Communication in committees: Who should listen?

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Abstract

We study communication among agents with partially conflicting interests in a collective decision framework, where players may have private, decision-relevant information. We compare two decision procedures, which differ with respect to the extend to which decision makers can exchange information. If information disclosure is observed by all decision makers, agents may strategically withhold information. As a consequence, individual votes will be less sensitive to observable information. Limiting the individuals' access to communication may yield a higher expected social surplus.

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1 Introduction

When a firm decides whether to enter a new market or not, it usually faces uncertainty about costs and benefits of market entry. If costs and benefits accrue asymmetrically to decision makers, and may be observed privately, an information aggregation problem arises. If the marketing division reaps the largest part of the benefits from market success, and the other decision makers (e.g. the production unit) bear most of the costs, the marketing division might be reluctant to inform the other decision makers about high costs. How should the information flow within the group of decision makers be organized in order to make use of private information, and to enter the market when it is worth entering and to stay out when it is not?

In this paper, we compare two alternative decision procedures. One of them allows decision makers to make public speeches before they decide via majority voting. In the other one, communication takes place within groups of decision makers with the same interests (for instance the marketing division) before the representatives of the groups make a decision via majority vote. We call the first decision procedure the *open debate mechanism*, and the latter the *group debate mechanism*. In a political economy context, we can think of the former as a parliament, and the latter as a party system. We are interested in the decision quality induced by the two mechanisms, measured in terms of expected social surplus.

The main difference between the two decision procedures is that members of one group have no access to the information which is revealed within the other group in the group debate, whereas they do have access to this information in the open debate. Although restricting access to communication seems to be a waste of information given that it is accessible, it might not have been accessible if everybody had listened. If some decision makers strongly favor one alternative, then an individual who is less biased towards that alternative may be cautious to reveal information which makes their votes for the alternative even more likely. Moreover, as committee members anticipate that information in favor of their preferred alternative will be concealed, they presume that an agent who does not talk probably has information which confirms their predisposition. As a consequence, choices are less sensitive to information in the open debate mechanism than in the group debate mechanism.

Our framework can be applied to collective decision frameworks in which the consequences of the decision are borne asymmetrically by the decision makers. Consider for instance decisions concerning public good provision, say a municipality's decision whether to build a dyke or not. If the dyke is financed by taxes, all decision makers are affected symmetrically by the costs. However, those who live near to the coast enjoy larger benefits if the dyke is built than those living in the inland. Another example is a faculty's decision whether to hire a researcher with a focus on applied econometrics or on economic theory. The costs of the hiring decision will be borne symmetrically by the faculty members. However, benefits may accrue asymmetrically to the decision makers, depending on their own research interests. Conflicting interests among decision makers may hinder the information exchange within the decision-making institution, and the efficient aggregation of decision-relevant information.

There is a growing literature on information aggregation in committees (for a survey, see Gerling et al. (2005)). If communication among committee members is possible prior to making a choice, the committee is able to make (weakly) better decisions than without the possibility to communicate. In fact, a committee of homogenous members can make efficient use of the available information (see e.g. Coughlan (2000)). If preferences are heterogenous, the possibility to communicate still (weakly) increases decision quality (Doraszelski et al. (2003)). One may presume that the more communication possibilities there are, the better decisions can be made. The present paper shows that this presumption may be wrong. If committee members have heterogenous preferences, decision quality may be higher when the decision makers can restrict communication to a subgroup of members with aligned interests rather than if they talk to the entire committee.

Previous work has emphasized that information sharing during debate is problematic if committee members have conflicting interests (see e.g. Austen-Smith (1990), Doraszelski et al. (2003), and Meirowitz (2005)). Piketty (1999) provides a survey on the role of political institutions for information aggregation in the political process. Austen-Smith and Feddersen (2006) study the impact of the voting rule on the extent of information sharing in debate. In Ottaviani and Sorensen (2001), the optimal sequence of statements is derived in a setting in which decision makers want to appear well-informed. So far, the question to whom the debate should be addressed has not received any attention. The present paper explores this question.

There are several contributions which study the question with whom to communicate prior to making a choice, when the informed agent does not take part in the decision process (e.g. Dewatripont and Tirole (1999), Dur and Swank (2005), and Gerardi et al. (2005)). Wolinsky (2002) allows for communication among experts with identical interests which differ from those of the decision maker. He shows that it may be beneficial for the decision maker to allow only partial communication among experts. In contrast to these papers, we study a decision framework in which decision makers themselves may be (partially) informed about the state of the world, and have to decide whether to share their information with other decision makers.

Maug and Yilmaz (2003) study the performance of a two-class voting mechanism compared to voting within the entire group. They also find that a separation of the committee into homogenous subgroups may increase decision quality. Maug and Yilmaz (2003) do not allow for communication, hence votes must reflect private information in order to make use of it. A two-class voting mechanism performs better in case of preference heterogeneity than voting within the whole committee because more voters base their decisions on information. The reason is that an individual vote is pivotal only if a majority of the other group votes in favor. Therewith, equilibrium information can be transmitted via the majority rules to make voters, who otherwise do not respond to their private information, more responsive. In the present paper, communication is possible. Here, too much information is transmitted through equilibrium strategies in the open debate in the sense that a committee member's silence is interpreted as a signal against his predisposition. By precluding the interpretation of communication actions (by preventing their observation), individual votes are more responsive to information in the group debate mechanism.

The paper is organized as follows. In the next section we present a parsimonious model of the decision environment within which the two mechanisms are studied. In Sections 3 and 4 the equilibria and the induced decision quality in the group debate mechanism and in the open debate mechanism are derived. We compare the two mechanisms and state our main result in Section 5. We conclude in Section 6.

2 The model

A group of four individuals has to decide whether to implement a project (enter a market, buy a public good, reform the welfare state) or not. (Per capita) costs (c) and benefits (b) arising from implementation are uncertain, and accrue asymmetrically to the committee members. We assume that there are two types of committee members. Committee members 1 and 2 are "low types" whose preferences can be represented by the following utility function:

$$U_l = \begin{cases} (1-\alpha)b - c, & \text{if the reform is implemented} \\ 0, & \text{else.} \end{cases}$$

Committee members 3 and 4 are "high types" whose preferences can be represented by the following utility function:

$$U_h = \begin{cases} (1+\alpha)b - c, & \text{if the reform is implemented} \\ 0, & \text{else.} \end{cases}$$

We assume that $\alpha > 0$. Hence, high types reap higher benefits from the project than low types do, and costs are shared equally. This fits for instance the dyke-building decision, where people who live near to the coast benefit more than people in the inland. In the market entry example, the marketing division might benefit more from market entry than the production division. The parameter α will be our measure of preference heterogeneity.

Costs and benefits can be either high or low, giving rise to four possible states of the world, $(b^l, c^l), (b^l, c^h), (b^h, c^l), (b^h, c^h)$, which are equally likely ex ante. Let $b^l = c^l = 1$

and $b^h = c^h = h > 1$. To make it a decision problem with only partially conflicting interests, we assume that $\alpha < \frac{h-1}{h}$. All players agree to implement the project in state (b^h, c^l), and not to implement in state (b^l, c^h). Low types prefer implementation only in state (b^h, c^l), and high types prefer implementation in all states except for (b^l, c^h). The stochastic structure implies that ex ante, high types are in favor of implementation, and low types are against implementation.

Prior to entering the decision procedure, an agent may receive a signal from nature, which contains perfect information about either the costs or the benefits, and can be credibly transmitted to other agents (depending on the decision procedure). Let δ be the probability to receive a signal, which is the same for all agents, and assume $0 < \delta < 1$. If an agent receives a signal, he will be informed about the costs or the benefits with equal probability. Individuals can infer information from the other players' actions during the game. Let $\mu_i(c^l)$ denote the probability agent i assigns to $c = c^l$, and let $\mu_i(b^h)$ be the probability agent i assigns to $b = b^h$. Figure 1 summarizes the agents' expected payoffs from implementation for the cases of imperfect information about the state of the world.

We consider two decision procedures, the open debate mechanism, and the group debate mechanism. The open debate mechanism works as follows. In a communication stage, each committee member has the opportunity to reveal his signal (if endowed with one) to the other committee members. After the communication stage, each committee member casts a vote for or against implementation. Majority wins. In case of a tie, a fair coin is tossed. The group debate mechanism works as follows. In a communication stage, the low types have the opportunity to reveal their signals to each other, and the high types have the opportunity to reveal their signals to each other. After the communication stage, a representative of each group (say agent 1 for the low type group and agent 3 for the high type group) casts a vote for or against implementation. Again, majority wins, and in case of a tie, a fair coin is tossed. The two mechanisms are illustrated in Figure 2. Information revelation is observed by members inside the same box, but not outside the box.

In these games, a strategy for a player i consists of a revelation strategy γ_i, i.e. a plan

A low type i's conditional expected utility from implementation:

Observed info	Conditional expected payoff	positive iff
b^l	$-\alpha - (1-\mu_i(c^l))(h-1)$	never
b^h	$(1-\alpha)h - \mu_i(c^l) - (1-p(c^l))h$	$\mu_i(c^l) > \frac{\alpha h}{h-1}$
c^l	$(1-\alpha)\left(\mu_i(b^h)h + (1-\mu_i(b^h))\right) - 1$	$\mu_i(b^h) > \frac{\alpha}{(1-\alpha)(h-1)}$
c^h	$(1-\alpha)\left(\mu_i(b^h)h + (1-\mu_i(b^h))\right) - h$	never
$\emptyset$	$(h-1)(\mu_i(b^h)(1-\alpha)h - 1 + \mu_i(c^l)) - \alpha$	$\mu_i(c^l) > \frac{h-1-\alpha}{h-1} - \mu_i(b^h)(1-\alpha)$

A high type i's conditional expected utility from implementation:

Observed info	Conditional expected payoff	positive iff
b^l	$\alpha - (1-\mu_i(c^l))(h-1)$	$\mu_i(c^l) > \frac{h-1-\alpha}{h-1}$
b^h	$(1+\alpha)h - p(c^l) - (1-\mu_i(c^l))h$	always
c^l	$(1+\alpha)\left(\mu_i(b^h)h + (1-\mu_i(b^h))\right) - 1$	always
c^h	$(1-\alpha)\left(\mu_i(b^h)h + (1-\mu_i(b^h))\right) - h$	$\mu_i(b^h) > \frac{h-1-\alpha}{(h-1)(1+\alpha)}$
$\emptyset$	$(h-1)(\mu_i(b^h)(1+\alpha)h - 1 + p(c^l)) - \alpha$	$\mu_i(c^l) > \frac{h-1+\alpha}{h-1} - \mu_i(b^h)(1+\alpha)$

Figure 1: Conditional expected payoffs from implementation.

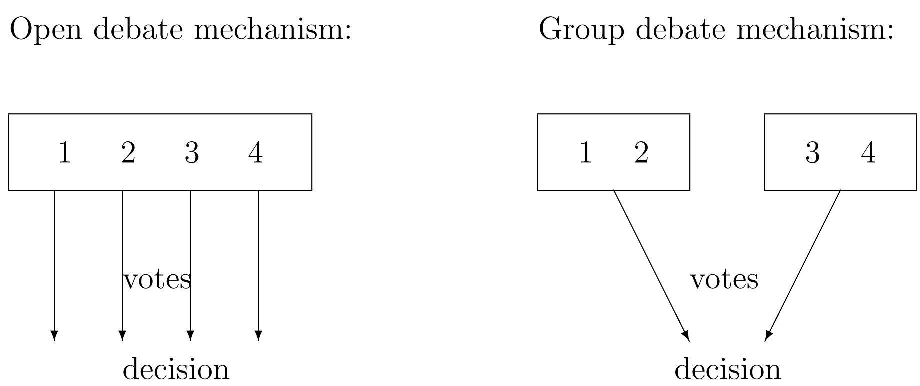

Figure 2: Open debate and group debate mechanism.

which prescribes which signals to reveal if endowed with them, and – if i is supposed to cast a vote – a voting strategy v_i, i.e. a plan which vote to cast, for each signal he may get and each communication outcome he might observe. Denote with γ a revelation profile, and with v a voting profile.

Our solution concept is Perfect Bayesian Nash equilibrium. That is, at each possible node of the game in which a player is asked to take an action, the action is required to be a best response to the other players' strategies given the beliefs. Beliefs shall be consistent with equilibrium strategies and Bayes' Rule on the equilibrium path, and shall not violate Bayes' Rule off the equilibrium path.

We measure decision quality in terms of expected social surplus, which is defined as the expected sum of payoffs. Expected social surplus depends only on the probability of implementation in state (b^h, c^l) and the probability of rejection in state (b^l, c^h). In the other states, committee members disagree, and the social surplus is zero for both decisions.

3 The group debate mechanism

In the voting stage, each of the two representatives casts a vote for or against implementation. A vote for (against) implementation increases (decreases) the probability of implementation by $\frac{1}{2}$ independently of the other representative's vote. Hence, a representative cannot infer any information from casting a pivotal vote. He votes for implementation if and only if the conditional expected payoff from implementation is positive, given the beliefs about the state of the world which were generated in the communication stage.

Group members have the same preferences. Given that the representative's vote maximizes his expected payoff, there is no incentive for a group member to conceal information. There may be equilibria in which some information is not revealed. Suppose for instance that α is so high that the low type representative votes for implementation only if he is sure that the state of the world is (b^h, c^l). Then, there is no need to report b^l because the representative will vote against implementation anyway. In that sense, the information is decision-irrelevant. However, there is no equilibrium in which decision-relevant information is not reported to the representative. Because a signal can only be revealed by a player who possesses that signal, the only admissible belief for the representative when observing an out-of-equilibrium revelation is to believe it. Thus, for any putative equilibrium in which decision-relevant information is concealed, revealing the information is a profitable deviation.

Without loss of generality, we can restrict attention to the equilibrium in which information is fully revealed within the groups. For communication outcomes which do not allow the identification of the state of the world, expected payoffs from implementation are given in Figure 1, where the beliefs $\mu_i(.)$ coincide with the priors for all communication outcomes. The equilibria of the group debate mechanism are characterized in the following lemma.

Lemma 1 *Consider the group debate mechanism. Any equilibrium has the following properties.*
The representative of the low type group votes for implementation (i) if he has observed b^h and c^l, and (ii) if he has observed c^l, and $\alpha \leq \frac{h-1}{h+1}$, and (iii) if he has observed b^h, and $\alpha \leq \frac{h-1}{2h}$. Otherwise, he votes against implementation.
The representative of the high type group votes against implementation (i) if he has observed b^l and c^h, (ii) he has observed b^l, and $\alpha \leq \frac{h-1}{2}$, and (iii) if he has observed c^h, and $\alpha \leq \frac{(h-1)}{h+1}$. Otherwise, he votes in favor of implementation.

We are interested in the probability of implementation if the state of the world is (b^h, c^l). Given that benefits are high and costs are low, whatever the representative of the high type group might learn during the communication stage, he will vote in favor of the project. Hence, if the representative of the low type group votes in favor of implementation, the probability of implementation is 1. Otherwise, it is $\frac{1}{2}$. If $\alpha \leq \frac{h-1}{2h}$, the low type representative votes in favor of implementation if and only if at least one of the agents in the low type group receives a signal. If $\frac{h-1}{2h} < \alpha \leq \frac{h-1}{h+1}$, the low type representative votes in favor of implementation if and only if at least one of them receives the information that costs are low. In case $\alpha > \frac{h-1}{h+1}$, the representative votes for implementation if and only if the group receives information about both, costs and benefits. The following lemma quantifies the probability of implementation in state (b^h, c^l) for the three cases.

Lemma 2 *Consider the group debate mechanism, and suppose that benefits are high and costs are low.*
(i) If $\alpha \leq \frac{h-1}{2h}$, the probability of implementation is

$$1 - \tfrac{1}{2}(1-\delta)^2.$$

(ii) If $\frac{(h-1)}{2h} < \alpha \leq \frac{(h-1)}{h+1}$, the probability of implementation is

$$1 - \tfrac{1}{2}\left(1 - \tfrac{\delta}{2}\right)^2.$$

(iii) If $\alpha > \frac{h-1}{h+1}$, the probability of implementation is

$$\tfrac{1}{2} + \left(\tfrac{\delta}{2}\right)^2.$$

Now, consider the case that benefits are low and costs are high. The representative of the low type group votes against implementation for any possible communication outcome. For $\alpha \leq \frac{h-1}{h+1}$, the representative of the high type group votes against implementation if and only if the group receives at least one signal. If $\frac{h-1}{h+1} < \alpha \leq \frac{h-1}{2}$, he votes against implementation if and only if at least one of the group members receives the information that benefits are low. If $\alpha > \frac{h-1}{2}$, he votes against implementation if and only if the group learns the state of the world. Lemma 3 quantifies the probability of rejection for the three cases.

Lemma 3 *Consider the group debate mechanism, and suppose that benefits are low and costs are high.*
(i) If $\alpha \leq \frac{h-1}{h+1}$, the probability of rejection is

$$1 - \tfrac{1}{2}(1-\delta)^2.$$

(ii) If $\frac{h-1}{h+1} < \alpha \leq \frac{h-1}{2}$*, the probability of rejection is*

$$1 - \tfrac{1}{2}\left(1 - \tfrac{\delta}{2}\right)^2.$$

(iii) If $\alpha > \frac{h-1}{2}$*, the probability of rejection is*

$$\tfrac{1}{2} + \left(\tfrac{\delta}{2}\right)^2.$$

From Lemmata 2 and 3, we can infer decision quality for the group debate mechanism, stated in the following proposition.

Proposition 1 *Expected social surplus generated in the group debate mechanism is:*

$$\begin{array}{ll} (h-1)(1-(1-\delta)^2), & \text{if } \alpha \leq \frac{h-1}{2h} \\ (h-1)(1-\frac{1}{2}\left(\left(1-\frac{\delta}{2}\right)^2 + (1-\delta)^2\right), & \text{if } \frac{h-1}{2h} < \alpha \leq \frac{h-1}{h+1} \\ (h-1)\frac{1}{2}\left(\delta + \left(\frac{\delta}{2}\right)^2\right), & \text{if } \frac{h-1}{h+1} < \alpha \leq \frac{h-1}{2} \\ (h-1)2\left(\frac{\delta}{2}\right)^2, & \text{if } \alpha > \frac{h-1}{2}. \end{array}$$

4 The open debate mechanism

In this section, we analyze the strategic interaction in the open debate mechanism. There is a class of equilibria in which all players vote for (against) implementation regardless of the communication outcome. Voting strategies are mutually best responses, because no single vote has an effect on the decision. It follows that any communication strategy is part of a best response. In this class of equilibria, the probability of implementation is 1 (0) in any state of the world. The group debate mechanism obviously yields a lower (higher) probability of implementation in state (b^h, c^l), and a higher (lower) probability of rejection in state (b^l, c^h). Because all states are equally likely ex ante, expected social surplus is higher in the group debate mechanism.

For a more convincing statement concerning the superiority of the group debate mechanism, however, we should compare the best equilibrium outcome of the open debate mechanism to the equilibrium outcome in the group debate mechanism. Hence, in the following we restrict attention to equilibria in which each voter votes for the alternative which maximizes his expected utility conditional on the information available to him. The term "equilibrium" will refer only to those strategy profiles which satisfy this additional criterion. Given that all players take into account all the available information at the stage of voting, decision quality will be the higher, the more information is revealed in the communication stage. Hence, we further restrict attention to equilibria that are *most revealing.*

Definition 1 *An equilibrium (γ^*, v^*) is most revealing if there is no equilibrium (γ', v') in which all players reveal all signals which they reveal in γ^*, and at least one player reveals a signal which he conceals in γ^*.*

With open debate, information revelation is observed by all players. Hence, a player's statement does not only affect the behavior of the like-minded player, but also that of the players who have different interests. Therefore, players may prefer to conceal information. In equilibrium, each player i's beliefs at the stage of voting $\mu_i(c^l), \mu_i(b^h)$ take into account equilibrium revelation strategies as well as equilibrium voting strategies. Note that whenever i finds himself in an information set in which any player has revealed c^l, whether on or off the equilibrium path, the only admissible belief for i yields $\mu_i(c^l) = 1$, because c^l can be revealed only by a player who has observed c^l, and c^l can only be observed if $c = c^l$. Analogously, we have $\mu_i(c^l) = 0$ in an information set in which c^h was revealed, $\mu_i(b^h) = 1$ if b^h was revealed, and $\mu_i(b^h) = 0$ if b^l was revealed.

Restricting attention to most revealing equilibria, we presume that a player i conceals information only if it is a profitable deviation from a putative equilibrium in which players $-i$ play the same revelation strategies, and i is assumed to reveal the information. In order to identify such a profitable deviation in the communication stage, we have to study the effect of the deviation on the other individuals' actions in the voting stage. If a player i conceals information in the communication stage, this has an effect on i's expected payoff only if there is at least one voter j, a signal for this voter j, and announcements by players $-i$ such that if i reveals his information, j chooses a different voting action than if i stays silent. Obviously – as all players cast expected payoff maximizing votes in any equilibrium – this can only be the case if the announcements by players $-i$ do not yield perfect information about the state of the world. Consider the players' expected payoffs for communication outcomes in which a concealment of information can possibly have an effect (see Figure 1).

A low type j's vote can be affected by concealing information only if an information set is reached in which (i) j has observed only b^h, (ii) j has observed only c^l, or (iii) j has observed nothing at all. Denote these information sets with $I_l(b^h)$, $I_l(c^l)$, and $I_l(\emptyset)$, respectively. Similarly, a high type j's vote can be affected by concealing information only if an information set is reached in which (a) j has observed only b^l, (b) j has observed only c^h, or (c) j has observed nothing at all. Denote these information sets with $I_h(b^l)$, $I_h(c^h)$, and $I_h(\emptyset)$, respectively. It is intuitive that no player has an incentive to conceal information in favor of his preferred alternative. This is stated in the following lemma. A proof of the lemma can be found in the appendix.

Lemma 4 *Consider the open debate mechanism. In a most revealing equilibrium, low types reveal b^l and c^h, and high types reveal b^h and c^l.*

High types conceal at most b^l and c^h in a most revealing equilibrium, and low types conceal at most b^h and c^l. As high types have the same preferences, a high type's intention when concealing information can only be to trigger a vote for implementation by a low type, and a low type's intention can only be to trigger a vote against implementation by a high type. An immediate consequence of Lemma 4 is that these effects on a player's vote cannot be achieved if the player is uninformed at the stage of voting. This is stated in the following lemma. A proof can be found in the appendix.

Lemma 5 *In a most revealing equilibrium of the open debate mechanism, if a low (high) type has not observed any information – neither privately nor during the communication stage – he votes against (in favor of) implementation.*

Concealing information has an effect only if it has a sufficient impact on a player's beliefs at the stage of voting. A high type's non-disclosure of c^h can have a desired effect on a low type j's vote only if j reaches an information set $I_l(b^h)$, and $\mu_j(c^l) > \frac{\alpha h}{h-1}$ at this information set. However, the non-disclosure can also affect the other high type k's vote, namely if he reaches an information set $I_h(b^l)$ and $\mu_k(c^l) > \frac{h-1-\alpha}{h-1}$ at this information set. Similarly, a low type's non-disclosure of c^l can have a desired effect on a low type j's vote only if j reaches an information set $I_h(b^l)$, and $\mu_j(c^l) < \frac{h-1-\alpha}{h-1}$ at this information set. The non-disclosure affects the other low type k's vote, if k reaches an information set $I_l(b^h)$ and $\mu_k(c^l) < \frac{\alpha h}{h-1}$ at this information set.

If no player conceals any information about the costs in a putative equilibrium, $\mu_i(c^l) = \frac{1}{2}\ \forall i$ in any information set in which i is not perfectly informed about the costs. There is no incentive for any player to deviate from the putative equilibrium by concealing information about the costs, if $\frac{1}{2} < \frac{\alpha h}{h-1}$, and $\frac{1}{2} > \frac{h-1-\alpha}{h-1}$. Note that both inequalities hold for $\alpha > \frac{h-1}{2}$. We summarize the consequences for equilibrium behavior in the following lemma.

Lemma 6 *In a most responsive equilibrium of the open debate mechanism, players conceal information about the cost only if* $\alpha < \frac{h-1}{2}$.

The intuition for Lemma 6 is straightforward. If conflicts of interests are strong, high types are against implementation only if they know that costs are high, and low types are in favor of implementation only if they know that costs are low. Hence, if players do not learn information about the costs, they will not change their minds. Concealing information about the costs has no effect on individual votes and hence no effect on expected payoffs.

A similar line of reasoning applies to the non-disclosure of information about the benefits. Concealing b^l has an effect on a low type j's vote only if j reaches an information set $I_l(c^l)$, and j's belief at this information set satisfies $\mu_j(b^h) > \frac{\alpha}{(1-\alpha)(h-1)}$. The concealment affects a high type k's vote if k reaches an information set $I_h(c^h)$ and $\mu_k(b^h) > \frac{h-1-\alpha}{(1+\alpha)(h-1)}$ at this information set. Concealing b^h has an effect on a high type j's vote only if j reaches an information set $I_h(c^h)$, and j's belief in this information set satisfies $\mu_j(b^h) < \frac{h-1-\alpha}{(1+\alpha)(h-1)}$. The concealment affects a low type k's vote if k reaches an information set $I_l(c^l)$ and

$\mu_k(b^h) < \frac{\alpha}{(1-\alpha)(h-1)}$ at this information set.

In a putative equilibrium in which no player conceals information about the benefits, no player has an incentive to deviate by concealing information about the benefits, if $\frac{1}{2} < \frac{\alpha}{(1-\alpha)(h-1)}$, and $\frac{1}{2} > \frac{h-1-\alpha}{(1+\alpha)(h-1)}$. Both inequalities are satisfied if $\alpha < \frac{h-1}{h+1}$.

Lemma 7 *In a most responsive equilibrium of the open debate mechanism, players conceal information about the benefits only if* $\alpha < \frac{h-1}{h+1}$.

For $\alpha \geq \frac{h-1}{2}$, there is no incentive to deviate from full information revelation. Hence, we are ready to identify the most revealing equilibrium for this parameter range, and to quantify induced the decision quality.

Lemma 8 *Consider the open debate mechanism. If* $\alpha \geq \frac{h-1}{2}$*, there is an equilibrium in which every committee member reveals the information he is endowed with. Low types vote against implementation unless they observe* b^h *and* c^l*. High types vote for implementation unless they observe* b^l *and* c^h*.*

Proof. There is obviously no profitable deviation in the voting stage. Revelation strategies follow from Lemmata 6 and 7. Q.E.D.

Proposition 2 *Consider the most revealing equilibrium of the open debate mechanism for* $\alpha > \frac{h-1}{2}$.

(i) In state (b^h, c^l)*, the probability of implementation is*

$$\frac{1}{2}\left(1 + \delta^2\left(3\left(1 - \frac{\delta}{2}\right)^2 + \frac{1}{2}\left(\frac{\delta}{2}\right)^2\right)\right).$$

(ii) In state (b^l, c^h)*, the probability of rejection is*

$$\frac{1}{2}\left(1 + \delta^2\left(3\left(1 - \frac{\delta}{2}\right)^2 + \frac{1}{2}\left(\frac{\delta}{2}\right)^2\right)\right).$$

(iii) Expected social surplus is

$$(h-1)\left(\delta^2\left(3\left(1 - \frac{\delta}{2}\right)^2 + \frac{1}{2}\left(\frac{\delta}{2}\right)^2\right)\right).$$

The proof of Proposition 2 can be found in the appendix. Remember our initial assumption $\alpha < \frac{h-1}{h}$. Hence, the previously discussed parameter range is relevant only if $h \leq 2$. Note that in the equilibrium identified in Lemma 8, players are indifferent between sticking to their equilibrium revelation strategy and a possible deviation to conceal information which triggers a certain vote for (respectively against) implementation by the other types. Consider a low type's incentive to reveal c^l. As high types vote for implementation anyway (because they will not learn c^h), i can make sure that the project is implemented by voting for it if one of the other players reveals b^h. The probability of implementation will be the same, whether he conceals the information or he reveals it. Incentives to conceal information arise if the information makes the choice of the disliked alternative in the states in which players disagree more likely. If $\alpha < \frac{h-1}{2}$, there is an incentive for a low type to deviate from full information revelation. If the other players expect him to fully reveal his information, high types would vote against implementation in case only b^l is revealed in the communication stage. Hence, an equilibrium in which all players reveal their information exists only if $\alpha > \frac{h-1}{2}$.

We already observed that there may be an incentive for low types to conceal c^l if $\alpha < \frac{h-1}{2}$. The following lemma states that in fact both low types conceal c^l in the most revealing equilibrium for $\frac{h-1}{h+1} < \alpha < \frac{h-1}{2}$. A proof of the lemma can be found in the appendix.

Lemma 9 *Consider the open debate mechanism and suppose* $\frac{h-1}{h+1} < \alpha < \frac{h-1}{2}$. *The most revealing equilibrium has the following properties. Low types conceal* c^l. *Each low type votes against implementation unless he observes* b^h *and* c^l. *High types vote for implementation unless they observe* b^l *and* c^h, *or if* b^l *is revealed in the communication stage and (i) both low types have revealed* b^l, *(ii) only one low type revealed* b^l *and* $\delta \leq \frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}$, *or (iii) none of the low types revealed* b^l *and* $\delta \leq \frac{\sqrt{h-1-\alpha}-\sqrt{\alpha}}{\sqrt{h-1-\alpha}-\frac{\sqrt{\alpha}}{2}}$.

Proposition 3 quantifies the highest decision quality which is attainable in equilbrium in the open debate mechanism for $\alpha \in \left[\frac{h-1}{h+1}, \frac{h-1}{2}\right]$.

Proposition 3 *Consider the most revealing equilibrium of the open debate mechanism for* $\frac{h-1}{h+1} < \alpha < \frac{h-1}{2}$.

(i) In state (b^h, c^l)*, the probability of implementation is*

$$\frac{1}{2}\left(1+\delta^2\left(3\left(1-\frac{\delta}{2}\right)^2+\frac{1}{2}\left(\frac{\delta}{2}\right)^2\right)\right).$$

(ii) In state (b^l, c^h)*, the probability of rejection is*

$$\begin{array}{ll} \frac{1}{2}\left(1+\delta^2\left(\frac{13}{4}\left(1-\frac{\delta}{2}\right)^2+\frac{1}{2}\left(\frac{\delta}{2}\right)^2\right)\right), & \textit{if } \delta > \delta'' \\ \frac{1}{2}\left(1+\delta\left(1+\frac{5}{4}\delta-2\delta^2+\frac{11}{16}\delta^3\right)\right), & \textit{if } \delta' < \delta \leq \delta'', \textit{ and} \\ 1-\frac{1}{2}\left(1-\left(\frac{\delta}{2}\right)\right)^4, & \textit{if } \delta \leq \delta', \end{array}$$

where $\delta' = \frac{\sqrt{h-1-\alpha}-\sqrt{\alpha}}{\sqrt{h-1-\alpha}-\frac{\sqrt{\alpha}}{2}}$*, and* $\delta'' = \frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}$.

(iii) Expected social surplus is

$$\begin{array}{ll} (h-1)\frac{1}{2}\delta^2\left(\left(\frac{\delta}{2}\right)^2+\frac{25}{4}\left(1-\frac{\delta}{2}\right)^2\right), & \textit{if } \delta > \delta'' \\ (h-1)\frac{1}{2}\left(\delta^2\left(3\left(1-\frac{\delta}{2}\right)^2+\frac{1}{2}\left(\frac{\delta}{2}\right)^2\right)+\delta\left(1+\frac{5}{4}\delta-2\delta^2+\frac{11}{16}\delta^3\right)\right), & \textit{if } \delta' < \delta \leq \delta'', \textit{ and} \\ (h-1)\frac{1}{2}\left(\left(\delta^2\left(3\left(1-\frac{\delta}{2}\right)^2+\frac{1}{2}\left(\frac{\delta}{2}\right)^2\right)\right)-\left(1-\left(\frac{\delta}{2}\right)\right)^4\right), & \textit{if } \delta \leq \delta'. \end{array}$$

For the purpose of this paper it is not necessary to derive the entire set of equilibria. We now turn to the comparison of the two mechanisms, where we can already show for the previously discussed parameter range that the group debate mechanism may yield higher expected social surplus.

5 Comparison

If conflicts of interests are strong, i.e. $\alpha > \frac{h-1}{2}$, full information revelation is possible in the open debate (see Lemma 8). Hence, voters can base their decision on more information than in the group debate, and the states in which they agree will be identified with a higher probability. Therefore, the open debate mechanism performs strictly better than the group debate mechanism.

For smaller conflicts of interests, $\frac{h-1}{h+1} < \alpha < \frac{h-1}{2}$, in the group debate mechanism, high types vote against implementation if they observe low benefits and are uninformed about the costs. With open debate, low types have an incentive to conceal c^l. As a consequence, in case of a low type's silence, high types suspect him to conceal information. Then, they may refrain from voting against implementation although they know that benefits are low. This case arises if the probability with which a voter is endowed with information is not too low. If at the same time the probability of receiving information is low enough, it is likely that low types do not receive information, which will trigger the high types' suspicion in the open debate. Then, the group debate mechanism performs better in terms of the probability to reject the project in state (b^l, c^h). Overall, the group debate mechanism may yield a higher expected social surplus than the open debate mechanism. This is stated in the following proposition. A proof can be found in the appendix.

Proposition 4 *Consider the case* $\frac{h-1}{h+1} < \alpha < \frac{h-1}{2}$ *and suppose* $\delta > \frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}$, *and* $h < \frac{5}{3}$.
(i) There exists a δ^* *such that for* $\delta \in [\frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}, \delta^*]$ *the probability of rejection in state* (b^l, c^h) *is higher in the group debate mechanism than in the open debate mechanism.*
(ii) There exist α^* *and* δ^{**}, *such that for all* $\alpha \in [\alpha^*, \frac{h-1}{2}]$, *expected social surplus is higher in the group debate mechanism than in the open debate mechanism if* $\delta \in [\frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}, \delta^{**}]$.

6 Conclusion

In this paper, we showed that it may be beneficial to restrict communication among decision makers with conflicting interests. When communication is allowed, committee members become suspicious when a member with different interests does not talk. The consequence is that committee members react less to observable information than they would do if communication with committee members with conflicting interests was impossible. If decision makers possess information only with a small probability, the incidence that one of them does not talk arises with a high probability. Benefits from sharing (some) information are then outweighed by the inefficient usage of available information due to committee members' suspicion. If decision makers are restricted to communicate within groups of agents with aligned interests, a higher expected social surplus can be achieved.

We derived this result in a parsimonious model of a collective decision problem, which may be extended into several directions. In our model, it is crucial that communication between the groups is impossible. If decision makers could freely decide whom to inform, a decision maker would again make inferences when he is not informed by another agent. It would be interesting to see whether the group debate may endogenously arise in a model in which communication with other players is costly. Suppose for instance that a decision maker has to establish a costly link to another decision maker in order to send a message to him, and that this link has to be established before the decision makers are endowed with information. Another interesting extension would be to allow for endogenous information endowment. If information acquisition is costly, a decision maker's incentives to acquire information depend on with whom he can share the information, and whether other players will be listening.

Appendix

Proof of Lemma 4

We have to show that neither concealing b^l nor concealing c^h is a profitable deviation for a low type from a putative equilibrium in which he reveals the information. Obviously, a low type aims to influence only the high types' votes by concealing information, as he shares common interests with the other low type. When observing c^h, a low type does not want implementation. Concealing c^h can have an effect on a high type j's vote only if j finds himself in information set $I_h(b^l)$ or $I_h(\emptyset)$. Note that $\mu_i(b^h)$ cannot be affected by concealing c^h. In both information sets, $\mu_j(c^l)$ is higher when c^h is concealed than if it is revealed. Hence, the only effect the concealment of c^h can have is to cause a vote for implementation, which is clearly not in the interest of a low type, who prefers rejection. It is easy to verify that analogous arguments apply for a low type's revelation of b^l, and a high type's revelation of b^h and c^l. Q.E.D.

Proof of Lemma 5

Consider an uninformed low type player i. Given that no player has revealed information, i can infer (by Lemma 4) that neither of the high types has observed b^h or c^l. The only player who might have information which makes the state in which i prefers implementation more likely (in the sense of raising $\mu_i(c^l)$ or $\mu_i(b^h)$ above the prior) is the other low type. If any of the high types possesses information, i can infer that either $c = c^h$ or $b = b^l$, in which case i does not want implementation. Hence, expected utility from implementation can be positive only in the case in which neither of the high types has information and the other low type has information. Agent i's vote for implementation is pivotal only if there is at least one vote against implementation, that is either if (i) the other low type votes against implementation and one or both high types vote for implementation, or if (ii) the other low type votes for implementation and at least one of the high types votes against implementation. We will show that both cases are incompatible with equilibrium behavior and the low type being informed and high types being uninformed.

Consider case (i). If expected utility from implementation for agent i is positive presuming that the other low type has information, then the other low type's expected utility is positive if he actually has the information. Hence, voting against implementation is no equilibrium action for the informed low type.

Consider case (ii). If expected utility from implementation for agent i is positive, then it must also be positive for an uninformed high type. Voting against implementation is a contradiction to equilibrium. Thus, i's vote for implementation is pivotal only in cases in which expected utility from implementation is negative.

The proof for the high types is along the same lines. Q.E.D.

Proof of Proposition 2

(i) In the most revealing equilibrium, the project will be implemented in state (b^h, c^l) with probability 1 if at least one committee member receives a signal b^h and at least one committee member receives a signal c^l, and with probability $\frac{1}{2}$ else. The probability that at least one committee member receives a signal b^h and at least one committee member receives a signal c^l is

$$\delta\left(1-\left(1-\tfrac{\delta}{2}\right)^3\right)+(1-\delta)\left(\delta\left(1-\left(1-\tfrac{\delta}{2}\right)^2\right)+(1-\delta)\delta\tfrac{\delta}{2}\right)$$
$$=\delta^2\left(3\left(1-\tfrac{\delta}{2}\right)^2+\tfrac{1}{2}\left(\tfrac{\delta}{2}\right)^2\right).$$

Hence, the probability of implementation is

$$\tfrac{1}{2}\left(1+\delta^2\left(3\left(1-\tfrac{\delta}{2}\right)^2+\tfrac{1}{2}\left(\tfrac{\delta}{2}\right)^2\right)\right).$$

(ii) Analogous. (iii) Obvious. Q.E.D.

Proof of Lemma 9

We already noticed that in a putative equilibrium with full information revelation, concealing c^l is a profitable deviation for a low type. Note that no other non-disclosure is a profitable deviation from full information revelation. It remains to be shown that concealing c^l is a profitable deviation for low type i from a putative equilibrium in which only low type j conceals c^l, and that the strategy profile consists of mutually best responses.

Consider a putative equilibrium in which low type j conceals c^l, and low type i reveals c^l, and consider i's deviation to conceal c^l. For $\frac{h-1}{h+1} < \alpha$, i does not want the project to be implemented unless he observes b^h and c^l. If b^h is revealed, high types vote for implementation, hence i can make sure implementation by voting for it. Given the putative equilibrium communication strategies, high types believe that i is uniformed if he does not reveal information. Hence, if j reveals b^l, and no information about the costs is revealed, high types assign probability $\frac{1}{2}$ to c^l and vote against implementation. They vote in favor of implementation if j reveals c^l. The deviation has a positive effect for some communication outcomes, and no negative effects. Hence, it is a profitable deviation from the putative equilibrium.

Given voting strategies, revelation strategies are mutually best responses. Low types' voting strategies obviously maximize conditional expected payoff. Note that the fact that a low type might be concealing c^l is decision-irrelevant for the other low type (Lemma 5).

Consider the high types' voting strategies when reaching an information set in which only b^l was revealed. If both low types reveal b^l, high types know that none of them has observed c^l. Implementation yields expected utility $\alpha - \frac{1}{2}(h-1)$, which is negative since $\alpha < \frac{h-1}{2}$. If one of the low types has not revealed any information, high types assign probability $\frac{1-\frac{\delta}{2}}{\left(1-\frac{\delta}{2}\right)+(1-\delta)}$ to $c = c^l$. Expected utility form implementation is $\frac{1-\frac{\delta}{2}}{\left(1-\frac{\delta}{2}\right)+(1-\delta)}\alpha + \frac{1-\delta}{\left(1-\frac{\delta}{2}\right)+(1-\delta)}(1+\alpha-h)$, which is negative if and only if $\delta < \frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}$. If none of the low types reveals any information, high types assign probability $\frac{\left(1-\frac{\delta}{2}\right)^2}{\left(1-\frac{\delta}{2}\right)^2+(1-\delta)^2}$ to $c = c^l$. Expected utility form implementation is $\frac{\left(1-\frac{\delta}{2}\right)^2}{\left(1-\frac{\delta}{2}\right)^2+(1-\delta)^2}\alpha+\frac{(1-\delta)^2}{\left(1-\frac{\delta}{2}\right)^2+(1-\delta)^2}(1+\alpha-h)$, which is negative if and only if $\delta < \frac{\sqrt{h-1-\alpha}-\sqrt{\alpha}}{\sqrt{h-1-\alpha}-\frac{\sqrt{\alpha}}{2}}$. Q.E.D.

Proof of Proposition 3

(i) A low type votes in favor of implementation upon observing b^h and c^l in the communication stage or when observing b^h in the communication stage and (privately) observing c^l. As high types vote for implementation for all possible communication outcomes in state (b^h, c^l), one low type's vote in favor of implementation suffices in order to implement the project with probability 1. Hence, the same distribution of information yields implementation with certainty as for $\alpha > \frac{h-1}{2}$. The probability of implementation in state (b^h, c^l) in the most revealing equilibrium is the same for $\frac{h-1}{h+1} < \alpha < \frac{h-1}{2}$ as for $\alpha > \frac{h-1}{2}$. The proof of Proposition 2(i) applies.

(ii) Concerning the probability of rejection in state (b^l, c^h) we have to distinguish three cases. Low types vote against implementation for any communication outcome. If $\delta > \frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}$, high types vote against implementation only if the state is revealed or both low types revealed b^l. The probability of these events is

$$\delta\left(\frac{1}{2}\left(\delta+(1-\delta)\left(1-\left(1-\frac{\delta}{2}\right)^2\right)\right)+\frac{1}{2}\left(1-\left(1-\frac{\delta}{2}\right)^3\right)\right)$$
$$+(1-\delta)\left(\delta\left(1-\left(1-\frac{\delta}{2}\right)^2\right)+(1-\delta)2\left(\frac{\delta}{2}\right)^2\right)$$
$$=\delta^2\left(\frac{13}{4}\left(1-\frac{\delta}{2}\right)^2+\frac{1}{2}\left(\frac{\delta}{2}\right)^2\right).$$

Hence, the probability of rejection is

$$\frac{1}{2}\left(1+\delta^2\left(\frac{13}{4}\left(1-\frac{\delta}{2}\right)^2+\frac{1}{2}\left(\frac{\delta}{2}\right)^2\right)\right).$$

If $\frac{\sqrt{h-1-\alpha}-\sqrt{\alpha}}{\sqrt{h-1-\alpha}-\frac{\sqrt{\alpha}}{2}} < \delta \leq \frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}$, high types vote against implementation if they learn the state of the world or if they learn b^l and at least one of the low types reveals information. The probability of these events is

$$\delta\left(\frac{1}{2}+\frac{1}{2}\left(1-\left(1-\frac{\delta}{2}\right)^3\right)\right)+(1-\delta)\left(\delta\left(\frac{1}{2}+\frac{1}{2}\left(1-\left(1-\frac{\delta}{2}\right)^2\right)\right)+(1-\delta)2\left(\frac{\delta}{2}\right)^2\right)$$
$$=\delta\left(1+\frac{5}{4}\delta-2\delta^2+\frac{11}{16}\delta^3\right).$$

Hence, the probability of rejection is

$$\tfrac{1}{2}\left(1+\delta\left(1+\tfrac{5}{4}\delta-2\delta^2+\tfrac{11}{16}\delta^3\right)\right).$$

If $\delta \leq \frac{\sqrt{h-1-\alpha}-\sqrt{\alpha}}{\sqrt{h-1-\alpha}-\frac{\sqrt{\alpha}}{2}}$, high types vote against implementation if they learn b^l. The probability of this event is

$$1-\left(1-\left(\tfrac{\delta}{2}\right)\right)^4.$$

Hence, the probability of rejection is

$$1-\tfrac{1}{2}\left(1-\left(\tfrac{\delta}{2}\right)\right)^4.$$

(iii) Obvious. Q.E.D.

Proof of Proposition 4

(i) We have to show that

(a) $1-\frac{1}{2}\left(1-\frac{\delta}{2}\right)^2-\frac{1}{2}\left(1+\delta^2\left(\frac{13}{4}\left(1-\frac{\delta}{2}\right)^2+\frac{1}{2}\left(\frac{\delta}{2}\right)^2\right)\right)>0$ for $\delta<\delta^*$, and

(b) $\delta^*>\frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}$.

(a) $1-\frac{1}{2}\left(1-\frac{\delta}{2}\right)^2-\frac{1}{2}\left(1+\delta^2\left(\frac{13}{4}\left(1-\frac{\delta}{2}\right)^2+\frac{1}{2}\left(\frac{\delta}{2}\right)^2\right)\right)=\frac{\delta}{2}\left(1-\frac{7}{2}\delta+\frac{13}{4}\delta^2-\frac{15}{16}\delta^3\right)$, which is positive if $1-\frac{7}{2}\delta+\frac{13}{4}\delta^2-\frac{15}{16}\delta^3>0$. It is easy to verify that the second factor monotonously decreases in δ and is positive for $\delta=\frac{4}{9}$.

(b) $\frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}$ monotonously decreases in α. For the smallest value in the parameter range, $\alpha=\frac{h-1}{h+1}$, we have $\frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}=\frac{2}{3}(h-1)$, which is smaller than $\frac{4}{9}$ for $h<\frac{5}{3}$. Hence, existence of a parameter range for δ for which the party system performs better than the parliament is guaranteed for the entire relevant parameter range if $h<\frac{5}{3}$.

(ii) We have to show that $(h-1)\frac{1}{2}\left(\delta+\left(\frac{\delta}{2}\right)^2\right)>(h-1)\frac{1}{2}\delta^2\left(\left(\frac{\delta}{2}\right)^2+\frac{25}{4}\left(1-\frac{\delta}{2}\right)^2\right)$.

$$\begin{aligned}
\tfrac{1}{4}(h-1)\tfrac{1}{2}\left(\delta+\left(\tfrac{\delta}{2}\right)^2\right) &> \tfrac{1}{4}(h-1)\tfrac{1}{2}\delta^2\left(\left(\tfrac{\delta}{2}\right)^2+\tfrac{25}{4}\left(1-\tfrac{\delta}{2}\right)^2\right)\\
\Leftrightarrow \delta+\left(\tfrac{\delta}{2}\right)^2 &> \delta^2\left(\left(\tfrac{\delta}{2}\right)^2+\tfrac{25}{4}\left(1-\tfrac{\delta}{2}\right)^2\right)\\
\Leftrightarrow 1 &> \delta\left(\left(\tfrac{\delta}{2}\right)^2+\tfrac{25}{4}\left(1-\tfrac{\delta}{2}\right)^2-\tfrac{1}{4}\right).
\end{aligned}$$

It is easy to verify that the right-hand-side is smaller than 1 for $\delta=\frac{1}{5}$, and monotonously increasing for smaller values. Existence of the parameter ranges is obvious, as $\frac{h-1-2\alpha}{h-1-\frac{3}{2}\alpha}$ is zero for $\alpha=\frac{h-1}{2}$. Q.E.D.

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