and Krehbiel (1987, 1989) develop formal models that constitute the underpinnings of informational theory. Their analysis is based on two premises. First, information gathering is the primary reason for the existence of specialized committees. By holding hearings and other investigations into the effect of various policies, they obtain a degree of knowledge not possessed by other members of the House. Second, the interests of committee members are not the same as those of the median voter on the House floor. Thus, there is both an asymmetry of information and a divergence of preferences between the committee and the legislature. Various actions by the committee convey information to, and thus indirectly influence, the legislature. Legislative rules affect how much information transmission takes place as well as how this information is translated into policy outcomes.

Open, closed, and modified (an intermediate form) legislative rules are evaluated on two grounds. First, how effective is a particular rule in overcoming the asymmetry of information? Different rules result in different amounts of information flowing from the committee to the legislature, and the more information that flows, the better it is for all parties. It is argued that greater informational efficiency may be fostered by rules that evolve in practice.[2] Second, how effective is a particular rule in providing the committee with the incentives to acquire relevant information? Different rules provide different incentives, and if information

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[1] The degree of restrictiveness varies a great deal. The vast majority of bills are assigned "modified open" or "modified closed" rules. Completely open or closed rules are applied much more rarely. See Sinclair 1994.

[2] A rule is said to have greater informational efficiency than others if it transmits more information from the committee to the legislature. Put another way, the residual uncertainty faced by the legislature under that rule is smaller than under others.

acquisition is costly for the committee, it may be that one set of rules leads it to acquire the information and become specialized, whereas another set does not. It is argued that greater specialization may be fostered by rules that evolve in practice.

In this article, we study the most informationally efficient equilibrium arising under each rule. We do this separately for two cases: heterogeneous and homogeneous committee member preferences. We also study the incentives to specialize. Our three main findings can be summarized as follows. First, with heterogeneous committees, the open and modified rules are fully informationally efficient, and the legislature faces no residual uncertainty (propositions 1 and 5, below). In contrast, all legislative equilibria under the closed rule are informationally inefficient (proposition 2). Second, with homogeneous committees, the closed rule is more informationally efficient than the open rule, regardless of the divergence of preferences among the committee and the legislature (propositions 6 and 8). Third, with heterogeneous committees, the modified rule provides the best overall incentives to specialize. With homogeneous committees, the closed rule provides the best overall incentives.

RELATED THEORETICAL WORK

The models we study were introduced by Gilligan and Krehbiel (1987, 1989), who found that informational inefficiency is pervasive, regardless of the particular rule or committee preferences. When the committee is heterogeneous, they found the closed rule most efficient. When the committee is homogeneous, the relative efficiency of rules depends upon the degree of preference divergence between the committee and the legislature. Closed are superior to open rules if that divergence is not too great, and the reverse is true when the divergence is large.

Our results differ significantly from those of Gilligan and Krehbiel. Since our model and methods are identical, it is worth exploring the reasons for this discrepancy. Informational theory models typically have multiple equilibria. Hence, a comparison of rules is also a comparison of a single equilibrium selected for each rule. It is important that the criterion used to select a particular equilibrium be applied in a consistent manner across all rules. Gilligan and Krehbiel (1987, 1989) propose maximal informational efficiency as the appropriate criterion (see the next section), but we show that they do not apply it consistently. We apply this criterion uniformly for each rule under consideration, which accounts for the difference in our results and theirs. Detailed comparisons and contrasts are discussed later.

Our work is also related to Epstein (1998), who looks at equilibria arising in the Gilligan and Krehbiel (1989) model when the majority committee median has gatekeeping power and all committee members are specialized. He points out that the equilibrium selected under the open rule by Gilligan and Krehbiel is not robust to the introduction of asymmetric committees. The equilibria we analyze under the open or modified rule are not subject to this criticism.

Baron (1999) modifies the Gilligan and Krehbiel (1987) model and allows the legislature to design contracts conditional on the bill proposed by the committee. Thus, his framework is a screening model of legislative rules as opposed to a signaling model.

Absent any rules restrictions, the actions of the committee are just "cheap talk." Crawford and Sobel (1982) analyze a general cheap talk model with a single sender and find that full informational efficiency cannot be attained. Battaglini (2000) studies two-sender cheap talk models in which the underlying uncertainty may be multidimensional. He introduces a model in which committee members are perfectly informed only with probability $1 - \varepsilon$ and examines the limiting case as ε becomes small. Equilibria that are robust to such a modification are called ε-stable. Battaglini's main result is that full informational efficiency can be achieved only when there is more than one dimension of uncertainty. Since the equilibria we construct under the open rule are fully efficient, they are not ε-stable. The full implications of ε-stability in the one-dimensional case are yet to be explored. For instance, there is no characterization of the most efficient ε-stable equilibrium, even under the open rule. Furthermore, how this requirement affects equilibria under restrictive rules remains an open question as well.

Austen-Smith (1990) examines the influence on the legislative process of cheap talk, that is, debates. He finds that these play a significant role in setting the legislative agenda, even if they are informationally irrelevant. Austen-Smith (1993) also examines belief formation in a setting in which the committee and the legislature have different prior distributions that are not commonly known. He then evaluates how the process by which bills are referred to committee can affect outcomes. Again, the issue of restrictive rules is not central to his analysis.

Restrictive legislative rules are a means of agenda control on the part of the committee. Agenda control has been studied in other contexts as well. For example, Romer and Rosenthal (1979) use a model of monopoly agenda control by a budget-maximizing bureaucrat to show that the median voter theorem may not hold in these circumstances. Banks (1990) extends their model to a situation of asymmetric information, so that only the agenda-setting bureaucrat knows the "disagreement outcome" if the proposal put forward is rejected.

Shepsle and Weingast (1987) study a model that seeks to isolate the sources from which committees derive political power. They show how the legislative process confers such power on committees and highlight the important role played by committees during the conference procedure in a bicameral legislature.

Dewatripont and Tirole (1999) examine the specialization question in a model of advocates. Although the information gathering role of an advocate is similar to that of a committee member, there are many important differences. First, the decision maker can commit to direct monetary compensation of the advocates (as in Baron 1999 also). Second, the advocates are ideologically neutral: They are not directly interested in the decision (the legislation) itself and care about it only to the extent that their reward may be contingent on the decision. Finally, the advocates are given only limited strategic power: They can either conceal the information they have acquired or reveal it truthfully. Dewatripont and Tirole show the informational benefits of heterogeneity in areas of specialization, not preferences. One may question, however, whether a framework in which the legislature can, in effect, sign an optimal contract with ideologically neutral committee members and compensate them monetarily is appropriate as a model of congressional committees. Moreover, the model is silent on the effect of process, in the form of restrictive rules, on legislative outcomes.

We will begin by sketching the informational theory models of legislative rules. We then study informational efficiency for open, modified, and closed rules when committees are heterogeneous. We next consider the case of a homogeneous committee and compare open and closed rules. We then endogenize the specialization decision of the committee and study the efficacy of restrictive rules with both heterogeneous and homogeneous committees. Finally, we discuss some of the empirical implications of our results and conclude with some comments on what our results say regarding the institutional design controversy. Detailed proofs of all propositions are contained in the Appendix.

THE MODEL

We will briefly sketch the Gilligan and Krehbiel (1989) model of legislation that originates in heterogeneous committees. The reader should refer to their article for further details and motivation. To facilitate comparison, we adopt their notation exactly.

There are three players in the game. Initial proposals are made by two *committee members*, $c1$ and $c2$. The third player is the *legislature*, ℓ, which ultimately determines the policy to be adopted. All players care about a unidimensional *outcome* $x \in X$. Each committee member has an ideal outcome, denoted by x_{c1} and x_{c2}, respectively. The legislature's ideal outcome, x_ℓ, is set equal to zero without loss of generality. All players use "quadratic loss" utility functions to evaluate actual outcomes. Thus, the legislature's utility from an outcome x is

$$u_\ell(x) = -(x_\ell - x)^2 = -x^2,$$

whereas the committee members' utilities are

$$u_{c1}(x) = -(x_{c1} - x)^2 \text{ and } u_{c2}(x) = -(x_{c2} - x)^2,$$

respectively. It is supposed that $x_{c1} \geq 0$, and $x_{c2} = -x_{c1}$. Thus, each committee member is "biased" relative to the legislature, and the two members are biased in opposite directions. In what follows, we write $x_{c1} = x_c$ and $x_{c2} = -x_c$.

The committee proposes one or more bills, b, and the legislature then chooses a *policy* $p \in P \subset \mathbf{R}$. The policy p results in an uncertain outcome, $x = p + \omega$, that depends on some underlying state of nature $\omega \in [0, 1]$. Because the state of nature is assumed to be uniformly distributed, ω has mean $\bar{\omega} = 1/2$ and variance $\sigma^2_\omega = 1/12$. It is assumed that $x_c < 3\sigma^2_\omega = 1/4$.

There is an exogenously given status quo policy, p_0. We suppose that $-1 \leq p_0 \leq 0$, so it is not the case that the status quo policy is never optimal from the perspective of the legislature. Indeed, it is optimal if $\omega = -p_0$.

The sequence of moves is as follows. First, nature reveals the state ω to both committee members. Second, the committee members send bills to the legislature in accordance with the rules set out below. Third, the legislature adopts a policy in accordance with the rules.

Legislative Rules

Three different rules governing the legislative process are considered. (1) The open rule allows both $c1$ and $c2$ to propose bills, $b_1 \in P$ and $b_2 \in P$, respectively. The legislature is free to choose any policy $p \in P$ it wishes. (2) The closed rule allows $c1$ to propose a bill $b \in P$ but does not allow $c2$ to make a proposal. Instead, $c2$ can influence the policy only by making a speech of the form $\omega \in [a, b]$. The legislature is constrained to choose from the set $\{b, p_0\}$, where p_0 is the status quo policy. (3) The modified rule also allows both $c1$ and $c2$ to propose bills, b_1 and b_2. The legislature is constrained to choose among the policies $\{b_1, b_2, p_0\}$.

Strategies and Solution Concept

A strategy for committee i, $b_i(\omega)$, specifies a bill to propose for each state of nature. A strategy for the legislature $p(b_1, b_2)$ specifies a feasible policy for each pair of bills. Finally, the legislature forms a posterior distribution $g(b_1, b_2)$ over the state space.

We use exactly the same solution concept as Gilligan and Krehbiel (1987, 1989), that of legislative equilibrium, to determine the set of outcomes arising under the various rules.[3] Formally, strategies and beliefs, $(b_1^*(\omega), b_2^*(\omega), p^*(b_1, b_2), g^*(b_1, b_2))$, comprise a legislative equilibrium if (1) the legislature selects the policy that maximizes expected payoffs given beliefs; (2) each committee member chooses b_i to maximize payoffs, given $p^*(b_1, b_2)$; and (3) beliefs are formed using Bayes's rule wherever possible.

Equilibrium Selection Criterion

We choose the most informationally efficient equilibrium occurring under each rule. This is the natural criterion in the context of informational theories. Indeed, Gilligan and Krehbiel (1989, 461, emphasis in the original) write: "the primary and unique focus of the analysis is on the *informational efficiency* of rules."

[3] A legislative equilibrium is the same as a perfect Bayesian equilibrium of a costless signaling game. See Banks 1991 for a detailed account of the use of signaling games in political science.

Because greater informational efficiency leads to a greater reduction in uncertainty, it is a collective good that is unanimously preferred.

We contend that the major implications of informational theory to date are derived by selecting equilibria under the different rules in an inconsistent manner. For instance, the conclusions of Gilligan and Krehbiel (1987) are based on comparing an informationally efficient equilibrium under the open rule to an informationally inefficient equilibrium under the closed rule. Likewise, the equilibria selected by Gilligan and Krehbiel (1989) for each of the rules (open, modified, and closed) are not the most informationally efficient.

Measuring Informational Efficiency

In order to obtain a measure of informational efficiency, we define the equilibrium outcome function as

$$X(\omega) \equiv p^*(b_1^*(\omega), b_2^*(\omega)) + \omega.$$

We can then write the expected utility of the legislature as

$$Eu_\ell = -\underbrace{\operatorname{Var} X}_{\text{Informational}} - \underbrace{(EX)^2}_{\text{Distributional}},$$

where Var X, the variance of the random variable X, represents informational losses to the floor median, and $(EX)^2$ represents distributional losses. Likewise, for a committee member, let us say $c1$, we have:

$$\begin{aligned} Eu_{c1} &= -E(x_c - X)^2 \\ &= -\underbrace{\operatorname{Var}\ X}_{\text{Informational}} - \underbrace{(EX - x_c)^2}_{\text{Distributional}}. \end{aligned} \tag{1}$$

The variance in outcomes is a measure of informational efficiency and can be used to compare both different equilibria under a given legislative rule and, for given equilibrium selections, the rules themselves.

Homogeneous Committees

The model of a homogeneous committee is identical to that above if one deletes player $c2$ from the game. Absent $c2$, the definitions of modified and closed rules are identical; hence, only two rules (open and closed) are considered in this environment.

HETEROGENEOUS COMMITTEES

In this section, we compare the informational properties of the open, modified, and closed rules in the case of heterogeneous committees.

Open Rule

With heterogeneous committees, when no rule restrictions are in place, it is possible to obtain full informational efficiency through the bills proposed by the committee.

Several definitions will prove helpful. Fix an equilibrium under the open rule. Given proposals b_1 and b_2 from committee members $c1$ and $c2$, respectively, we will say that the two committee members agree if there exists an ω such that $b_1^*(\omega) = b_1$ and $b_2^*(\omega) = b_2$. In other words, proposals b_1 and b_2 are consistent with the equilibrium. If there is no such ω, then the committee members are said to disagree. In that case, the legislature can be sure that at least one committee member has deviated from the equilibrium strategy.

PROPOSITION 1. *A legislative equilibrium under the open rule is*

$$b_1^*(\omega) = -\omega,$$

$$b_2^*(\omega) = \begin{cases} -\omega - 2x_c & \text{if } \omega \le 1 - 2x_c \\ -\omega + 2x_c & \text{if } \omega > 1 - 2x_c \end{cases}.$$

If $c1$ and $c2$ agree, then

$$p^*(b_1, b_2) = b_1.$$

If $c1$ and $c2$ disagree and $b_1, b_2 \in [-1, 0]$, then

$$p^*(b_1, b_2) = \begin{cases} b_1 & \text{if } u_{c2}(b_2 + \omega_1) > u_{c2}(b_1 + \omega_1) \\ b_2 & \text{if } u_{c2}(b_2 + \omega_1) \le u_{c2}(b_1 + \omega_1) \end{cases},$$

where $\omega_1 = -b_1$ and $u_{c2}(x) = -(-x_c - x)^2$.
If $c1$ and $c2$ disagree, $b_i \notin [-1, 0]$, and $b_j \in [-1, -0]$, then

$$p^*(b_1, b_2) = b_j.$$

Otherwise,

$$p^*(b_1, b_2) = p_0.$$

The beliefs of the legislature are

$$g^*(b_1, b_2) = -p^*(b_1, b_2).$$

The expected utilities are

$$Eu_\ell = 0,$$

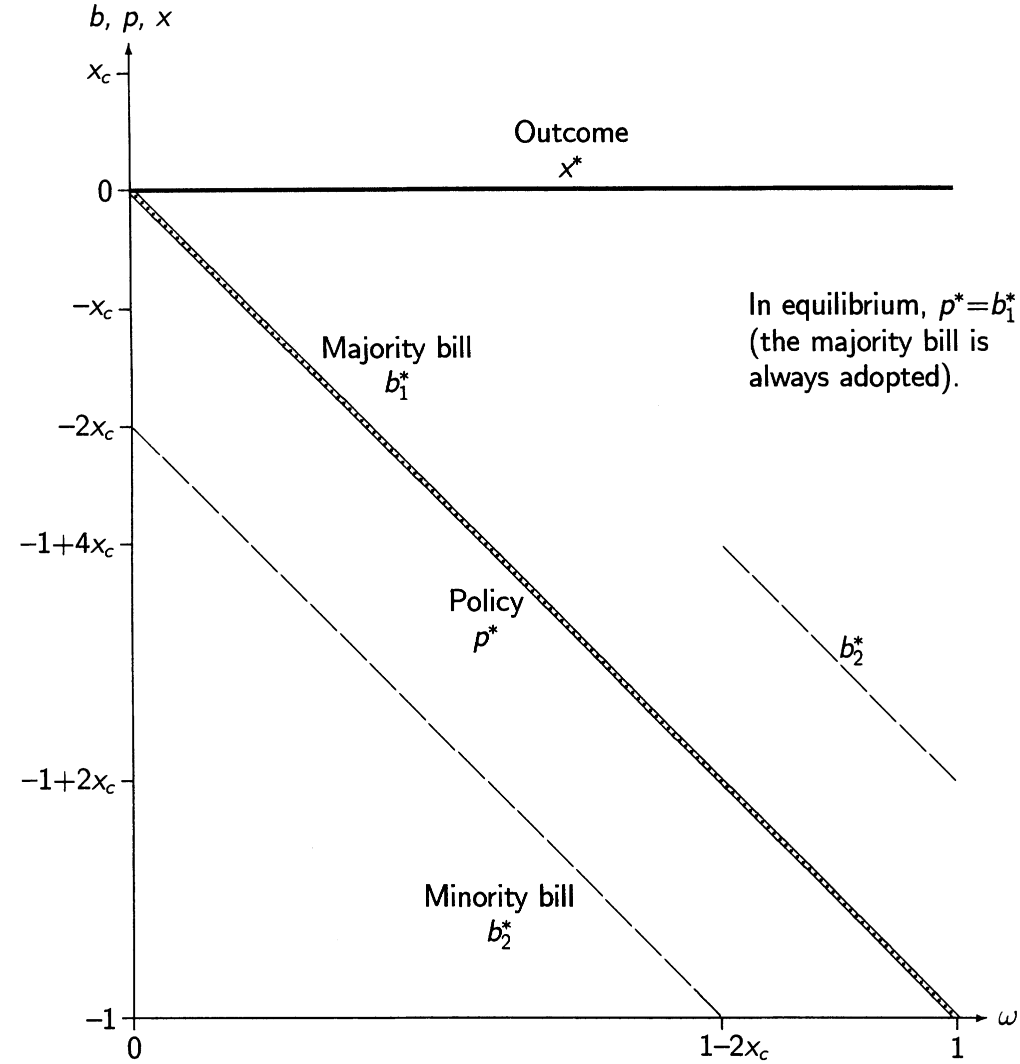
$$Eu_{c1} = -x_c^2 = Eu_{c2}.$$

Figure 1 illustrates the open rule equilibrium identified in proposition 1.

The strategies in proposition 1 can be explained intuitively as follows. The majority bills coincide with the legislature's ideal policy in each state. The minority bills, however, do not coincide with the ideal policy for the legislature and are not fully revealing. If the majority and minority members agree, that is, a state exists that would result in the bills proposed, then the legislature infers that both are telling the truth and adopts the majority bill.

In case of a disagreement, the legislature first hypothesizes that the majority is reporting accurately. Under this hypothesis, if the minority proposal is "self-serving," in the sense that adoption of its bill would benefit it relative to adoption of the majority bill, then the legislature accepts the working hypothesis that the majority is reporting accurately and adopts the majority bill. Under the same hypothesis, if the minority proposal is not deemed self-serving, the legislature

FIGURE 1. An Informationally Efficient Equilibrium under the Open Rule



Note: The horizontal axis measures the state of nature (ω)—known to committee members but not to the legislature. The vertical axis simultaneously measures bills proposed (b_1, b_2), policies adopted (p), and outcomes (x). The legislature's ideal outcome is zero. Since the outcome is simply the sum of the state and the policy, the legislature's ideal policy lies along the negative 45-degree line. The line segments in the figure denoted with asterisks are the bills, policies, and outcomes occurring in equilibrium. The figure depicts an equilibrium where, in each state, the majority proposes the legislature's ideal, which is then adopted, so the outcome, labeled x^*, is zero in every state. The minority proposes more extreme bills, which serve to discipline the majority. The discontinuous line, labeled b_2^*, depicts the minority's bills. The discontinuity occurs in state $\omega = 1 - 2x_c$, depicted on the horizontal axis, where the minority is indifferent between the legislature's ideal policy, $p = -1 + 2x_c$, and the lowest possible policy, $p = -1$, both depicted on the vertical axis.

rejects the hypothesis that the majority is reporting accurately and adopts the minority bill. Notice that the minority has no incentive to induce disagreement because in exactly the circumstances in which the bill it proposes is advantageous, such a bill will be viewed as self-serving and not be adopted.

The argument that the majority also wishes to follow the equilibrium strategy is slightly more involved. In equilibrium, the majority never prefers the minority bill to its own, so it will never induce a disagreement that leads to adoption of the minority bill. Could the majority benefit by inducing a disagreement that leads to adoption of its own bill? That would require the minority bill to appear self-serving. When the minority bill is lower than the legislature's ideal, it will be deemed self-serving only if the majority bill is also lower than the legislature's ideal. Since the majority's ideal is higher than the legislature's, this cannot be advantageous for the majority. When the minority bill is higher than the legislature's ideal, it will be deemed self-serving only if the majority bill is even higher. Notice, however, that the bill the minority proposes in these situations is already so high that the majority is just indifferent between it and the legislature's ideal. Thus, proposing an even higher bill cannot be advantageous for the majority.

In equilibrium, the majority bill is always adopted, so it seems the minority has little influence. Yet, the minority bills have an important preventive role to play, since they act to discipline the majority and are the key to generating full informational efficiency.[4]

It is useful to contrast the fully revealing equilibrium in proposition 1 with the partially revealing equilibrium constructed by Gilligan and Krehbiel (1989) in their proposition 1.[5] To facilitate the comparison, consider an example in which $x_c = 1/8$. In the Gilligan and Krehbiel construction, the legislature is able to obtain its ideal policy only when the state is extreme, either very small ($\omega < 1/4$) or very large ($\omega > 3/4$). In intermediate states, a single default policy ($b = -1/2$) is adopted. Their equilibrium is sustained as follows. When the states are extreme, both the majority and the minority propose their ideal bills, $b_1 = -\omega + 1/8$ and $b_2 = -\omega - 1/8$, respectively. Because the difference in two ideal bills is always the same ($b_1 - b_2 = 1/4$), the legislature is able to infer that they "agree." The legislature then splits the difference between these two bills by amending one of them to policy $-\omega$, which is also the legislature's ideal policy. In moderate states, the majority and minority propose bills chosen randomly from $[-7/8, 1/8]$ and $[-9/8, -1/8]$, respectively. This results in a disagreement almost always, in which case the legislature infers only that the state is between $1/4$ and $3/4$. It is then optimal for the legislature to adopt the default bill.

Notice that when the state is sufficiently extreme ($\omega < 1/4$ or $\omega > 3/4$), both the minority and the majority prefer the legislature's ideal policy, $-\omega$, to the default bill, $-1/2$. For more moderate states ($\omega \in [1/4, 3/4]$), at least one of the committee members prefers the default bill to $-\omega$ and so chooses to send a bill at random. Thus, the legislature's ideal policy is adopted only half the time. The (residual) variance in outcomes is $1/96$.

In our construction, the strategies specified in proposition 1 require that the minority propose the bill $-\omega - 1/4$ if $\omega \leq 3/4$ and propose $-\omega + 1/4$ if $\omega > 3/4$. In every state, ω, the majority always proposes the bill $-\omega$. Two key features generate full revelation in this equilibrium. First, in every state ω the majority never prefers the minority bill to $-\omega$. Second, the minority bill is not adopted if it is viewed as self-serving. In the example, a minority bill is self-serving if and only if $b_1 > b_2 > b_1 - 1/4$, that is, when the minority bill is lower than the majority bill, but not by too much. We have already explained why neither member has any incentive to deviate. In equilibrium, the legislature's ideal policy is always adopted, and the (residual) variance in outcomes is 0.

Our construction differs in several important respects. First, it is intuitive. The legislature simply adopts the bill proposed by the majority. The minority bill (mostly) is biased in the direction that the minority favors. In the event of a disagreement, it seems likely that the legislature may try to judge the motives of the minority using the yardstick set by the majority and decide which bill to adopt on this basis. In addition, the bills proposed by the committee in our construction are neither random nor extreme, that is, outside the set of policies the legislature might conceivably wish to adopt, $[-1, 0]$.

Second, the preceding arguments do not make explicit use of the particular structure of the model. Our construction above is for the case in which the committee members are symmetrically opposed to one another, but it is easy to verify that a similar construction is valid for all values of x_{c1} and x_{c2}, such that $x_{c1} - x_{c2} < 1/2$. Moreover, we do not rely on the assumption that the distribution of states is uniform or that preferences are quadratic. Indeed, one can show that the legislature, by using the self-serving yardstick to judge majority and minority bills, can successfully induce full informational efficiency in a more general set-up.

A key feature of our construction is that the legislature is flexible in resolving disagreements among the committee members. That is, in the event of disagreement, the bill adopted by the legislature depends on the nature of the disagreement. This flexibility is essential to obtaining full informational efficiency.

The equilibrium described in proposition 1 leads to the outcome 0 in every state, so it follows that this is the best equilibrium for the legislature. But notice that $EX = 0$ for all equilibria under the open rule. This is because in any equilibrium, following any pair of bills b_1, b_2, the legislature must choose $p^*(b_1, b_2) = -E(\omega|b_1, b_2)$, the expectation of $-\omega$ conditional on the signals. Because, in equilibrium, the beliefs are formed using Bayes's rule, this implies that $EX = 0$. Thus, all equilibria arising under open rules are optimal from a distributional perspective. Combining this with the efficiency properties of the equilibrium in proposition 1 implies that this equilibrium is unanimously preferred to all others arising under the open rule. Finally, we have:

COROLLARY 1. *The equilibrium described in proposition 1 is unanimously preferred to all equilibria under the open rule.*

Closed Rule

In the previous section we showed that under the open rule full informational efficiency can be achieved. Here we show that the additional restrictions imposed by the closed rule preclude such outcomes. In particular, for a nontrivial interval of states, the status quo policy is chosen even though it is not the ideal policy for any of the parties.

In contrast to proposition 1, we have:

PROPOSITION 2. *Every equilibrium under the closed rule is informationally inefficient.*

The intuition for this result is that when the status quo policy coincides with the ideal policy of the majority member, he can guarantee this by proposing $b = p_0$. In other words, the majority chooses to kill the proposed legislation in committee, which leaves the

[4] It is intuitive that the minority can discipline the majority by proposing very extreme bills. In our construction, however, the minority bills are not too extreme: They all lie within $2x_c$ of the legislature's ideal policy $-\omega$.

[5] The reader may wish to compare our Figure 1 with Figure 1 in Gilligan and Krehbiel 1989, 470.

status quo as the only option available to the legislature. When the status quo policy is lower than the ideal policy for the majority, disagreement between the majority and the legislature leads the majority to kill that bill as well. It is not in the interest of the majority to propose a policy lower than the status quo, and it is not in the interest of the legislature to adopt a policy higher than the status quo. Hence, there is an interval in which neither party gets its ideal policy.

We next show that informational losses are unavoidable under the closed rule, but distributional losses are not. Fix an equilibrium under the closed rule. Given a bill b from $c1$ and a speech s from $c2$, we will say that the two committee members agree if there exists an ω such that $b = b^*(\omega)$ and $s \subseteq s^*(\omega)$. In other words, b and s are consistent with the equilibrium. If there is no such ω, then the committee members are said to disagree. If there is a disagreement, then the legislature can be sure that at least one committee member has deviated from the equilibrium strategy.

PROPOSITION 3. *A legislative equilibrium under the closed rule is:*

$$b^*(\omega) =$$

$$\begin{cases} -\omega & \text{if } \omega \leq -2x_c - p_0 \\ -2\omega + (-2x_c - p_0) & \text{if } -2x_c - p_0 \leq \omega \leq -x_c - p_0 \\ p_0 & \text{if } -x_c - p_0 < \omega < x_c - p_0 \\ -2\omega + (2x_c - p_0) & \text{if } x_c - p_0 \leq \omega \leq 2x_c - p_0 \\ -\omega & \text{if } \omega \geq 2x_c - p_0 \end{cases};$$

$$s^*(\omega) = -b^*(\omega).$$

If $c1$ and $c2$ agree, then

$$p^*(b, s) = b.$$

If $c1$ and $c2$ disagree, then

$$p^*(b, s) = p_0.$$

The beliefs of the legislature are

$$g^*(b, s) = \begin{cases} -b & \text{if } b = -s \neq p_0 \\ U[-x_c - p_0, x_c - p_0] & \text{if } b = -s = p_0 \\ -p_0 & \text{if } b \neq -s \end{cases}.$$

The expected utilities are

$$Eu_\ell = -\frac{4}{3}x_c^3,$$

$$Eu_{c1} = -\frac{4}{3}x_c^3 - x_c^2 = Eu_{c2}.$$

Figure 2 illustrates the equilibrium described in proposition 3.

The strategies used in proposition 3 can be understood as follows. If both committee members prefer the ideal policy of the legislature to the status quo, then the ideal policy is proposed by the majority, supported by the minority, and adopted. If only the majority (minority) prefers the status quo to the ideal policy, then a compromise bill, b, such that the majority (minority) is indifferent between b and the status quo, is proposed by the majority, supported by the minority, and adopted. If the compromise bill is worse than the status quo for either the majority or the minority, then the bill is killed in committee. A feature of the equilibrium is that all bills are supported by the minority, that is, "cosponsored."

Again, it is useful to compare the equilibrium in proposition 3 to the equilibrium under the closed rule constructed by Gilligan and Krehbiel.[6] The two constructions are not too dissimilar, but in the Gilligan and Krehbiel equilibrium the majority party is able to wield its power and obtain its ideal policy a significant proportion of the time. As an example, if $x_c = 1/8$ and $p_0 = -1/2$, then the majority's ideal policy results half the time (when $\omega < 1/8$ or when $\omega > 5/8$), but the ideal policy of the legislature is never realized. The fact that the majority wields such power in the Gilligan and Krehbiel equilibrium leads to significant distributional losses relative to our equilibrium. In addition, there are also informational losses. Continuing with the example, in the Gilligan and Krehbiel equilibrium the variance of outcomes is $5/768$, whereas the distributional losses are $1/256$.

In contrast, in the equilibrium of proposition 3, the ideal policy of the legislature is adopted half the time (when $\omega < 1/4$ or when $\omega > 3/4$), and the ideal policy of the majority is never realized. In addition, the frequency with which legislative compromise tilts in favor of the majority is exactly the same as the frequency with which it tilts in favor of the minority. Thus, although there are distributional effects in specific instances, these exactly offset each other. As a result, there are no distributional losses, and the variance of outcomes is $1/216$. Thus, on both informational and distributional grounds this equilibrium dominates the Gilligan and Krehbiel equilibrium.

A key feature of all equilibria under the closed rule is a substantial amount of inertia; that is, the ideal policy for the legislature must diverge widely from the status quo for any change in policy to take place. For instance, in the example studied above, there is no change in policy from the status quo for all states $\omega \in [3/8, 5/8]$.

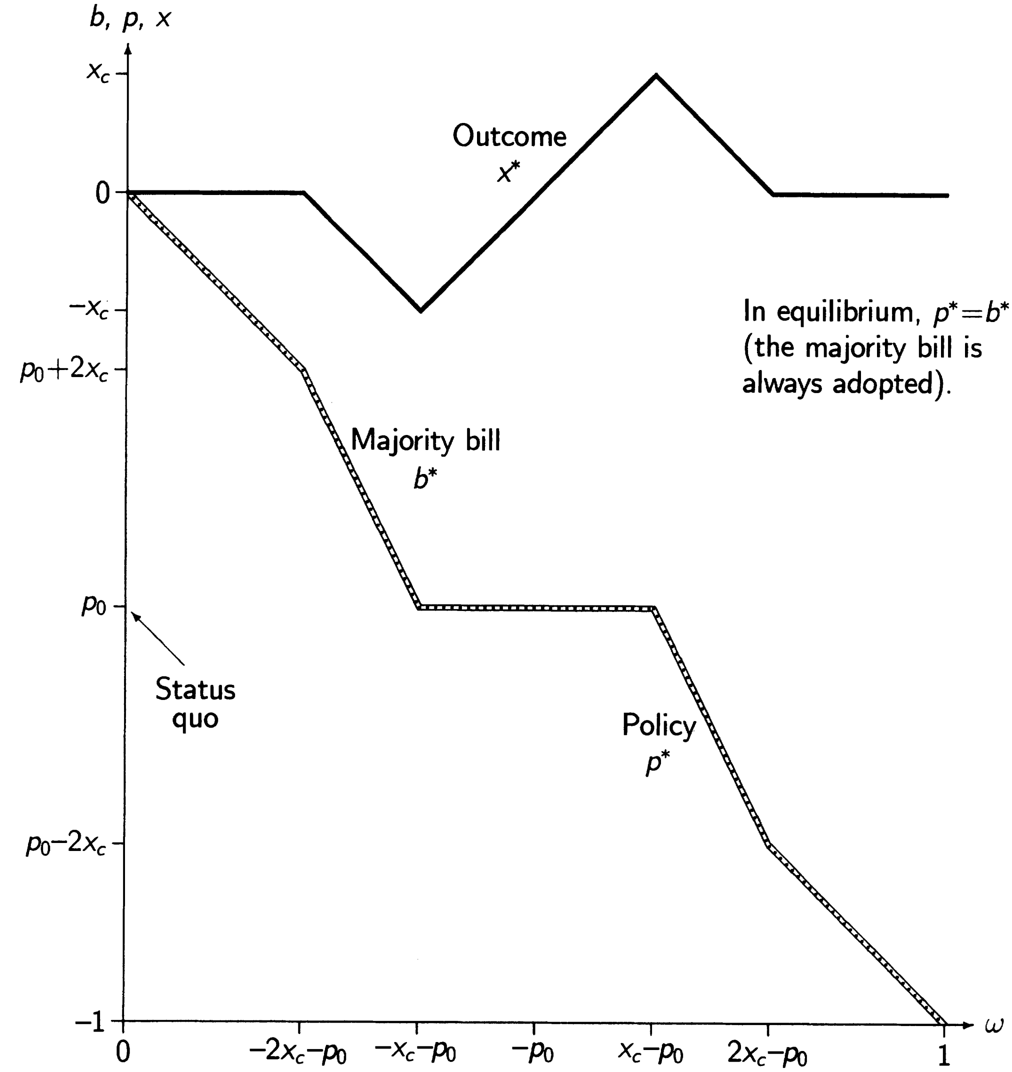
Our next result shows that from the perspective of the legislature the equilibrium constructed in proposition 3 dominates all equilibria under the closed rule.

PROPOSITION 4. *The legislative equilibrium identified in proposition 3 is the best for the legislature among all equilibria under the closed rule.*

Under the restrictive closed rule, the legislature cedes substantial power to the majority member on the committee. As proposition 2 demonstrates, this inevitably leads to informational losses. But this need not necessarily lead to distributional losses: In the equilibrium of proposition 3 there are none. As a consequence, the most informative equilibrium under the open or modified rule is unanimously preferred to the above equilibrium under the closed rule.

[6] The reader may wish to compare our Figure 2 with Figure 3 in Gilligan and Krehbiel 1989, 479.

FIGURE 2. An Equilibrium under the Closed Rule



Note: The horizontal axis measures the state of nature (ω)—known to committee members but not to the legislature. The vertical axis simultaneously measures majority bills (b), policies adopted (p), and outcomes (x). Notice that under the closed rule, only the majority can propose bills. The status quo policy (p_0) is also depicted on the vertical axis and is set equal to negative one-half. The legislature's ideal outcome is zero. The line segments in the figure denoted with asterisks are the bills, policies, and outcomes occurring in equilibrium. The figure depicts an equilibrium where, in extreme states (close to zero or close to one), the majority proposes the legislature's ideal. In states close to one-half, the status quo is maintained. The status quo policy, p_0, depicted on the vertical axis, first gets adopted in state $\omega = -x_c - p_0$, depicted on the horizontal axis. In intermediate states, the majority proposes a "compromise" policy midway between the legislature's ideal and the status quo. In the figure, these compromise policies begin in state $\omega = -2x_c - p_0$, depicted on the horizontal axis, where the minority is indifferent between the legislature's ideal policy, $p = p_0 + 2x_c$, and the status quo policy, p_0, both depicted on the vertical axis. The majority's proposals are always adopted. The dark line, labeled x^*, depicts the resulting outcomes.

Modified Rule

We have demonstrated that under the open rule full informational efficiency is possible (proposition 1) and that under the closed rule it is impossible (proposition 2). Together these seem to suggest that restrictive rules also restrict the amount of information transmitted from the committee to the legislature. Our next result shows, however, that this view is mistaken: Under the restrictive modified rule, full informational efficiency can be achieved.

PROPOSITION 5. *Fix any status quo p_0. The legislative equilibrium under the open rule described in proposition 1 is also a legislative equilibrium under the modified rule.*

Proposition 5 follows immediately from an examination of the equilibrium strategies given in proposition 1: The strategy of the legislature always consists of a choice from the set $\{b_1, b_2, p_0\}$, thus conforming to the modified rule.

It is useful to contrast the restrictions on possible policies under the closed rule with those under the modified rule. Under the closed rule, in the event of a disagreement between committee members, the only recourse of the legislature is to adopt the status quo,

TABLE 1. Legislature's Preferences over Rules with a Heterogeneous Committee

Rank	Informational	Distributional
1.	Open/Modified	Open/Modified/Closed
2.	Closed	—

which leads to the "inertia" observed under the closed rule. In contrast, under the modified rule, the legislature can choose the minority proposal in the event of a disagreement. As proposition 1 shows, this additional flexibility is all that is necessary to generate full efficiency.

A Comparison of Rules

Using the expected utility calculations in propositions 1, 3, and 5, we obtain the ranking in Table 1 among the equilibria under each of the rules.

We see that, in contrast to the trade-off illustrated in Gilligan and Krehbiel (1989), the open and modified rules dominate the closed rule according to both informational and distributional criteria. Moreover, regardless of the status quo action, modified rules are just as effective as open rules and superior to completely closed rules in terms of informational efficiency, regardless of the degree of preference divergence.

HOMOGENEOUS COMMITTEES

We now examine informational efficiency for the case of homogeneous committee preferences, that is, the committee may be represented by a single pivotal actor. In this case, the modified and closed rules are the same, so we compare only the open and closed rules.

Open Rule

Under the open rule, the Gilligan and Krehbiel (1987) model is isomorphic to the costless signaling model of Crawford and Sobel (1982). That is, all legislative equilibria arising under the open rule have only a finite number of equilibrium policies (see lemma 1 of Crawford and Sobel 1982) and thus are informationally inefficient.

COROLLARY 2. *Every equilibrium under the open rule with a homogeneous committee is informationally inefficient.*

Theorem 3 of Crawford and Sobel (1982) characterizes the most informationally efficient equilibrium under the open rule with homogeneous committees. For future reference, we state this as follows.

PROPOSITION 6. *The most informationally efficient equilibrium under the open rule with a homogeneous committee results in the following expected utilities:*

$$Eu_\ell = -\frac{1}{12N^2} - \frac{x_c^2(N^2-1)}{3},$$

$$Eu_c = -\frac{1}{12N^2} - \frac{x_c^2(N^2-1)}{3} - x_c^2,$$

where N is the smallest positive integer greater than or equal to $(-1/2 + 1/2\sqrt{(1 + 2/x_c)})$.

As is the case under open rules with heterogeneous committees, no equilibrium entails distributional losses. The one that is most informationally efficient is also unanimously preferred by all parties.

Closed Rule

We now compare the information content under the open rule relative to the closed rule. Notice that proposition 2 holds as well for a homogeneous committee.

PROPOSITION 7. *Every equilibrium under the closed rule with a homogeneous committee is informationally inefficient.*

Because both open and closed rules lead to informational inefficiencies, we must examine the informativeness of equilibria under the closed rule as compared to the open rule.

PROPOSITION 8. *Suppose $3x_c \leq -p_0 \leq 1 - x_c$. With a homogeneous committee, a legislative equilibrium under the closed rule is:*

$$b^*(\omega) =$$

$$\begin{cases} -\omega + x_c & \text{if } 0 \leq \omega \leq -3x_c - p_0 \\ 4x_c + p_0 & \text{if } -3x_c - p_0 \leq \omega \leq -2x_c - p_0 \\ 2x_c + p_0 & \text{if } -2x_c - p_0 < \omega < -p_0 \\ p_0 & \text{if } -p_0 \leq \omega \leq x_c - p_0 \\ -\omega + x_c & \text{if } x_c - p_0 \leq \omega \leq 1 \end{cases};$$

$$p^*(b) =$$

$$\begin{cases} b & \text{if } b \notin (p_0, 2x_c + p_0) \cup (2x_c + p_0, 4x_c + p_0) \\ p_0 & \text{otherwise} \end{cases}$$

The beliefs of the legislature are:

$$g^*(b) =$$

$$\begin{cases} x_c - b & \text{if } 4x_c + p_0 < b \leq x_c \\ U([-3x_c - p_0, -2x_c - p_0]) & \text{if } b = 4x_c + p_0 \\ U([-2x_c - p_0, -p_0]) & \text{if } b = 2x_c + p_0 \\ U([-p_0, -p_0 + x_c]) & \text{if } b = p_0 \\ x_c - b & \text{if } -1 + x_c \leq b < p_0 \\ -p_0 & \text{otherwise} \end{cases}$$

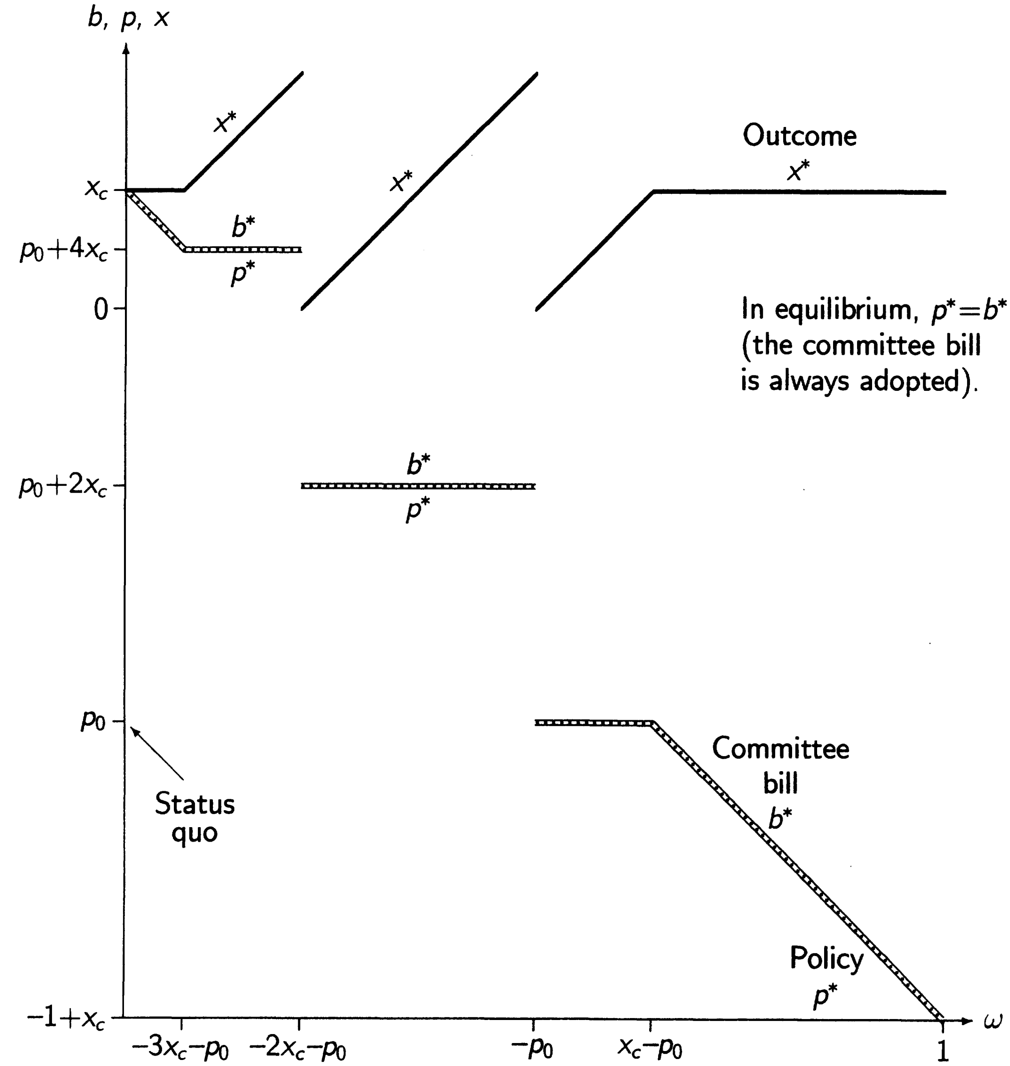
The expected utilities are

$$Eu_\ell = -\frac{4}{3}x_c^3 - x_c^2,$$

$$Eu_c = -\frac{4}{3}x_c^3.$$

Figure 3 illustrates the closed rule equilibrium identified in proposition 8.

FIGURE 3. An Equilibrium under the Closed Rule with a Homogeneous Committee



Note: The horizontal axis measures the state of nature (ω)—known to the committee but not to the legislature. The vertical axis simultaneously measures committee bills (b), policies adopted (p), and outcomes (x). The status quo policy (p_0) is also depicted on the vertical axis. The legislature's ideal outcome is zero while the committee's ideal outcome is x_c. The line segments in the figure denoted with asterisks are the bills, policies, and outcomes occurring in equilibrium. The figure depicts an equilibrium under the closed rule where, in extreme states (close to zero or close to one), the committee proposes its ideal policy. In intermediate states, the committee proposes one of three bills, one of which is the status quo. The discontinuous line with three steps, labeled b^*, depicts the committee proposals, which are always adopted. In the figure, the first discontinuity occurs in state $\omega = -2x_c - p_0$, depicted on the horizontal axis, where the committee is indifferent between the policy, $p = p_0 + 4x_c$, and the legislature's ideal policy, $p_0 + 2x_c$, both depicted on the vertical axis. The second discontinuity occurs in state $\omega = -p_0$, depicted on the horizontal axis, where the committee is indifferent between the policy, $p = p_0 + 2x_c$, and the legislature's ideal policy, which happens to be the status quo p_0, both depicted on the vertical axis. The dark line, labeled x^*, depicts the resulting outcomes.

The intuition for this result is that, when the legislature's ideal policy diverges substantially from the status quo, the legislature is willing to cede power to the committee and exchange distributional losses for informational gains. In these circumstances, the committee proposes its own ideal policy; confronted with the choice between this and the status quo, the legislature adopts the proposed bill. When the legislature's ideal policy is close to the status quo, the committee cannot force the legislature to accede to its demands. The situation becomes much more complex, and in equilibrium the committee proposes one of three policies. In particular, when the status quo lies between the legislature's ideal policy and the committee's ideal policy, no compromise can be reached, so no new policy is adopted.

This equilibrium is similar to the one constructed by Gilligan and Krehbiel (1987, proposition 5). Their construction differs from ours in that for states between $-p_0 - 3x_c$ and $-p_0 + x_c$ only two policies are chosen. As a consequence, the informational efficiency of the equilibrium in our proposition 8 is higher than in the Gilligan and Krehbiel equilibrium. At the same time the distributional losses in the two equilibria are the same. As a result, the equilibrium derived here is unanimously preferred to the Gilligan and Krehbiel equilibrium. More concretely, consider the case in which $x_c = 1/8$ and $p_0 = -1/2$. The distributional losses

TABLE 2. Legislature's Preferences over Rules with a Homogeneous Committee

Rank	Informational	Distributional	Overall
1.	Closed	Open	Closed
2.	Open	Closed	Open

in both the Gilligan and Krehbiel equilibrium and the equilibrium in proposition 8 amount to $1/64$. The latter is superior on informational grounds, however, with informational losses of $1/384$ compared to losses of $1/96$ in the Gilligan and Krehbiel equilibrium.

Comparison of Rules

It appears to be difficult to characterize explicitly the most informative legislative equilibrium under the closed rule with a homogeneous committee. In particular, we do not know whether the equilibrium in proposition 8 is the most informative. Nevertheless, a comparison shows that for all values of $x_c < 1/4$, this closed rule equilibrium is more informative than any equilibrium under the open rule. Furthermore, the following proposition shows that this is preferred by the legislature to any equilibrium under the open rule.

PROPOSITION 9. *Suppose* $x_c - 1 \leq -p_0 \leq 3x_c$. *With a homogeneous committee, the equilibrium in proposition 8 is informationally superior to all open rule equilibria. Furthermore, all open rule equilibria are worse for the legislature than the equilibrium in proposition 8.*

The conclusion of proposition 9 alters the results of Gilligan and Krehbiel (1987), who find the closed rule superior to the open rule if and only if the committee is not composed of "preference outliers," that is, x_c is not too large. With preference outliers, the distributional losses to the legislature exceed any informational gains in selecting the closed rule over the open rule. We find that the potential informational gains under the closed rule are, in fact, greater than in the Gilligan and Krehbiel (1987) equilibrium. As a consequence, informational gains always more than offset distributional losses, and the closed rule is superior even with preference outliers. We summarize these findings in Table 2.[7]

SPECIALIZATION

Thus far we have compared the informational efficiency of different legislative rules under the assumption that committee members are informed. An additional basis for comparing rules is the incentives that each rule provides for the committee to become informed about the implications of policies on outcomes. Information gathering is expensive: The committee staff does research, cost-benefit studies are conducted, hearings are held, and so on. Legislative rules differ in the efficiency and distributional gains that accrue to the committee, so it may well be that under one rule a committee chooses to become informed, but under another rule it does not. Clearly, the efficiency losses due to remaining uninformed are likely to be severe. To study these effects, we examine the efficiency and distributional gains from specialization under each rule for heterogeneous and homogeneous committees.[8] In this section, we suppose that the status quo reflects the fact that the legislature is completely uninformed, that is, $p_0 = -1/2$. We further suppose that the conditions required for proposition 8 hold; in particular, $3x_c \leq -p_0$, so $x_c \leq 1/6$.

Homogeneous Committees

With specialized committees, we showed that closed rules lead to greater efficiency as well as distributional gains to the committee as compared to the open rule. When the committee is unspecialized, the best the legislature can do under each rule is simply maintain the status quo; thus, there are no differences, either in efficiency or distributional effects, between the two rules. As a consequence, the closed rule provides a strictly greater incentive to specialize than does the open rule. This is not to say that the committee will specialize whenever it is socially desirable to do so. Because efficiency gains accrue to both the committee and the legislature, the committee's specialization decision does not take into account all the net social gains from specialization. In other words, in some circumstances the committee will not choose to specialize even though it is socially desirable to do so. Moreover, the committee's decision to specialize takes into account distributional gains to itself but not distributional losses to the legislature. In other words, in some circumstances a committee will choose to specialize even though it is socially undesirable to do so. As a result, although a closed rule provides the best incentives to specialize, it does not align private and social incentives.

Heterogeneous Committees

In heterogeneous committees, the exact nature of the process by which committee members become informed affects the incentives to specialize. It is useful to distinguish two cases. If the information is acquired publicly as a result of committee hearings or general staff reports, then all committee members are informed. If the information is acquired privately as a result of staff working exclusively for either the majority or minority, then it is possible that one side of the committee is informed but the other is not.

Public Information. When information is publicly acquired, the decision to become specialized is committee-wide, that is, either every member or none become

[7] Because the distributional losses under the open rule are zero, the losses under the best legislative equilibrium will always be (weakly) larger.

[8] We omit the formal analysis underlying the results reported in this section, but it may be obtained from the authors.

specialized. As we showed previously, equilibria with specialized committees under the open, modified, and closed rules do not differ in their distributional characteristics (indeed, all three rules lead to no distributional gains to either the majority or minority), but the open and modified rules lead to greater efficiency gains compared to the closed rule. In contrast, when the committee is unspecialized, the best the legislature can do under each rule is simply maintain the status quo; hence there are no differences, either in efficiency or distributional effects, among the rules. As a consequence, the open and modified rules provide strictly greater incentives to specialize than does the closed rule. This happens because there are greater efficiency gains under the open or modified rule, and the committee suffers no reductions in distributional gains relative to the unspecialized case. Because distributional effects are absent, it is never the case that a committee operating under these rules will choose to specialize, even when it is socially undesirable to do so. Of course, since the committee's specialization decision does not account for the full efficiency gains accruing to society, it is still the case that it may be socially desirable to specialize, but the committee will choose not to do so.

Private Information. When information is privately acquired, the decision to specialize is taken separately by the majority and the minority.

First, consider the majority's specialization decision. If the majority anticipates that the minority will remain unspecialized, the strategic situation is the same as for a homogeneous committee. This is obvious under the open and closed rules. Under the modified rule, the unspecialized minority could, in principle, actively participate in shaping the legislative outcome. Yet, one can show that such participation can only be detrimental on informational grounds. Thus, the incentives to specialize under the modified rule are identical to those under the closed rule in the homogeneous case. Therefore, the closed and modified rules provide the best incentives for the majority to specialize when the minority remains unspecialized.

Next, suppose the majority anticipates that the minority will become informed. If the majority remains unspecialized, then, under the open rule, the outcome is the same as in the homogeneous case. Under the modified rule, the unspecialized majority could, in principle, be an active participant. Once again, this can only have deleterious informational consequences, so the most informative outcome is the same as under the closed rule in the homogeneous case. Under the closed rule, however, such active participation by the unspecialized majority is beneficial. A comparison of these outcomes to the outcomes when both are specialized determines the majority's specialization incentives. We find that when preference divergence is large, the adverse distributional effects associated with giving power to the minority dominate; hence, the modified rule provides the best incentives to specialize. When preferences are less divergent, the relatively larger efficiency gains associated with the closed rule dominate, and it provides the best incentives for the majority to specialize.

Second, consider the minority's specialization decision. If the minority anticipates that the majority will remain unspecialized, then its gains from specialization under the open rule are identical to those under the open rule in the homogeneous case. For reasons given above concerning the majority's incentives, the gains to the minority from specialization under the modified rule are identical to those under the closed rule in the homogeneous case. Under the closed rule, there are some limited gains from specialization to the minority—it can work with the unspecialized majority to overturn the status quo when that serves their mutual best interest. We find that the modified rule provides the best incentives for the minority to specialize when the majority is unspecialized.

Finally, suppose the minority anticipates that the majority will specialize. If the minority remains unspecialized, then, under the closed or modified rules, the outcome is the same as with a closed rule in the homogeneous case. Likewise, the open rule coincides with the homogeneous case. We find that when preference divergence is large, the distributional losses from the modified rule dominate, and it provides the best incentives to specialize. When preference divergence is relatively small, the large efficiency gains of the open rule dominate, and it provides the best incentives.

To recapitulate, the modified rule provides the best incentives for both sides to specialize when preferences are divergent. When preferences are less divergent, there is a trade-off among the rules. The closed rule provides the best incentives for the majority to specialize, whereas the open rule provides the minority with the best incentives. How this is resolved, of course, depends on the relative costs of the different sides in becoming specialized.

EMPIRICAL IMPLICATIONS

What are the empirical implications of the informational theory? Is the theory consistent with data on rules assignment in the House? There has been a lively debate regarding these questions (Dion and Huber 1996, 1997; Krehbiel 1991, 1997a, 1997b; Sinclair 1994). In this section we revisit some of the issues and examine the consequences of our results.

At the most general level, the theory postulates that restrictive rules are more likely to be observed when the legislature's expected utility in equilibrium is greater under, say, a closed rule as compared to an open rule. A weak postulate of the informational theory relates the probability of observing a restrictive rule to the difference in payoffs resulting from using such a rule. More precisely,

$$\text{Prob [closed]} = f(Eu_l^{\text{closed}} - Eu_l^{\text{open}}), \qquad \textbf{(2)}$$

where f is an increasing function. Expected utilities, of course, cannot be observed in the data, but the theory indicates relationships between other observable variables and the difference in expected utilities. One such variable is the degree of preference divergence, x_c, and the other is the degree of heterogeneity in committee preferences.

Reduced form models in this area typically seek to explain the occurrence of restrictive rules by using, among others, explanatory variables that measure (or act as a proxy for) preference divergence and heterogeneity.

Different informational theory models lead to differing predictions about how x_c affects utilities, $\Delta_l \equiv Eu_l^{\text{closed}} - Eu_l^{\text{open}}$, and then, via equation 2, the probability that a restrictive rule will be used.[9] As we show below, heterogeneity plays an important role in the predictions of the effects of preference outliers.

In the case of a heterogeneous committee, our results predict that the relationship between the difference in utilities and the preference divergence x_c is unambiguously negative (more precisely, $(\partial/\partial x_c)(\Delta_l) < 0$, for all x_c). This, combined with equation 2, implies that one should expect to see restrictive rules more often when x_c is small. In other words, outliers should be given less restrictive rules. In the case of a homogeneous committee, $(\partial/\partial x_c)(\Delta_l) < 0$, if and only if x_c is small (precisely, if $x_c < 1/12$).

In almost all the models estimated by Krehbiel (1991, 1997a) and Dion and Huber (1997), the preference divergence variable has a significant negative effect. This finding does not seem to be affected by alternative measures of preference divergence: continuous (x_c) or binary (outlier). The only exception is that in some models estimated by Dion and Huber (1996) the effect of the outlier variable is insignificant.

In addition to the effect of heterogeneity on the relation between preference divergence and restrictiveness, our results predict that the gain from using a restrictive closed rule versus an open rule is greater when committees are homogeneous rather than heterogeneous, that is, $\Delta_l^{\text{hom}} > \Delta_l^{\text{het}}$. This prediction should be treated with some care, however, since it involves holding the degree of preference divergence fixed. Thus, it involves a comparison between a homogeneous committee with preference parameter x_c and a heterogeneous committee in which the majority and minority have preference parameters of x_c and $-x_c$, respectively. The somewhat restrictive nature of this prediction means that it is rather difficult to submit this to a convincing empirical test.

Empirical evidence on how heterogeneity variables affect rule assignments is mixed. The signs of the effects seem to depend closely on how heterogeneity and preference divergence are measured. Dion and Huber (1997) interact binary outlier and heterogeneity measures and find that heterogeneity is generally associated with less restrictive rules. Krehbiel (1991, 1997a) uses continuous measures of both preference divergence and heterogeneity and finds the opposite effect, although for several specifications the effect of heterogeneity is not statistically significant. For our purposes, an ideal empirical test would combine a continuous measure of divergence with a discrete heterogeneity measure.

Informational theory also suggests that the greater the degree of specialization of a committee, the more likely are restrictive rules. As our results show, however, this hypothesis is sensitive to whether the committee is heterogeneous. Homogeneous specialized committees should receive closed rules, whereas heterogeneous specialized committees should receive modified rules.

Overall, the empirical evidence is not inconsistent with these predictions. The proxy variables used for specialization, the number of laws cited by the committee, and the seniority of committee members are generally associated with more restrictive rules. Krehbiel (1991, 1997a) also finds that the specialization variables have generally positive effects, but these are not always statistically significant. According to Sinclair (1994), "laws cited" has a positive and significant effect. Dion and Huber (1997) also find that variable positive and significant, whereas the committee seniority variable has a negative but insignificant coefficient.

Our work highlights the importance of distinguishing between somewhat restrictive modified rules and more restrictive closed rules. We showed in proposition 5 that modified rules are fully informationally efficient in sharp contrast to closed rules. Moreover, when committees are heterogeneous, the modified rule provides the best overall incentives for them to specialize. All the empirical studies of which we are aware, however, give no special distinction to modified rules—a bill is coded as either restrictive (closed) or not. Indeed, in the coding convention followed by most researchers, modified rules (as studied here) and closed rules are lumped together. Our results suggest that intermediate degrees of restrictiveness can matter a great deal to informational efficiency. This suggests that the conclusions regarding the empirical support for informational theories may depend on whether modified rules are coded as restrictive. In our view, it would be useful to recode rule-bill observations in such a way as to distinguish between unrestrictive open rules, somewhat restrictive modified rules, and more restrictive closed rules.

CONCLUSION

In the so-called institutional design controversy, two rival theories, the distributive and informational, seek to explain the design of legislative institutions.

The *distributive* theory, as expounded by, for instance, Weingast and Marshall (1988), postulates that the committee system is set up to facilitate the exchange of influence over policy choices. Legislators effectively bid for membership in committees with jurisdiction over issues they perceive as most important for their reelection. Appointment to a particular committee endows the members with "rights" to influence policy in that area, and the seniority system preserves

[9] In practice, it is unrealistic to expect an exact measurement of x_c. Rather, in many cases, a binary classification is developed, depending on whether x_c is above or below some threshold value. If x_c is large, which indicates substantial preference divergence, then the committee is classified as consisting of outliers.

those rights. Committee members appropriate rents in their areas of interest, and the outcomes may be socially inefficient. Restrictive rules that limit the power of the legislature to amend proposed bills allow committee members to appropriate the rents they are "due" by virtue of their appointments.

Whereas distributive theory views the committee system as a means of rent appropriation and exchange, informational theory views the system as a means of specialization and information transmission. Committee composition reflects this theoretical difference. In particular, distributive theory predicts that committees are more likely to be composed of preference outliers and receive restrictive rules. Our analysis indicates that preference divergence, per se, is not harmful to informational efficiency. In heterogeneous committees, full efficiency can be achieved under open or modified rules regardless of preference divergence. Thus, significant divergence, as predicted by distributive theory, need not have harmful informational effects, provided rules are not too restrictive.

Distributive theory also predicts that committees are likely to be composed of members with similar (homogeneous) preferences. Informational theory predicts that homogeneous committees will be associated with informational losses. Thus, there is a trade-off between a committee optimally composed for distributive purposes and one composed for informational purposes. In some instances, the legislature may be able to overcome this trade-off by making multiple referrals to separate committees. That is, two homogeneous committees with opposing preferences have jurisdiction over the bill. In that case, a system of multiple referrals to two homogeneous committees is strategically equivalent to a system of a single referral to one heterogeneous committee. As long as the rules permit the legislature the choice between the bills proposed by the two committees, mimicking the modified rule, full informational efficiency can be achieved.

Informational theory shows that full efficiency not only can be achieved but also can be achieved in a way that ensures no distributional costs. In other words, committee members cannot extract any rents from the legislative process; the policy outcomes are those most favored by the legislature. Under the open rule, because the legislature retains all power to amend bills, it is not too surprising that the committee is unable to appropriate any rents. Under the modified rule, however, the legislature cedes substantial power to the committee, yet the committee is still unable to appropriate any rents. As explained earlier, the equilibrium constructed in proposition 1 exploits the fact that committee preferences are opposed; the preferences of the majority and minority straddle those of the legislature.[10] This allows the legislature to extract all the information in such a way that the chosen bill is always the one that emerges from committee, and this is true both in and out of equilibrium. Stated another way, the committee is unable to exploit its power under the modified rule because positive rents to one side mean negative rents to the other. Even though the modified rule is restrictive, the fact that it allows both sides to propose bills gives the legislature enough strategic flexibility to play off one against the other, so full efficiency can be achieved. In contrast, the restrictive closed rule allows only the majority to propose bills, which leaves the legislature with almost no room to maneuver. As a result, under the closed rule, full efficiency cannot be achieved.

[10] The fact that they are symmetrically opposed and exactly balance each other is not important. Propositions 1 and 5 continue to hold even if committee preferences are asymmetric. What is important is that they lie on either side of the legislature's preferences.

APPENDIX

Proof of Proposition 1

We show that none of the players can gain by deviating from the prescribed strategies.

Note that the legislature is always optimizing, given its beliefs, and these beliefs are consistent with Bayes's rule along the equilibrium path. We only need to consider deviations by $c1$ and $c2$.

We will say that $c2$'s proposal is self-serving if $u_{c2}(b_2 + \omega_1) > u_{c2}(b_1 + \omega_1)$, where $\omega_1 \equiv b_1^{*-1}(b_1) = -b_1$. In other words, $c2$'s proposal is self-serving if b_2 is more profitable for $c2$ than b_1, under the hypothesis that $c1$ is "telling the truth," and hence the state is $\omega_1 = -b_1$. It is easy to verify that b_2 is self-serving if and only if $b_1 > b_2 > b_1 - 2x_c$.

First, suppose $c2$ follows the prescribed strategy. We argue that $c1$ has no profitable deviations.

If $\omega \leq 1 - 2x_c$ but $c1$ deviates to a b_1 such that $b_1 > b_1^*(\omega)$, then $c2$'s proposal is not viewed as self-serving, and the resulting policy $b_2^*(\omega)$ is even lower than $-\omega$. This is disadvantageous for $c1$. If $c1$ deviates to a b_1 such that $b_1 < b_1^*(\omega)$, then whether $c2$'s proposal will be viewed as self-serving depends on b_1. If it is so viewed, then the chosen policy is $b_1 < b_1^*(\omega)$, which is worse for $c1$. If it is viewed as not self-serving, then the chosen policy is $b_2^*(\omega) = -\omega - 2x_c$, which is also lower than $-\omega$.

If $\omega > 1 - 2x_c$ but $c1$ deviates to a b_1 such that $b_1 > b_1^*(\omega)$, then the policy chosen is at least as high as $b_2^*(\omega)$; because $b_2^*(\omega)$ is already too high, this is not advantageous for $c1$. If $c1$ deviates to a b_1 such that $b_1 < b_1^*(\omega)$, then $c2$'s proposal is not viewed as self-serving, and $b_2^*(\omega) = -\omega + 2x_c$ is adopted. But $c1$ is exactly indifferent between this bill and the equilibrium bill $-\omega$, so such a deviation is not advantageous either.

Now suppose $c1$ follows the prescribed strategy but $c2$ deviates. The only circumstance in which this could be profitable—that is, when $u_{c2}(b_2, \omega) > u_{c2}(b_1^*(\omega), \omega)$—results in no change to the chosen policy. Thus, $c2$ has no profitable deviation.

Finally, it is unprofitable for $c1$ to deviate to a bill b_1 that is outside the range of equilibrium actions. *Q.E.D.*

Proof of Proposition 2

Suppose the contrary, so that for every pair $(b^*(\omega), s^*(\omega))$, the legislature chooses the policy $b^*(\omega) = -\omega$.

Define $[\omega_0, \omega_1]$ to be the interval such that, for all $\omega \in [\omega_0, \omega_1]$, $-(x_c - (p_0 + \omega))^2 \geq -(x_c)^2$. It is routine to verify that $\omega_0 = -p_0$ and $\omega_1 = 2x_c - p_0$. Hence, in this interval, $c1$ prefers the status quo action to the equilibrium action. But for $\omega \in (\omega_0, \omega_1)$, if $c1$ chooses $b' = -\omega + \varepsilon$, where $\varepsilon > 0$ is small, then ℓ must choose either policy p_0 or b'. Because both of these policies are preferred to the equilibrium action by $c1$, this is a profitable deviation. *Q.E.D.*

Proof of Proposition 3

We show that no one can gain by deviating from the prescribed strategies.

Note that the legislature is always optimizing, given its beliefs, and the beliefs are consistent with Bayes's rule along the equilibrium path. We only need to consider deviations by $c1$ and $c2$.

A. $\omega \leq -2x_c - p_0$. If $c1$ deviates, this results in policy p_0, which is lower than $-\omega$ and hence worse from $c1$'s perspective.

If $c2$ deviates, the result is p_0. This is not profitable, since $x_c \leq -x_c - \omega - p_0$, and thus $-x_c^2 \geq -(-x_c - \omega - p_0)^2$.

B. $-2x_c - p_0 \leq \omega \leq -x_c - p_0$. If $c1$ deviates, this results in policy p_0, which is lower than $b^*(\omega)$ and worse from $c1$'s perspective.

If $c2$ deviates, this, by construction, leads to exactly the same utility for $c2$ as the equilibrium action. To see this, notice that $-2\omega + (-2x_c - p_0) - (-x_c - \omega) = (-x_c - \omega) - p_0$, and so $c2$'s utilities from the two outcomes are the same.

C. $-x_c - p_0 \leq \omega \leq x_c - p_0$. In this region a deviation by neither $c1$ nor $c2$ affects the policy chosen, p_0.

D. $x_c - p_0 \leq \omega \leq 2x_c - p_0$. If $c1$ deviates, then, by construction, this leads to exactly the same utility for $c1$ as the equilibrium action. To see this, notice that $(x_c - \omega) - (-2\omega + (2x_c - p_0)) = p_0 - (x_c - \omega)$, and so $c1$'s utilities from the two outcomes are the same.

If $c2$ deviates, this results in a policy p_0, which is higher than $b^*(\omega)$ and worse from $c2$'s perspective.

E. $\omega \geq 2x_c - p_0$. The proof is analogous to the case in which $\omega \leq -2x_c - p_0$.

The calculation of the expected utilities is routine. *Q.E.D.*

Proof of Proposition 4

The proof of proposition 4 is somewhat involved. Unlike the open or modified rules, the closed rule does not permit full informational efficiency (proposition 2), so a detailed examination of the set of equilibria is needed.

We begin by identifying a parametric class of closed rule equilibria that includes the equilibrium of proposition 3. This proves useful in determining the most informative equilibrium.

LEMMA 1. *For each $\alpha \in [0, x_c]$, the following constitutes a legislative equilibrium under the closed rule:*

$$b^\alpha(\omega) =$$

$$\begin{cases} -\omega & \text{if } \omega \leq -2x_c - p_0 \\ -2\omega + (-2x_c - p_0) & \text{if } -2x_c - p_0 \leq \omega \leq -x_c - p_0 - \alpha \\ p_0 + 2\alpha & \text{if } -x_c - p_0 - \alpha < \omega < x_c - p_0 - \alpha \\ p_0 & \text{if } x_c - p_0 - \alpha \leq \omega \leq x_c - p_0 \\ -2\omega + (2x_c - p_0) & \text{if } x_c - p_0 \leq \omega \leq 2x_c - p_0 \\ -\omega & \text{if } \omega \geq 2x_c - p_0 \end{cases};$$

$$s^\alpha(\omega) =$$

$$\begin{cases} \omega & \text{if } \omega \leq -x_c - p_0 - \alpha \\ \omega \in [-x_c - p_0 - \alpha, x_c - p_0 - \alpha] & \text{if } -x_c - p_0 - \alpha \leq \omega \leq x_c - p_0 - \alpha \\ -p_0 & \text{if } x_c - p_0 - \alpha < \omega < x_c - p_0 \\ \omega & \text{if } \omega \geq x_c - p_0 \end{cases}$$

If $c1$ and $c2$ agree or $b = p_0 + 2\alpha$, then

$$p^\alpha(b, s) = b.$$

If $c1$ and $c2$ disagree and $b \neq p_0 + 2\alpha$, then

$$p^\alpha(b, s) = p_0.$$

The beliefs of the legislature are

$$g^\alpha(b_1, b_2) =$$

$$\begin{cases} -p^\alpha(b, s) & \text{if } b \neq p_0 + 2\alpha \\ [-x_c - p_0 - \alpha, x_c - p_0 - \alpha] & \text{otherwise} \end{cases}$$

The expected utilities are

$$Eu_\ell = -\frac{4}{3}x_c^3 - 2\alpha^2,$$

$$Eu_{c1} = -\frac{4}{3}x_c^3 - x_c^2 + 4\alpha x_c(2x_c - \alpha),$$

$$Eu_{c2} = -\frac{4}{3}x_c^3 - x_c^2 - 4\alpha x_c(2x_c - \alpha).$$

See Figure 4 for an illustration of a semirevealing equilibrium of type α.

Proof of Lemma 1. The proof of lemma 1 is virtually identical to the proof of proposition 3, with two differences. First, it is now possible for $c1$ to deviate and induce the policy $p_0 + 2\alpha$. If $\omega \leq -x_c - p_0 - \alpha$, this deviation induces a lower policy than that called for in equilibrium; hence, the equilibrium policy is preferred by $c1$. For $\omega \geq x_c - p_0 - \alpha$, such a deviation induces a policy that is higher than p_0, and in this region the policy p_0 is preferred by $c1$ to all actions higher than p_0; hence, this is not a profitable deviation. Second, consider deviations in the region $[-x_c - p_0 - \alpha, x_c - p_0 - \alpha]$. No deviations are preferable in this region because, at the point $\omega = x_c - p_0 - \alpha$, committee member $c1$ is exactly indifferent between the policy $p_0 + 2\alpha$ and the status quo p_0. For states ω in this region satisfying $\omega < x_c - p_0 - \alpha$, $c1$ strictly prefers $p_0 + 2\alpha$ to p_0, and for states $\omega > x_c - p_0 - \alpha$, $c1$ strictly prefers p_0 to $p_0 + 2\alpha$. Thus, no deviations from the equilibrium strategies are profitable in this region also.

The calculation of the expected utilities is then routine. *Q.E.D.*

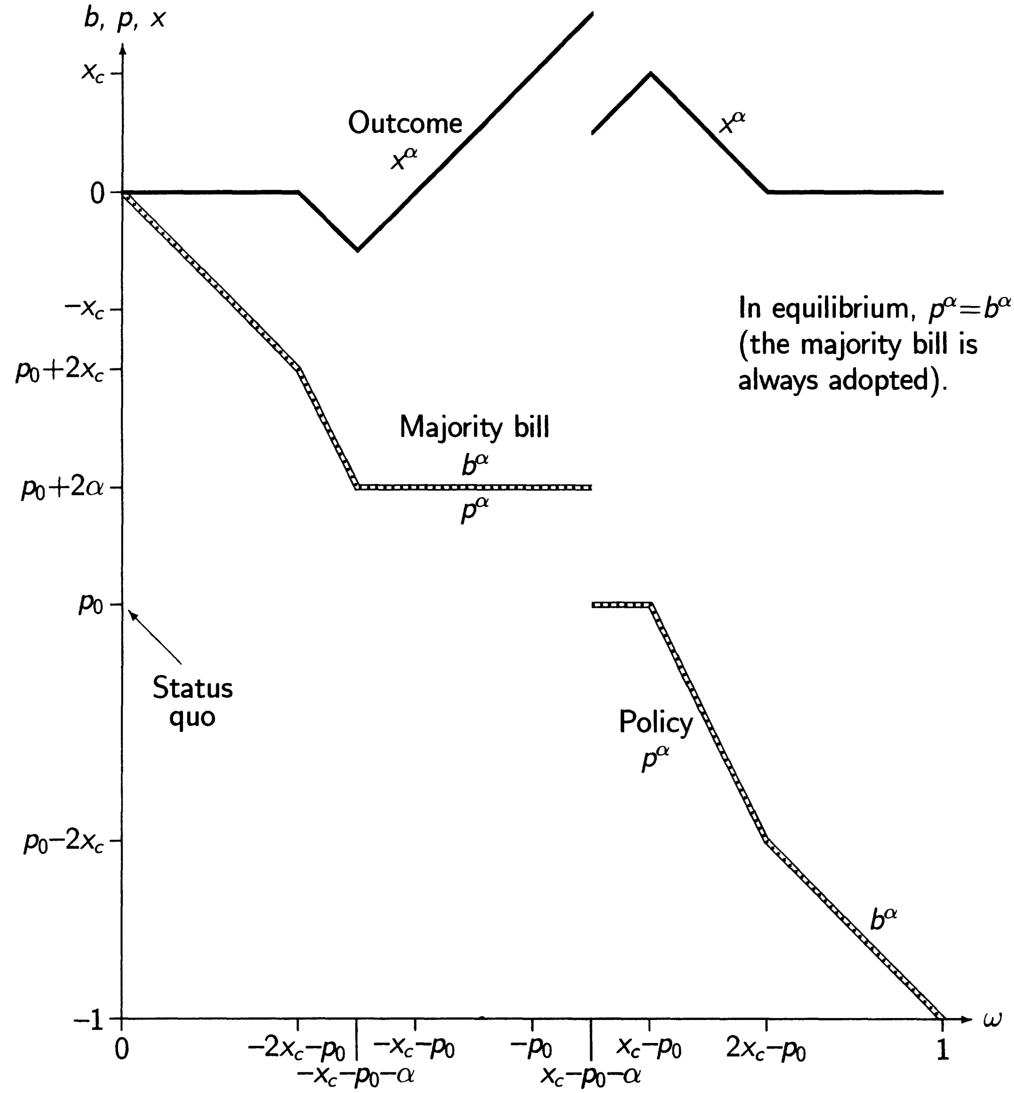
We will refer to the equilibria identified in lemma 1 as semirevealing equilibria of type α. Two observations are worth noting. First, a semirevealing equilibrium of type 0 is identical to the equilibrium in proposition 3 (Figure 4 reduces to Figure 2 when $\alpha = 0$). Second, the legislature's payoff is maximized when $\alpha = 0$, that is, the equilibrium in proposition 3 is at least as good for the legislature as any semirevealing equilibrium of type α.

We now show that, in fact, the equilibrium in proposition 3 is the best for the legislature among all equilibria. We do this by showing that the legislature views any other equilibrium as dominated by some semirevealing equilibrium of type α. As noted above, this in turn is dominated by the equilibrium in proposition 3. In order to establish this formally, some definitions are useful.

Suppose $(\bar{b}, \bar{s}, \bar{p})$ is some arbitrary legislative equilibrium under the closed rule. Let $\bar{P}$ denote the resulting *equilibrium policy function*; that is, for all ω, $\bar{P}(\omega) = \bar{p}(\bar{b}(\omega), \bar{s}(\omega))$.

It is also useful to define $q_1(\omega)$ to be the policy, such that in state ω, $c1$ is exactly indifferent between $q_1(\omega)$ and p_0. In other words, $q_1(\omega)$ satisfies $-(x_c - q_1(\omega) - \omega)^2 = -(x_c - p_0 - \omega)^2$, and from this it follows that $q_1(\omega) = -2\omega + 2x_c - p_0$. In any state ω, the set of policies that $c1$ considers to be at least as good as p_0 are those lying between min $\{p_0, q_1(\omega)\}$ and max $\{p_0, q_1(\omega)\}$.

FIGURE 4. A Semirevealing Equilibrium of Type α under the Closed Rule



Note: The horizontal axis measures the state of nature (ω)—known to committee members but not to the legislature. The vertical axis simultaneously measures majority bills (b), policies adopted (p), and outcomes (x). Notice that under the closed rule, only the majority can propose bills. The status quo policy (p_0) is also depicted on the vertical axis and is set equal to negative one-half. The legislature's ideal outcome is zero. The line segments in the figure denoted with the symbol α are the bills, policies, and outcomes occurring in equilibrium, where α is a parameter. For each α between 0 and x_c, there is an equilibrium of "type α." The discontinuous line with two steps, labeled b^α, depicts the majority's equilibrium proposals, which are always adopted. In extreme states (close to zero or close to one), the majority proposes the legislature's ideal. In states close to one-half, a single policy that is higher than the status quo is proposed. This policy, $p_0 + 2\alpha$, depicted on the vertical axis, first gets adopted in state $\omega = -x_c - p_0 - \alpha$, depicted on the horizontal axis. In intermediate states, the majority proposes a "compromise" policy midway between the legislature's ideal and the status quo. The discontinuity in the bills proposed by the majority, b^α, occurs in state $\omega = x_c - p_0 - \alpha$, depicted on the horizontal axis, where the majority is indifferent between the policy, $p = p_0 + 2\alpha$, and the status quo policy, p_0, both depicted on the vertical axis. The dark line, labeled x^α, depicts the resulting outcomes. Notice that the equilibrium in Figure 2 is of this type when α is equal to zero, so there is no discontinuity.

LEMMA 2. *Suppose $\bar{P}$ is an equilibrium policy function under the closed rule.*

Then, for almost all ω,

$$\min\{p_0, q_1(\omega)\} \le \bar{P}(\omega) \le \max\{p_0, q_1(\omega)\}.$$

Proof. If there exists an open interval of states in which neither of the above conditions are satisfied, then $c1$ can profitably deviate by proposing $b = p_0$ in these states, which guarantees that p_0 will be adopted. *Q.E.D.*

Lemma 2 sets some limits on equilibrium policy function $\bar{P}$ because $c1$'s incentive constraints must be respected. Similarly, $c2$'s incentive constraints must be respected, but $c2$ is in a much weaker position than $c1$ because he can only make speeches and not offer proposals. Whereas proposals constrain the legislature's choices under the closed rule, speeches are only cheap talk and can be ignored by the legislature.

We will say that $c2$'s speech is relevant, given proposal b, if there exists an s' such that $p(b, s') = p_0$ and an s'' such that $p(b, s'') = b$. In other words, given $c1$'s proposal b, $c2$'s speech can affect the policy adopted. If $c2$ cannot affect the policy, that is, if $p(b, s)$ is a constant no matter what speech s $c2$ makes, we will say that $c2$'s speech is irrelevant.

Analogous to the definition above, define $q_2(\omega)$ to be the policy such that, in state ω, $c2$ is exactly indifferent between $q_2(\omega)$ and p_0. In other words, $q_2(\omega)$ satisfies $-(-x_c - q_1(\omega) - \omega)^2 = -(-x_c - p_0 - \omega)^2$, and from this it follows that $q_2(\omega) = -2\omega - 2x_c - p_0$. In any state ω, the set of policies that $c2$ considers to be at least as good as p_0 are those lying between $\min\{p_0, q_2(\omega)\}$ and $\max\{p_0, q_2(\omega)\}$.

LEMMA 3. *Suppose $\bar{P}$ is an equilibrium policy function under the closed rule. Then, for almost all ω, if $c2$'s speech is relevant, given proposal $\bar{b}(\omega)$,*

$$\min\{p_0, q_2(\omega)\} \leq \bar{P}(\omega) \leq \max\{p_0, q_2(\omega)\}.$$

Proof. If there exists an open interval O of states in which $c2$'s speech is relevant, given proposal $\bar{b}(\omega)$, then for any $\omega \in O$, there exists a speech $s'(\omega)$ such that $p(b(\omega), s'(\omega)) = p_0$. If p_0 is preferred to $\bar{P}(\omega)$ by $c2$, she can profitably deviate by making the speech $s'(\omega)$. *Q.E.D.*

LEMMA 4. *Suppose $\bar{P}$ is an equilibrium policy function under the closed rule. If there is an open interval of states O such that $\bar{P}(\cdot)$ is continuous and strictly decreasing (or strictly increasing) over O, then either*

1. $c2$'s speech is relevant, given proposal $b(\omega)$, or
2. $\bar{P}(\omega) = -\omega + x_c$.

Proof. Suppose that the contrary is true. Then there exists some open interval O in which the policy function is strictly decreasing, say, speeches are irrelevant, and $\bar{P}(\omega) \neq -\omega + x_c$. In this case, in any state $\omega \in O$, $c1$ prefers either policy $\bar{b}(\omega - \varepsilon)$ or $\bar{b}(\omega + \varepsilon)$ for small enough ε to the equilibrium policy $\bar{b}(\omega)$, since $\bar{P}(\omega) \neq -\omega + x_c$. Moreover, because speeches are irrelevant, $c1$ can unilaterally induce either of these policies in state ω, and this is a profitable deviation. *Q.E.D.*

Suppose that neither of the conditions given in lemma 4 holds over some open interval of states $\omega \in O$. Then it must be the case that $\bar{P}(\omega)$ is almost everywhere a constant function. Moreover, at any point ω' where $\lim^{-}_{\omega\to\omega'} P(\omega) = p^- \neq p^+ = \lim^{+}_{\omega\to\omega'} P(\omega)$, then $c1$ must be indifferent between p^+ and p^- in state ω'. We shall refer to an equilibrium policy function with these properties as a step function over the interval O.

LEMMA 5. *Given any equilibrium under the closed rule, there exists a semirevealing equilibrium of type α that is no worse for the legislature.*

Proof. Suppose $\bar{P}$ is an equilibrium policy function under the closed rule. Let $(b^\alpha, s^\alpha, p^\alpha)$ be a semirevealing equilibrium of type α, and let P^α denote the resulting policy function; that is, for all ω, $P^\alpha(\omega) = p^\alpha(b^\alpha(\omega), s^\alpha(\omega))$.

We will argue that there exists an $\alpha \in [0, x_c]$ such that the legislature's payoff from P^α is at least as large as its payoff from $\bar{P}$. Again, it is useful to divide the state space into different regions.

A. $\omega \leq -2x_c - p_0$, or $\omega \geq 2x_c - p_0$.

If $\omega \leq -2x_c - p_0$, then $P^\alpha(\omega) = -\omega$, and this is the best possible policy for the legislature. Similarly, if $\omega \geq 2x_c - p_0$, then $P^\alpha(\omega) = -\omega$, which is the optimal policy for the legislature.

B. $x_c - p_0 \leq \omega \leq 2x_c - p_0$.

Now suppose $x_c - p_0 \leq \omega \leq 2x_c - p_0$. In this region, $P^\alpha(\omega) = q_1(\omega) = -2\omega + 2x_c - p_0 \geq -\omega$ and thus has the property that all policies the legislature prefers to $P^\alpha(\omega)$ are lower than $P^\alpha(\omega)$. Also, $q_1(\omega) \geq p_0$ and, by lemma 2, $\bar{P}(\omega) \geq P^\alpha(\omega)$. Hence, $P^\alpha(\omega)$ is no worse for the legislature than $\bar{P}(\omega)$.

C. $-x_c - p_0 \leq \omega \leq x_c - p_0$.

Lemma 2 implies that $\bar{P}(\omega) \geq p_0$ in this region. Combining this with lemma 3 implies that, in any legislative equilibrium, speeches are irrelevant in this region. By lemma 4 it then follows that any equilibrium $\bar{P}$ must either be a step function or $\bar{P}(\omega) = -\omega + x_c$. Yet, $\bar{P}(\omega) = -\omega + x_c$ is not possible, because the legislature prefers p_0 to $-\omega + x_c$ for every ω in this region and can guarantee p_0. Thus, $\bar{P}$ is a step function in this region.

Suppose that the last discontinuity in the region $[-x_c - p_0, x_c - p_0]$ occurs at the point ω', and let $\lim_{\varepsilon>0} \bar{P}(\omega' - \varepsilon) = p'$. Notice that at ω', $c1$ must be indifferent between p' and p_0 (because speeches by $c2$ must be irrelevant in this region). This is the same as saying that $p' = q_1(\omega) = -2\omega' + 2x_c - p_0$.

Next, we claim that if the region in which p' is the equilibrium action under $\bar{P}$ is $[\sigma', \omega']$, then it must be the case that $P^*(\sigma') = p'$. A necessary condition for this to be an equilibrium is that the legislature knows only that $\omega \in [\sigma', \omega']$ and weakly prefers to choose p' rather than p_0. Given its information, the legislature's optimal policy is $-½(\sigma' + \omega')$, and it chooses p' as long as

$$p' + \frac{1}{2}(\sigma' + \omega') \leq -\frac{1}{2}(\sigma' + \omega') - p_0,$$

which is equivalent to

$$\sigma' \leq \omega' - 2x_c.$$

This in turn is equivalent to saying that $\sigma' \leq P^{*-1}(p')$.

Now notice that because $\omega' \in [-x_c - p_0, x_c - p_0]$ there exists an $\alpha \in [0, x_c]$ such that $\omega' = x_c - p_0 - \alpha$, and hence $\sigma' \leq -x_c - p_0 - \alpha$. Finally, since $c1$ is indifferent between p' and p_0 at the point $\omega' = x_c - p_0 - \alpha$, it must be that $p' = p_0 + 2\alpha$, but this is identical to a P^α equilibrium in this region.

D. $-2x_c - p_0 \leq \omega \leq -x_c - p_0$.

In any subinterval of this region, if $\bar{P}(\omega) > P^*(\omega)$, then by lemmas 3 and 4, $\bar{P}$ either must consist of a step function or follow $c1$'s bliss line. From the argument given in region **C**, we know that for all $\omega \geq -x_c - p_0 - \alpha$ where $\alpha \in [0, x_c]$, $\bar{P}(\omega) = p_0 + 2\alpha$.

Next note that any equilibrium with the property that for all $\omega \geq -x_c - p_0 - \alpha$, $\bar{P}(\omega) \geq p_0 + 2\alpha$ or $\bar{P}(\omega) < -2\omega + (-2x_c - p_0)$ is worse than any P^α equilibrium from the perspective of the legislature. It is routine to verify that any equilibrium $\bar{P}$ consisting of either a step function or $\bar{P}(\omega) = -\omega + x_c$ or both has the property that $\bar{P}(\omega) \geq p_0 + 2\alpha$ or $\bar{P}(\omega) < -2\omega + -2x_c - p_0$. Hence, P^α is no worse than $\bar{P}$ in this region.

It is now easy to verify that $\bar{P}$ is no better for the legislature than some P^α. *Q.E.D.*

Combining lemmas 1 and 5 with the observation that from the perspective of the legislature the best semirevealing equilibrium of type α is one in which $\alpha = 0$, we complete the proof of proposition 4. *Q.E.D.*

Proof of Proposition 8

Observe that the beliefs are consistent with Bayes's rule wherever possible. We show that, given beliefs, the legislature cannot profitably deviate.

1. If $4x_c + p_0 < b \leq x_c$, then by selecting policy b, the legislature earns $-x_c^2$. By deviating to p_0, the legislature earns $(b - p_0)(p_0 + 2x_c - b) - x_c^2$, and because $4x_c + p_0 < b$, this expression is less than $-x_c^2$.
2. If $b = 4x_c + p_0$, then the expected utility of the legislature from choosing b is $-7/3\ x_c^3$. By deviating to p_0, the legislature earns $-19/3\ x_c^3$, so deviating is clearly not profitable.
3. If $b = 2x_c + p_0$, then the legislature earns $-8/3\ x_c^3$ by

choosing b. By deviating to p_0, the legislature gains identical payoffs, so this is not a profitable deviation.

It is routine to verify that deviation is unprofitable to the legislature for the remaining cases.

We now turn to the incentives of the committee to deviate.

1. If $0 \leq \omega \leq -3x_c - p_0$, then the committee is obtaining its best possible outcome, so deviation is not profitable.
2. Suppose $-3x_c - p_0 \leq \omega \leq -2x_c - p_0$. The committee is just indifferent between the policy $4x_c + p_0$ and $2x_c + p_0$ if and only if $\omega = -2x_c - p_0$. Hence, for all $\omega \geq -2x_c - p_0$, the committee prefers the policy $4x_c + p_0$ to any policy $p \leq 2x_c + p_0$.

The remaining cases are analogous to one of those above. *Q.E.D.*

Proof of Proposition 9

It is sufficient to show that the legislature's expected utility in the equilibrium under the closed rule constructed in proposition 8 is higher than the legislature's expected utility in the best equilibrium under the open rule, that is, in the equilibrium described in proposition 6.

Under the open rule, the payoff to the legislature in the best legislative equilibrium is (proposition 6):

$$-\frac{1}{12N(x_c)^2} - \frac{x_c^2(N(x_c)^2 - 1)}{3}, \tag{3}$$

where $N(x_c)$ is the smallest positive integer greater than or equal to $(-1/2 + 1/2\sqrt{1 + 2/x_c})$ and, in fact, is the number of distinct policies chosen in equilibrium.

This can be equivalently stated as follows. For any positive integer N, define $x(N) = 1/(2N(N + 1))$. If $x(N) \leq x_c < x(N - 1)$, then $N(x_c) = N$.

Under the closed rule, the payoff to the legislature in the equilibrium constructed in proposition 8 is

$$-\frac{4}{3}x_c^3 - x_c^2. \tag{4}$$

Because $x_c < 1/4$, $N(x_c) \geq 2$, so

$$-x_c^2 \geq -\frac{x_c^2(N(x_c)^2 - 1)}{3}.$$

Next note that for any $N \geq 2$ and $x(N) \leq x_c < x(N - 1)$,

$$\begin{aligned} -\frac{4}{3}x_c^3 &> -\frac{4}{3}x(N - 1)^3 \\ &= -\frac{4}{3}\left(\frac{1}{2N(N - 1)}\right)^3 \\ &= -\frac{1}{6N^3(N - 1)^3} \\ &\geq -\frac{1}{12N^2}. \end{aligned}$$

Thus, the second term in equation 4 is no less than the corresponding term in equation 3, and the first term is actually greater. *Q.E.D.*

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