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Published Version:
Public versus Secret Voting in Committees / Mattozzi, Andrea; Nakaguma, Marcos Y. - In: JOURNAL OF THE EUROPEAN ECONOMIC ASSOCIATION. - ISSN 1542-4766. - ELETTRONICO. - 21:3(2023), pp. 907-940. [10.1093/jeea/jvac061]

Availability:
This version is available at: https://hdl.handle.net/11585/897249 since: 2023-09-04

Published:

DOI: http://doi.org/10.1093/jeea/jvac061

(Article begins on next page)

Public versus Secret Voting in Committees*

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May 2022

Abstract

We study the effect of transparency of individual votes in committees where members are heterogeneous in competence and bias, they are career-concerned, and they can abstain. We show that public voting attenuates the biases of competent members and secret voting attenuates the biases of incompetent members. Public voting leads to better decisions when the magnitude of the bias is large, while secret voting performs better otherwise. We present novel experimental evidence consistent with our theory.

Keywords: Committees, Voting, Career-Concern, Transparency.
JEL Classification Codes: D72, C92, D71.

*We are especially grateful to Marina Agranov, Paulo Furquim de Azevedo, Maria Bigoni, Stefania Bortolotti, Marco Casari, Alessandra Casella, Vincenzo Denicolò, Juan Dubra, Fernanda Estevan, Francesco Feri, Piero Gottardi, Daniela Iorio, Philipp Kircher, Gilat Levy, Massimo Morelli, Salvatore Nunnari, Emanuel Ornelas, Luigi Proietti, Debraj Ray, Aniol Llorente-Saguer, Arthur Schram, Justin Valasek, seminar audiences at Bologna, CORS-RWIO, EESP-FGV, ECARES, Erasmus University, EUI, Georgetown, Insper, King's College, Leicester, Ridge Forum, Royal Holloway, SBE, St.Andrews, University of Oslo, USP, Warwick,Venice 4th Political Economy conference, the editor, and two referees. Veronica Rattini, Hanno Kase, Chiara Santantonio and Riccardo Ghidoni provided excellent research assistance. All omitted proofs and appendices can be found at https://sites.google.com/view/andrea-mattozzi/research

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1 Introduction

Committee decision-making is a central feature of many political and economic organizations, including legislative bodies, government agencies, central banks, law courts, and private and public companies. The issues confronted by committees are typically multi-faceted and complex, often involving a variety of conflicts and private interests. Furthermore, committee members are usually motivated by the desire to advance their own careers and, therefore, care about being perceived as high-ability decision-makers. Finally, members often have different competencies, so that it is not unusual to observe situations where some of them abstain when unable to form a firm conviction.[1]

This paper studies both theoretically and empirically a committee decision-making problem which combines all elements described above. Specifically, we examine an environment where committee members are biased towards different alternatives, they are heterogeneous in their level of competence, they care about their reputation for competence, and they may vote or abstain. In such a context, we investigate how the choice between secret and public voting affects the voting behavior of members and the quality of committee decisions. The main contribution of this paper is twofold. First, from a positive point of view, we study how biases, competence and career-concerns interact in shaping the incentives of committee members to abstain or vote for or against their biases. Second, from a normative point of view, we examine the conditions under which voting should be public or secret.

We start by proposing a collective decision-making model where a committee must take a decision over a binary agenda by simple majority, and members can vote for either alternative or abstain. The payoff of a committee member depends on three components: (*i*) a common value, i.e. whether the committee takes the 'correct' decision; (*ii*) a private value, i.e. whether the decision matches the member's bias; and (*iii*) a career-concern, i.e. the ex-post perceived competence of the member. Competence and bias are private information. Furthermore, under public voting the individual votes of all committee members are observed, while under secret voting only the aggregate number of votes for each alternative are observed. Our analysis highlights the fact that the interaction between career-concerns and transparency of voting leads to qualitatively different implications depending on the member's competence and the magnitude of

[1] A general view in the literature is that voting in committees provides an efficient way to aggregate disperse information and contributes to mitigate the interference of individual biases in the decisions. See Gerling et al [20] and Li and Suen [29] for literature reviews.

her bias relative to the common value.

In our setting, competent members know what the correct decision is, so that transparency creates an incentive for them to vote for it instead of following their private interests. Conversely, incompetent members are uncertain about which alternative is correct, so that transparency simply creates an incentive for them to vote, either for their biases or for the ex-ante more likely alternative, even though they would have otherwise preferred to abstain. In fact, in the absence of career-concerns and provided that the common value is sufficiently large, it is optimal for incompetent members to abstain, since by doing so they delegate the decision to the competent members (as in the *swing voter's curse*). In the presence of career-concerns, however, such behavior affects perceived competence negatively, since abstentions can be interpreted as a sign of incompetence in equilibrium. Therefore, we conclude that while transparency attenuates the pre-existing biases of competent members, it may actually exacerbate the pre-existing biases of incompetent members. We also show that, while these incentives exist everywhere in the parameters' space, they may lead to actual changes in observable behavior in different situations depending on the magnitude of the bias.

Focusing on a symmetric environment, we derive a number of comparative static results which are insightful in terms of the design of committees and organizations. Specifically, our analysis suggests that the presence of career-concerns hinders information aggregation in large committees, given that incompetent members have less incentive to abstain as the size of the committee becomes arbitrarily large. We also extend our basic model to consider an alternative setting where only the final decision is observed under secret voting. Interestingly, in this case we show that career-concerns become directly tied to the quality of committee's decisions, so that incompetent members have more incentive to abstain.[2] Finally, we consider a version of the model where we allow for a behind closed-doors deliberation prior to the voting stage. We show that the level of transparency induces a trade-off between the quality of information aggregation at the deliberation stage and the quality of decisions at the voting stage.

Given the difficulties involved in evaluating the effects of secret and public voting using observational data, we empirically explore the main predictions of our model by means of a laboratory study. An experimental approach allows us to control for the competence and biases of committee members, as well as to impose a structure on career-concerns. We implement a 2×2 design where we vary the magnitude of

[2] We also show that, in this case, information can still be fully aggregated even in large committees.

the bias (low or high) and the size of the career-concern rewards associated with a correct vote, which is low under secret voting and high under public voting. Our study focuses on the regions of parameters where a change in the level of transparency may lead to a change in equilibrium voting behavior. Interestingly, there are regions of the parameter space where our model features multiple equilibria with different information aggregation properties and, from this perspective, a laboratory experiment can help informing whether subjects coordinate on a particular class of equilibrium.

Consistently with the theoretical predictions, our experimental results show that: (*i*) under high bias treatments, the proportion of informed subjects who vote correctly is significantly larger under public voting, while (*ii*) under low bias treatments, the proportion of uninformed subjects who abstain is significantly larger under secret voting. Furthermore, in treatments where there are multiple equilibria, we find that a substantial fraction of subjects coordinate on the efficient equilibrium. While most of our experimental results are in line with the main comparative static predictions of the model, certain aspects of the observed behavior are difficult to rationalize based on theory alone. In particular, we find that a non-negligible proportion of uninformed subjects vote *against* their biases, which is consistent with the idea that some individuals vote based on "subjective beliefs" (Elbittar et al [8]). Moreover, a considerable fraction of informed subjects vote correctly in spite of the large incentives to follow their biases, possibly due to the psychological costs of doing the "wrong" thing (Gneezy [21]).

Related Literature and Contribution. The theoretical literature on secret versus public voting provides mixed results regarding the optimal choice of transparency in committees. On the one hand, in an environment with common value only, Levy [28] and Gersbach and Hahn [18] show that transparency induces agents to distort their behavior in order to signal competence. Specifically, in Levy [28] public voting creates an incentive for competent members to vote too much against the alternative favored by the prior in order to separate themselves from incompetent types, while in Gersbach and Hahn [18] transparency leads uninformed members to play an active role in deliberation. On the other hand, Gersbach and Hahn [17] and Stasavage [43] analyze a setting where committee members may be misaligned with the interests of society, but also care about being perceived as "unbiased" to the extent that this enhances their reelection prospects. They show that transparency induces biased agents to act in accordance with the public interest.

Our paper contributes to this literature by analyzing the interaction among competence, career-concerns and biases, and it provides a complete characterization of the set of equilibria for any bias size. Interestingly, the analysis shows that for any combination of parameters there can only exist three classes of equilibria. We derive the conditions for the existence of each of these equilibria under secret and public voting, which in turn allows us to precisely pin down the regions of parameters where transparency is preferred to secrecy, and vice-versa. Our analysis helps to reconcile the two strand of the literature discussed above. Importantly, and differently from Gersbach and Hahn [17] and Stasavage [43], our model does not assume that individual biases are detrimental to reputation.

This paper is also related to a branch of the literature which studies strategic abstentions in settings where the quality of information is heterogeneous across voters. In a seminal contribution, Feddersen and Pesendorfer [12] showed that less informed agents may prefer to abstain in equilibrium since they recognize that their vote is most likely to be pivotal when they vote for the wrong alternative: the swing voter's curse.[3] Our paper contributes to this literature by showing that the incentives for incompetent members to abstain depend crucially on whether they expect other incompetent members to abstain as well. This coordination issue gives rise to multiple equilibria in some parameter regions and has important implications for the design of committees.[4]

In addition to the studies discussed above, a number of other papers have examined the impact of career-concerns and transparency on committee decision-making.[5] Gersbach and Hahn [19] argue that transparency induces agents to exert more effort in order to improve their chances of reappointment, Dal Bo [7], Felgenhauer and Gruner [11] and Seidmann [41] show that public voting makes committees more vulnerable to the interference of special interest groups, and Visser and Swank [45] argue that

[3]Feddersen and Pesendorfer [14] and McMurray [31] extended the basic model by considering settings where voters have private values and where there is a continuum of private signals, respectively. See also Herrera et al [26] for an analysis of strategic abstentions in proportional elections.

[4]The mechanism behind this multiplicity would be present even in a model without career-concerns and biases. In this respect, our paper fully characterizes multiple equilibria in voting games where agents are subject to the swing voter's curse. Morton and Tyran [36] identified a case of multiplicity but in a more specific setting, Feddersen and Pesendorfer [12] focused their analysis on equilibria involving mixed strategies, and McMurray [31] recognized the possibility of multiple equilibria but focused mostly on cases where the equilibrium was unique.

[5]In the literature on individual decision-makers with career-concerns, Morris [34], Ely and Välimäki [9] and Shapiro [42] argue that transparency induces unbiased agents to ignore their private information and choose the alternative which makes them look "impartial". See also Prat [39] and Maskin and Tirole [30].

career-concerns create an incentive for committees to conceal internal disagreements and show a united front in public.[6] Finally, Midjord et al [33] point out that career-concerns induce experts to be too conservative in order not to put their reputation at risk, while Gradwohl [23] shows that transparency leads to a trade-off between the accuracy of decisions and the welfare of agents in a model where committee members have privacy concerns.

Following the pioneering theoretical work of Condorcet [5], and later contributions by Austen-Smith and Banks [1], Feddersen and Pesendorfer [13] and Coughlan [6], an experimental literature on collective decision-making emerged focusing mostly on common value environments. Guarnaschelli et al. [25] investigated the presence of strategic behavior under different voting rules, while Goeree and Yariv [22] studied the effect of deliberation on collective decisions. Adding information heterogeneity and allowing for abstentions, Battaglini et al [2] provided the first test of the swing voter's curse.[7] Grosser and Seebauer [24], Bhattacharya et al. [3] and Elbittar et al. [8] examined the incentives for information acquisition in committees under different voting rules.

Our paper adds to this literature by being the first to study an experimental setting combining information heterogeneity, biases, career-concerns and the possibility of abstentions. Our work is particularly related to Fehrler and Hughes [15] who also examine the effect of transparency on committee decision-making with career-concerns. However, their main experimental focus is on deliberation and, differently from us, they analyze an environment where all members are unbiased and abstentions are not allowed. A few other papers have studied the effect of career-concerns on information transmission and collective decision-making. Meloso, Nunnari and Ottaviani [32] provide a test of a reputational cheap talk game, while Renes and Visser [40] investigate how career-concerns affect communication and voting in committees, testing a version of the model proposed by Visser and Swank [45].[8]

[6]See also Swank and Visser [44] for a model that combines the public's demand for transparency, and the committee members' aversion to it. They argue that pressures to become transparent induce committee members to organize pre-meetings away from the public eye.

[7]Morton and Tyran [36] also studied the swing voter's curse in a setting with imperfect signals, where the number of experts and non-experts in the committee was known, while Morton and Tyran [37] showed that the existence of "corrupt" members mitigate the incentives for non-experts to delegate through abstentions.

[8]See also Morton and Ou [35] for a test of whether public voting leads to more prosocial voting behavior.

2 The Model

We consider a committee of n members, with $n \geq 3$ odd, which must decide between two alternatives, A and B. There are two states of the world, $\omega \in \{A, B\}$, with $\Pr(\omega = A) = q \in (0, 1)$.[9] While the true state is a priori unknown, committee members receive a signal about it, $s_i \in \{A, \emptyset, B\}$. A member may be either competent $\texttt{c}$, in which case she receives a perfectly informative signal $s_i = \omega$, or incompetent $\texttt{nc}$, in which case she receives an uninformative signal $s_i = \emptyset$. We assume that each member knows her own competence type $\tau_i \in \{\texttt{c},\texttt{nc}\}$ and the distribution of other members' competences, which is assumed to be common knowledge and iid with $\Pr(\tau_i = \texttt{c}) = \sigma \in (0, 1)$. After observing their private signals, all members decide simultaneously whether to vote for A or B or abstain, $v_i \in \{A, \emptyset, B\}$, where we denote an abstention by $v_i = \emptyset$. We say that a member voted correctly if $v_i = \omega$. The final decision $x \in \{A, B\}$ is determined by simple majority rule and ties are broken randomly.

Committee members care about making correct decisions and receive a common value $\alpha > 0$ whenever the final decision is equal to the state of the world, $x = \omega$. Additionally, every member is biased towards either A or B. Each member knows her own bias type, $\beta_i \in \{A, B\}$, as well as the distribution of other members' biases, which is assumed to be common knowledge and iid with $\Pr(\beta_i = A) = p \in (0, 1)$. A member with bias β_i receives an extra payoff $\gamma > 0$ when alternative $x = \beta_i$ is chosen, regardless of the state of the world.

Committee members are also concerned about building a reputation for competence and making correct decisions. In particular, we assume the existence of an external evaluator, whose only task is to update his beliefs about the likelihood that each member is competent and voted correctly, conditional on knowledge about the state of the world and any other information that might be available to him under a particular voting rule. The state of the world is always revealed ex-post. Moreover, under *public voting* the evaluator is also able to observe the individual votes of all members, while under *secret voting* he is able to observe only the total number of votes for each alternative.[10] The posterior probability that a committee member i is competent and

[9] Our model extends the setting analyzed by Nakaguma [38] to an asymmetric environment.

[10] We assume that committee members are unable to credibly communicate information about their votes ex-post, otherwise all members who voted correctly would have an incentive to do so and voting would become *de facto* public in our model.

voted correctly is therefore given by

$$r_i^{\omega,\lambda} \equiv \Pr(\tau_i = \texttt{c}, v_i = \omega | \omega, \mathcal{I}^\lambda), \tag{1}$$

where ω is the state of the world, $\lambda \in \{\texttt{p}, \texttt{s}\}$ denotes whether voting is public or secret, and $\mathcal{I}^\lambda$ represents all relevant information available under voting rule λ. Note that our definition of career-concern reward assumes that the evaluator cares not only about competence but also about whether the committee member voted correctly or not.[11] This assumption simplifies our analysis and allows us to focus on the more interesting types of equilibria. Furthermore, it proves particularly helpful in terms of the experimental implementation of our theory. In Online Appendix A.5 we provide a detailed analysis of a version of the model where we use a definition of career-concerns based simply on the posterior probability that the agent is competent, $r_i^{\omega,\lambda} \equiv \Pr(\tau_i = \texttt{c} | \omega, \mathcal{I}^\lambda)$. All our qualitative results remain unchanged under this alternative setting.

Given the state of the world ω and the committee's decision x, the utility of a member i biased towards β_i under voting rule λ is given by

$$u_i^{\beta_i,\lambda}(x, \omega) = \phi r_i^{\omega,\lambda} + \mathbb{I}_{\{x=\omega\}}\alpha + \mathbb{I}_{\{x=\beta_i\}}\gamma, \tag{2}$$

where $\phi > 0$ is the weight assigned to career-concerns and $\mathbb{I}_{\{\cdot\}}$ is an indicator function that is equal to one if the condition inside brackets is satisfied and zero otherwise.

Remark. Our model makes a number of simplifying assumptions which deserve to be discussed in more detail. In Online Appendix A, we undertake the following extensions and robustness checks: (*i*) we examine the case where competent and incompetent members receive signals of positive but imperfect precisions, (*ii*) we show that the model can be extended to allow for the presence of unbiased members and for the existence of correlation between competence and bias, (*iii*) we discuss the role of the assumption that the state of the world is always observed ex-post, and (*iv*) we show,

[11] As we shall show, this assumption implies that in equilibrium a committee member receives zero career-concern rewards whenever she abstains or votes incorrectly, conditional on her vote being observed. Intuitively, this aspect of the model captures an external evaluator very tough on whoever says "*I am not sure what to do*" or who expresses blatantly wrong opinions. While it is not always the case that not taking a position is detrimental in terms of expected competence, our assumption seems plausible in most cases. For example, a member of a monetary committee who candidly reveals not knowing whether inflation is permanent or transitory or whether interest rates should be hiked or not would most probably harm his reputation.

as mentioned above, that our main qualitative results remain unchanged when we use a notion of career-concerns that is based only on the posterior probability that the member is competent. Furthermore, in Section 6 we show that our main results are robust to assuming that only the final decision of the committee is observed under secret voting, and in Online Appendix B we characterize the institutional preferences of committee members and consider a version of the model with behind closed-doors deliberation.

3 Equilibrium Analysis

We solve the model for symmetric pure-strategy equilibria where committee members of the same type, i.e. with the same bias and competence level, adopt identical strategies. We assume that players do not use weakly-dominated strategies and we ignore trivial equilibria where everybody votes for the same alternative and no one is ever pivotal.[12] In equilibrium, each committee member chooses a voting strategy that maximizes her expected utility given the equilibrium strategies of other members and the beliefs of the external evaluator. At the same time, the external evaluator's beliefs must be consistent with the members' strategies and computed by Bayes rule.

3.1 Basic Properties

We begin our analysis by providing a general characterization of the basic properties of the equilibria. Let μ_i denote the conjecture held by a committee member i about the behavior of other members and the beliefs of the external evaluator. Suppose first that member i observes the state of the world prior to voting, i.e. consider that she receives a perfectly informative signal. Given the conjecture μ_i and the state of the world ω, player i's choice v_i induces a probability distribution over final outcomes, which is represented by the mapping $\rho^{\omega}_{\mu_i} : \{A, \emptyset, B\} \to [0, 1]$, where $\rho^{\omega}_{\mu_i}(v_i)$ denotes the probability (as perceived by the member) that the committee's decision is A when her choice is v_i, given μ_i and ω. Note that $\rho^{\omega}_{\mu_i}(B) < \rho^{\omega}_{\mu_i}(\emptyset) < \rho^{\omega}_{\mu_i}(A)$ since a vote for A always leads to a higher probability that the committee's decision is A relative to the case where the member abstains or votes for B.[13]

[12] Specifically, we focus our analysis on responsive equilibria where at least some committee members condition their votes on their private signals and/or biases.

[13] Observe that the probability $\rho^{\omega}_{\mu_i}(v_i)$ already takes into account the uncertainty related to the realization of types of all other committee members.

Let μ_e be the external evaluator's beliefs about the behavior of committee members. Under public voting, all individual votes are observed ex-post, so that the career-concern rewards depend only on each member's own vote in accordance with the following expression

$$r_{i,\mu_e}^{\omega,\mathsf{p}} = \Pr_{\mu_e}(\tau_i = \mathsf{c}|v_i = \omega)\mathbb{I}_{\{v_i=\omega\}}, \tag{3}$$

where the conditional probability $\Pr_{\mu_e}(\tau_i = \mathsf{c}|v_i = \omega)$ is computed based on the external evaluators' beliefs. Under secret voting, on the other hand, only the aggregate voting outcome is observed ex-post, so that the career-concern rewards depend on the total number of correct votes $V^C \equiv \sum_i \mathbb{I}_{\{v_i=\omega\}}$ in accordance with the following expression

$$r_{i,\mu_e}^{\omega,\mathsf{s}} = \Pr_{\mu_e}(\tau_i = \mathsf{c}|v_i = \omega)\tfrac{V^C}{n}, \tag{4}$$

where V^C/n represents the probability that a particular member voted correctly. Note that in this case the career-concern rewards are the same across all members and equal to the average expected competence in the committee given V^C.

In equilibrium, each committee member correctly anticipates the voting behavior of other members as well as the beliefs of the external evaluator. Before casting a vote, a member forms an expectation about the career-concern reward that she will receive as a function of her vote. Suppose, first, that the state of the world is observed by the member. Under public voting, the expected career-concern reward is given by

$$\widetilde{r}_i^{\omega,\mathsf{p}}(v_i) = \Pr(\tau_i = \mathsf{c}|v_i = \omega)\mathbb{I}_{\{v_i=\omega\}}, \tag{5}$$

where we omit the index for the evaluator's beliefs to simplify the notation. Under secret voting, on the other hand, the expected career-concern reward is given by

$$\widetilde{r}_i^{\omega,\mathsf{s}}(v_i) = \Pr(\tau_i = \mathsf{c}|v_i = \omega)\tfrac{1}{n}[\mathbb{I}_{\{v_i=\omega\}} + \mathbb{E}(\textstyle\sum_{j\neq i}\mathbb{I}_{\{v_j=\omega\}})], \tag{6}$$

where $\mathbb{E}(\sum_{j\neq i}\mathbb{I}_{\{v_j=\omega\}})$ represents the expected number of correct votes cast by all other committee members.[14] Hence, under secret voting the impact of a member's correct vote on her own career-concern reward is diluted in proportion to the size of

[14] Observe that the term inside brackets represents member i's expectation about the total number of correct votes cast by the committee, given her vote v_i and conditional on her beliefs about the behavior of other members μ_i. As before, we omit reference to member i's beliefs to simplify the notation.

the committee. Finally, when the state of the world is not observed, each member computes her expected career-concern reward as follows

$$\widetilde{r}_i^{\lambda}(v_i) = q\widetilde{r}^{\omega=A,\lambda}(v_i) + (1-q)\,\widetilde{r}^{\omega=B,\lambda}(v_i)\,, \tag{7}$$

where $\Pr(\omega = A) = q$.

Assuming that the state of the world is known to be A, the expected utility of a competent member biased towards β_i can be expressed as a function of her vote v_i as follows

$$U^{\beta_i=A,\lambda}(v_i, s_i = A) = \phi\widetilde{r}_i^{\omega=A,\lambda}(v_i) + \rho^{\omega=A}(v_i)(\alpha+\gamma) \tag{8}$$

and

$$U^{\beta_i=B,\lambda}(v_i, s_i = A) = \phi\widetilde{r}_i^{\omega=A,\lambda}(v_i) + \rho^{\omega=A}(v_i)\alpha + (1-\rho^{\omega=A}(v_i))\gamma, \tag{9}$$

depending on whether the member is biased towards A or B, respectively. Similar expressions hold for the case where $\omega = B$. The next lemma provides a general characterization of the behavior of competent members whose biases are equal to the state of the world.[15]

Lemma 1. *Both abstaining and voting against the bias are strictly dominated strategies for a competent member whose bias is equal to the signal* $s_i = \beta_i$.

Lemma 1 shows that a competent member who receives a signal equal to her bias always prefers to vote correctly. Note that, by Bayes rule, this result implies that the likelihood that a member is competent given that she voted correctly is strictly positive in any equilibrium, $\Pr(t = \mathsf{c}|v = \omega) > 0$. The next lemma then follows as a direct implication.

Lemma 2. *In equilibrium, a committee member's expected career-concern reward is always strictly larger when she votes correctly than when she abstains or votes incorrectly.*

Based on this property, we can then characterize the equilibrium behavior of competent members whose biases are different from the state of the world.

Lemma 3. *There exists no equilibrium in which a competent member whose bias is different from her signal* $s_i \neq \beta_i$ *abstains.*

[15] All proofs can be found in Online Appendix D.

Intuitively, competent members observe the state of the world and, as such, are not subject to the swing voter's curse. Therefore, there is no reason for them to abstain in our model, as Lemmas 1 and 3 show. Based on the previous results, we are also able to provide a general characterization of the equilibrium behavior of incompetent members.

Lemma 4. *There exists no equilibrium in which a competent member who receives a signal different from her bias $s_i \neq \beta_i$ votes for β_i and an incompetent member abstains. Furthermore, if in equilibrium a competent member who receives a signal different from her bias votes for β_i then all incompetent members with bias β_i must also vote for β_i.*

Intuitively, incompetent members are always more inclined to follow their biases relatively to competent members. Note that when a competent member decides to vote against the signal, she is certain to be casting an incorrect vote, while an incompetent member always attributes some positive probability to the event that her vote is correct. Lemma 4 guarantees, for instance, that if in equilibrium competent members biased towards A vote for A when the state is B, then all incompetent members biased towards A must vote for A as well. As for the behavior of incompetent members with bias B in this case, Lemma 4 just says that they will never abstain $-$ they might vote for their bias or for the ex-ante more likely alternative.[16]

Finally, we show that it is possible to classify the equilibria of the model into three classes.

Proposition 1. *The set of symmetric pure-strategy equilibria of the model can be categorized into one of the following classes:*

i. A fully-competent equilibrium, where all competent members vote in accordance with the signal and all incompetent members abstain;

ii. A partially-competent equilibrium, where all competent members vote in accordance with the signal and not all types of incompetent members abstain;

iii. A biased equilibrium, where not all types of competent members vote in accordance with the signal and all incompetent members vote.

[16] Note that voting against the bias might be optimal for an incompetent member if the prior q is sufficiently asymmetric.

A fully-competent equilibrium completely pins down the behavior of all committee members, while both a partially-competent and a biased equilibrium allow for a variety of different behaviors within each class. A partially-competent equilibrium pins down the behavior of competent members and is consistent with either both types of incompetent members voting – either for the ex-ante more likely alternative or for their biases – or with one type voting (e.g. incompetent members with bias A) and the other abstaining (e.g. incompetent members with bias B). A biased equilibrium is consistent with either both types of competent members always voting for their biases or with one type voting in accordance with the signal and the other voting for their bias. As for the incompetent members, they never abstain in a biased equilibrium and, as shown in Lemma 4, they vote for their biases if competent members with the same bias are also doing so. Proposition 1 organizes the set of all possible equilibria by grouping them in terms of key qualitative features of voters' behavior.[17] Importantly, our characterization holds under both public and secret voting, although the region of parameters where each class of equilibrium exists does depend on the type of voting rule as we next show.

3.2 Main Comparative Statics Results

This subsection provides a general characterization of the regions of parameters where it is possible to sustain each class of equilibrium under secret and public voting. The following proposition characterizes the conditions for the existence of a fully-competent equilibrium.

Proposition 2. *There exists a unique threshold $\overline{\gamma}^{\lambda}_{full}(\alpha, \phi, \sigma, n) < \alpha$, such that a fully-competent equilibrium can be sustained if and only if $\gamma \leq \overline{\gamma}^{\lambda}_{full}(\alpha, \phi, \sigma, n)$. Furthermore $\overline{\gamma}^{\mathtt{s}}_{full}(\alpha, \phi, \sigma, n) > \overline{\gamma}^{\mathtt{p}}_{full}(\alpha, \phi, \sigma, n)$.*

A fully-competent equilibrium can be sustained only if the magnitude of the bias is small relatively to the common value and is more likely to exist under secret voting. The binding constraint for the existence of this class of equilibrium is that on the behavior of incompetent members and guarantees that they prefer to abstain rather than vote. Note that the interaction between transparency and career-concerns creates

[17] Furthermore, as we shall discuss in Subsection 3.3, under symmetry $q = p = 1/2$ there exists a unique equilibrium in each class.

an incentive for incompetent members to vote, since abstaining perfectly reveals their lack of competence under transparency.

Proposition 3. *There exist unique thresholds* $\underline{\gamma}^{\lambda}_{part}(\alpha,\phi,\sigma,n)$ *and* $\overline{\gamma}^{\lambda}_{part}(\alpha,\phi,\sigma,n)$, *with* $\underline{\gamma}^{\lambda}_{part}(\alpha,\phi,\sigma,n) < \alpha < \overline{\gamma}^{\lambda}_{part}(\alpha,\phi,\sigma,n)$, *such that a partially-competent equilibrium can be sustained if and only if:*

$$\underline{\gamma}^{\lambda}_{part}(\alpha,\phi,\sigma,n) \leq \gamma \leq \overline{\gamma}^{\lambda}_{part}(\alpha,\phi,\sigma,n).$$

Furthermore $\underline{\gamma}^{\mathtt{p}}_{part}(\alpha,\phi,\sigma,n) < \underline{\gamma}^{\mathtt{s}}_{part}(\alpha,\phi,\sigma,n) < \overline{\gamma}^{\mathtt{s}}_{part}(\alpha,\phi,\sigma,n) < \overline{\gamma}^{\mathtt{p}}_{part}(\alpha,\phi,\sigma,n)$.

A partially-competent equilibrium can be sustained even if the magnitude of the bias is large relatively to the common value and is more likely to exist under public voting. Specifically, the region of parameters where a partially-competent equilibrium can be supported under secrecy is strictly contained in the region where it can be supported under transparency. Observe that in this case transparency acts to counteract the effect of the bias for competent members by creating an incentive for them to vote correctly in order to signal their competence. At the same time, it provides incentive for incompetent members to vote rather than abstain.

We emphasize that a partially-competent equilibrium is consistent with a few different behaviors by incompetent members, so that the condition above simply guarantees that a partially-competent equilibrium of "some sort" exists. To be clear, a move from secret to public voting (or vice-versa) might cause the equilibrium to change from one type of partially-competent equilibrium to another (e.g. it might cause one group of incompetent members to change from abstaining to voting). The results presented in Proposition 3 apply broadly to the class of partially-competent equilibrium, as we do not distinguish between the different subclasses. We will be able to derive more precise predictions about the behavior of committee members in Subsection 4.3, where we analyze the symmetric version of the model.

Finally, the next proposition characterizes the conditions for the existence of a biased equilibrium.

Proposition 4. *There exists a unique threshold* $\underline{\gamma}^{\lambda}_{bias}(\alpha,\phi,\sigma,n) > \alpha$ *such that a biased equilibrium can be sustained if and only if* $\gamma \geq \underline{\gamma}^{\lambda}_{bias}(\alpha,\phi,\sigma,n)$ *Furthermore,* $\underline{\gamma}^{\mathtt{s}}_{bias}(\alpha,\phi,\sigma,n) < \underline{\gamma}^{\mathtt{p}}_{bias}(\alpha,\phi,\sigma,n)$.

A biased equilibrium can be sustained only if the bias is large relatively to the common value and is more likely to exist under secret voting. Specifically, the region of parameters where a biased equilibrium can be supported under transparency is strictly contained in the region where it can be supported under secrecy. Intuitively, secrecy reduces the career-concern rewards associated with a correct vote, which makes competent members more willing to disregard their information about the state of the world and follow their biases. We also emphasize that a biased equilibrium is consistent with different behaviors by both competent and incompetent members, so that the same caveats discussed above apply to this case.

Finally, note that there will generally be an overlap between the regions of parameters where a fully-competent and a partially-competent equilibria can be sustained as well as between the regions of parameters where a partially-competent and a biased equilibrium can be sustained. Overall, our analysis highlights the fact that transparency affects the behavior of competent and incompetent members in different ways. On the one hand, transparency attenuates the preexisting biases of competent members by inducing them to vote correctly even if the state of the world contradicts their biases. On the other hand, transparency exacerbates the preexisting biases of incompetent members by inducing them to vote in order to avoid exposing their lack of competence. While these incentives exist everywhere in the parameters' space, our analysis shows that they may lead to actual changes in observable voting behavior in different situations. Specifically, when the magnitude of the bias is relatively large, transparency may induce competent members to vote correctly rather than incorrectly (an attenuation effect) − while incompetent members vote anyway. Alternatively, when the magnitude of the bias is relatively small, transparency may induce incompetent members to vote rather than abstain (an exacerbation effect) − while competent members vote correctly anyway.

3.3 The Symmetric Case

In this subsection, we assume that the distributions of both prior and biases are symmetric, i.e. $q = p = 1/2$. The symmetric prior assumption guarantees that when an incompetent member decides to vote she always votes for her bias. Moreover, the symmetry in the distribution of biases further simplifies the analysis by making the incentives of members with the same competence type but different biases symmetric. Together, these assumptions also imply that there exists a unique equilibrium in each class, so that voting behavior is completely pinned-down. Specifically, the unique partially-competent equilibrium is such that all competent members vote correctly and all incompetent members vote for their biases, while the unique biased equilibrium is such that all members follow for their biases. Under symmetry we can explicitly solve for the thresholds defined in Propositions 2, 3 and 4.

Proposition 5. *Suppose that $q = p = 1/2$, then:*

i. A fully-competent equilibrium can be supported if and only if:

$$\gamma \leq \overline{\gamma}^{\lambda}_{full}(\alpha, \phi, \sigma, n) \equiv \frac{(n-1)\,\sigma}{2+(n-3)\,\sigma}\alpha - \frac{\left(1-\frac{n-1}{n}\mathbb{I}_{\{\lambda=\mathtt{s}\}}\right)\phi}{\left(1+\frac{n-3}{2}\sigma\right)(1-\sigma)^{n-2}}$$

ii. A partially-competent equilibrium can be supported if and only if:

$$\gamma \leq \overline{\gamma}^{\lambda}_{part}(\alpha, \phi, \sigma, n) \equiv \alpha + \frac{2^{n}\sigma\left(1-\frac{n-1}{n}\mathbb{I}_{\{\lambda=\mathtt{s}\}}\right)\phi}{\binom{n-1}{(n-1)/2}(1+\sigma)^{\frac{n+1}{2}}(1-\sigma)^{\frac{n-1}{2}}}$$

iii. A biased equilibrium can be supported if and only if:

$$\gamma \geq \underline{\gamma}^{\lambda}_{bias}(\alpha, \phi, \sigma, n) \equiv \alpha + \frac{2^{n-1}\sigma\left(1-\frac{n-1}{n}\mathbb{I}_{\{\lambda=\mathtt{s}\}}\right)\phi}{\binom{n-1}{(n-1)/2}}$$

with $\overline{\gamma}^{\lambda}_{full} < \underline{\gamma}^{\lambda}_{bias} < \overline{\gamma}^{\lambda}_{part}$. Furthermore, $\overline{\gamma}^{\mathtt{p}}_{full} < \overline{\gamma}^{\mathtt{s}}_{full}$, $\overline{\gamma}^{\mathtt{p}}_{part} > \overline{\gamma}^{\mathtt{s}}_{part}$, and $\underline{\gamma}^{\mathtt{p}}_{bias} > \underline{\gamma}^{\mathtt{s}}_{bias}$.

Note that the term $((n-1)/n) \cdot \mathbb{I}_{\{\lambda=\mathtt{s}\}}$ which appears in the expressions above captures the impact of the dilution of career-concern rewards under secret voting.[18] Observe that a change from public to secret voting is qualitatively equivalent to a reduction in the weight attached to career-concerns ϕ. Figure 1 shows the regions of the parameters α and γ where each class of equilibrium can be sustained, for voting rule λ and fixed values of ϕ, σ and n.

Observe that since $\overline{\gamma}^{\lambda}_{full} < \overline{\gamma}^{\lambda}_{part}$, the region of parameters where a fully-competent equilibrium exists is contained in the region where a partially-competent equilibrium can be sustained. Recall that the main reason for an incompetent member to abstain is to avoid adding "noise" to the decision process. However, a coordination issue arises

[18]The lower-bar threshold for a partially-competent equilibrium $\underline{\gamma}^{\lambda}_{part}$, which appears in Proposition 3, is strictly negative under symmetry, meaning that the constraint on incompetent members is not binding in this case and they always prefer to vote rather than abstain. Under symmetry, there can be no gain in abstaining for an incompetent member if all other incompetent members are voting.

in the region where the two equilibria overlap in that abstaining can only be optimal for an incompetent member if she expects other incompetent members to abstain as well. Similarly, since $\underline{\gamma}_{bias}^{\lambda} < \overline{\gamma}_{part}^{\lambda}$, there exists a region of parameters where both a partially-competent and a biased equilibrium can be sustained. The multiplicity of equilibria arises in this case due to the existence of a coordination issue among competent members who are biased against the state of the world. In the region where the two equilibria overlap, voting in accordance with one's bias can only be optimal if a member expects other competent members of the same bias type to do the same. The reason is that an individual is less likely to be pivotal when she is the only competent member voting against the state, in which case she would prefer to vote correctly in order to obtain a larger career-concern reward.

Figure 2 summarizes the main comparative static results of the model. Observe that in region I, where $\overline{\gamma}_{part}^{\mathsf{s}} < \gamma < \overline{\gamma}_{part}^{\mathsf{p}}$, a partially-competent equilibrium can be sustained under public but not under secret voting. Instead, in region II, where $\overline{\gamma}_{full}^{\mathsf{p}} < \gamma < \overline{\gamma}_{full}^{\mathsf{s}}$, a fully-competent equilibrium can be sustained under secret but not under public voting. When the magnitude of the bias is relatively large, as in region I, incompetent members always vote in accordance with their biases, but public voting may induce competent members to vote correctly rather than incorrectly. On the other hand, when the magnitude of the bias is relatively small, as in region II, competent members always vote correctly, but secret voting may induce incompetent members to abstain rather than vote.

For each class of equilibrium, it can be shown that the probability of a correct decision is given by

$$\Pi_{full}(\sigma, n) = 1 - \tfrac{1}{2}(1-\sigma)^n$$

$$\Pi_{part}(\sigma, n) = \textstyle\sum_{i=(n+1)/2}^{n} \binom{n}{i} \left(\sigma + \tfrac{1}{2}(1-\sigma)\right)^i \left(\tfrac{1}{2}(1-\sigma)\right)^{n-i}$$

$$\Pi_{bias}(\sigma, n) = \tfrac{1}{2},$$

with $\Pi_{full}(\sigma, n) > \Pi_{part}(\sigma, n) > \Pi_{bias}(\sigma, n)$ for any $0 < \sigma < 1$ and $n \geq 3$.[19] We are therefore able to rank public and secret voting in welfare terms, based on the expected quality of the decisions.

Proposition 6. *Suppose that $q = p = 1/2$. In equilibrium, we have:*

[19] Observe that the probability of a correct decision is strictly smaller than 1 under a fully-competent equilibrium, since with probability $(1-\sigma)^n$ all committee members are incompetent.

i. If $\overline{\gamma}^{\mathsf{s}}_{part}(\alpha,\phi,\sigma,n) < \gamma < \overline{\gamma}^{\mathsf{p}}_{part}(\alpha,\phi,\sigma,n)$ *then the probability of a correct decision under public voting is at least as large as under secret voting.*

ii. If $\overline{\gamma}^{\mathsf{p}}_{full}(\alpha,\phi,\sigma,n) < \gamma < \overline{\gamma}^{\mathsf{s}}_{full}(\alpha,\phi,\sigma,n)$ *then the probability of a correct decision under secret voting is at least as large as under public voting.*

Note that because of the existence of multiple equilibria in some parameter regions, as discussed above, we are only able to rank public and secret voting weakly. We complement our characterization of the equilibria by providing additional comparative static results based on the expressions derived in Proposition 5.

Proposition 7. *The following comparative static results hold:*

i. Career-concerns (ϕ). For any $\alpha \geq 0$, $\phi > 0$, $0 < \sigma < 1$, $n \geq 3$, we have that:

$$\frac{\partial \overline{\gamma}^{\lambda}_{full}(\alpha,\phi,\sigma,n)}{\partial \phi} < 0, \quad \frac{\partial \overline{\gamma}^{\lambda}_{part}(\alpha,\phi,\sigma,n)}{\partial \phi} > 0 \quad \textit{and} \quad \frac{\partial \underline{\gamma}^{\lambda}_{bias}(\alpha,\phi,\sigma,n)}{\partial \phi} > 0$$

ii. Competent members (σ). There exists $\overline{n} \in \mathbb{R}$ such that for any $\alpha \geq 0$, $\phi > 0$, $0 < \sigma < 1$ and $n \geq \overline{n}$, we have that:

$$\frac{\partial \overline{\gamma}^{\lambda}_{full}(\alpha,\phi,\sigma,n)}{\partial \sigma} < 0$$

Furthermore, for any $n \geq 3$, we have:

$$\frac{\partial \overline{\gamma}^{\lambda}_{part}(\alpha,\phi,\sigma,n)}{\partial \sigma} > 0 \quad \textit{and} \quad \frac{\partial \underline{\gamma}^{\lambda}_{bias}(\alpha,\phi,\sigma,n)}{\partial \sigma} > 0$$

The comparative static results with respect to ϕ are intuitive in light of our previous discussion. Both a fully-competent and a biased equilibrium become more difficult to sustain as the weight attached to career-concerns increases, while a partially-competent equilibrium becomes easier to sustain. Indeed, for an arbitrarily large ϕ only a partially-competent equilibrium exists. On the other hand, the comparative static results with respect to σ are more subtle. First, we show that, for n large enough, a fully-competent equilibrium becomes less likely to exist as the proportion of competent members increases. Note that, in this case, as σ goes up the likelihood that an incompetent member is pivotal when she casts an incorrect vote (i.e. swing voter's curse) decreases, which gives incompetent members a strong incentive to vote. Moreover, we show that a partially-competent equilibrium becomes more likely to exist as σ increases. Note that, in this case, an increase in the proportion of competent members reduces the likelihood that any competent member is pivotal when she casts an incorrect vote and, at the same time, increases the cost of doing so in terms of forgone career-concern rewards. Both of these elements provide a strong incentive for competent members to vote correctly.[20] Finally, a biased equilibrium is always less likely to exist as σ increases. The general intuition here is that an increase in σ raises the opportunity cost of voting against the state for a competent member, given that the career-concern rewards associated with a correct vote are increasing in the fraction of competent members.

In the next proposition we examine what happens to the existence conditions when the size of the committee becomes arbitrarily large.

Proposition 8. *For any $\alpha \geq 0$, $\phi > 0$, $0 < \sigma < 1$, we have that:*

i. Under public voting:

$$\lim_{n\to\infty} \overline{\gamma}^{\mathsf{p}}_{full}(\cdot) = -\infty, \quad \lim_{n\to\infty} \overline{\gamma}^{\mathsf{p}}_{part}(\cdot) = +\infty \;\text{ and }\; \lim_{n\to\infty} \underline{\gamma}^{\mathsf{p}}_{bias}(\cdot) = +\infty$$

ii. Under secret voting:

$$\lim_{n\to\infty} \overline{\gamma}^{\mathsf{s}}_{full}(\cdot) = -\infty, \quad \lim_{n\to\infty} \overline{\gamma}^{\mathsf{s}}_{part}(\cdot) = +\infty \;\text{ and }\; \lim_{n\to\infty} \underline{\gamma}^{\mathsf{s}}_{bias}(\cdot) = \alpha$$

First, note that as n gets arbitrarily large a fully-competent equilibrium can never be sustained. Indeed, the probability that an incompetent member is pivotal in a fully-competent equilibrium converges to zero as $n \to \infty$, so that incompetent members have a large incentive to vote. Thus, contrarily to Feddersen and Pesendorfer (1996), information is never fully aggregated in large elections.[21] Furthermore, a partially-competent equilibrium exists everywhere in the parameters' space under both public and secret voting when $n \to \infty$. Finally, we show that a biased equilibrium can only exist under secrecy. Thus, overall, our analysis suggests that in large elections with career-concerns, transparency is expected to lead to (weakly) better decisions.

[20] When σ is arbitrarily close to 1 a fully-competent equilibrium never exists while a partially-competent equilibrium always exists, i.e. $\lim_{\sigma\to 1} \overline{\gamma}^{\lambda}_{full}(\cdot) = -\infty$ and $\lim_{\sigma\to 1} \overline{\gamma}^{\lambda}_{part}(\cdot) = +\infty$.

[21] This result holds for any ϕ strictly positive.

4 Experimental Design

In this section we test the main theoretical predictions of our model by means of a controlled lab experiment. Given that the choice between secret and public voting is often endogenous to the composition of the committee as well as to the type of decision being taken, it is difficult to isolate the impact of transparency on voting outcomes using non-experimental data. A lab experiment allows us to collect information on individual voting behavior and compare the quality of the decisions made under public and secret voting while controlling for the level of competence and the biases of committee members. Furthermore, since our model features multiple equilibria with different information aggregation properties, the experimental results can inform us on whether subjects coordinate on a particular equilibrium.

For the experimental implementation of the model, we amend our basic setup by assuming that the career-concern rewards associated with a correct vote are exogenously given under both public and secret voting. Specifically, we assume that before voting each member knows, and is guaranteed to receive, a certain payoff $R^{\lambda} > 0$ under voting rule λ when she votes correctly, with $R^{\mathrm{p}} > R^{\mathrm{s}}$. Note that this simplification maintains all basic features of the original model, except that we are now modeling career-concerns in a reduced form fashion.[22] By doing so, we limit attention to testing individual and collective voting behavior, taking the process of establishment of reputation as given instead of having human subjects involved in this computation.[23]

We consider committees of three members with an uniform prior ($q = 1/2$) and a symmetric distribution of biases ($p = 1/2$) and competence ($\sigma = 1/2$). Recall that in this case a fully-competent equilibrium is such that all competent members vote correctly and all incompetent members abstain, a partially-competent equilibrium is such that all competent members vote correctly and all incompetent members vote for their biases, and a biased equilibrium is such that all members vote for their biases. Under our proposed experimental setup, the conditions for the existence of each class

[22] In particular, the same three classes of equilibria exist, there are multiplicity of equilibria in some parameter regions and all previous comparative static results hold.

[23] Both Fehrler and Hughes [15] and Meloso, Nunnari and Ottaviani [32] find that experimental subjects have a hard time updating beliefs correctly in the lab. Fehrler and Hughes [15] show that average evaluations are too optimistic and Meloso, Nunnari and Ottaviani [32] find that human evaluations tend to be so noisy that they considerably dampen the incentives of other subjects, particularly in treatments where there are multiple equilibria. More generally, Esponda and Vespa [10] show that subjects have difficulty inferring information from the strategies of other players. For a recent paper in which human subjects update beliefs about the level of competence of committee members, see Renes and Visser [40].

of equilibrium are given by[24]

$$\gamma \leq \overline{\gamma}^{\lambda}_{full} \equiv \frac{1}{2}\alpha - 2R^{\lambda}$$

$$\gamma \leq \overline{\gamma}^{\lambda}_{part} \equiv \alpha + \frac{8}{3}R^{\lambda}$$

and

$$\gamma \geq \overline{\gamma}^{\lambda}_{bias} \equiv \alpha + 2R^{\lambda}$$

We focus our analysis on the regions of parameters where a change in the level of transparency is expected to lead to a change in voting behavior. The choice of parameters and the predicted equilibria associated with each treatment are reported in Table 1. The common value is set to $\alpha = 10$ in all treatments, while the magnitude of the bias is either low $\gamma = 1$ or high $\gamma = 14$, and the career-concern reward is either $R^{\mathsf{s}} = 1$ under secret voting or $R^{\mathsf{p}} = 9$ under public voting. Accordingly, we have four treatments labelled as (with predicted equilibria in parenthesis): Low-Bias/Secret-Voting (fully or partially-competent), Low-Bias/Public-Voting (partially-competent), High-Bias/Secret-Voting (biased) and High-Bias/Public-Voting (partially-competent). Note that since there are multiple equilibria in the Low-Bias/Secret-Voting treatment, in principle one could observe no difference in voting behavior and fraction of correct decisions between Low-Bias/Secret-Voting and Low-Bias/Public-Voting.

The experimental sessions were conducted at the Bologna Laboratory for Experiments in Social Science (BLESS) between November and December 2021 with registered undergraduates from the University of Bologna. Our experiment follows a between-subjects design, where participants in each session were exposed to a single treatment. We run a total of 12 sessions (3 sessions per treatment) with 18 subjects each. Each treatment was repeated for 32 rounds, the first two being practice non-paid rounds. In total, 216 different subjects took part in the experiment.

The experiment was implemented via computer terminals and programmed in z-Tree (Fischbacher [16]). Instructions were read aloud at the beginning of each session, after which a short comprehension quiz was administered in order to check basic understanding of the rules.[25] Subjects were randomly divided into "groups" (i.e. committees) of three members and were randomly re-assigned in every period to different groups

[24] See the Online Appendix E for the derivation of these conditions.

[25] All participants were provided a copy of the instructions that they could consult at any moment during the session. See the Online Appendix F for a version of the instructions translated into English.

formed by participants coming from a fixed matching-group composed of 9 subjects. The task of each group was to choose between two colors, blue or yellow. The "group's color" (i.e. the state of the world) was ex-ante unknown and could be either blue or yellow with equal probability.

Before voting, each subject received a message about the group's color that could be either perfectly informative ("*blue*" or "*yellow*") or non-informative ("*blue or yellow with equal probability*") with equal probability.[26] Each subject was also informed about her "role" (i.e. bias), which could be either blue or yellow with equal probability. After observing their messages and roles, each subject had to choose whether to vote for blue or yellow or to abstain. The "group's decision" was taken by majority rule and ties were broken randomly. At the end of each period, participants were informed about their group's color, the decision taken, number of votes for blue, yellow and abstentions, and their payoffs.

The individual payoff in each period was such that if the group's decision was equal to the group's color, then the subject received 10 points. Moreover, if the group's decision was equal to the subject's role, then she received 1 extra point under Low-Bias treatments and 14 extra points under High-Bias treatments. Finally, if the subject's vote was equal to the group's color, then she received 1 extra point under Secret-Voting treatments and 9 extra points under Public-Voting treatments. The points obtained during a session were converted to Euros at a rate of €1 per 100 points and participants were paid the sum of their earnings over the 30 paid rounds after the experiment. The average earning was €9.75, including a show-up fee of €5, with each session lasting approximately 45 minutes.

5 Experimental Results

5.1 Committee Decisions

We begin our analysis of the experimental results by examining the quality of the groups' decisions. Table 2 reports the proportion of correct decisions under each treatment for both the full sample and a subsample considering only the last five rounds of each session. In the last column, we also report the fraction of correct decisions predicted to hold in equilibrium under each treatment according to our model. Under

[26] In our discussion, we will refer to subjects who receive informative messages as "informed" (i.e. competent) and to those who receive non-informative messages as "uninformed" (i.e. incompetent).

Low-Bias treatments the quality of decisions is slightly larger, but not significantly different, under Secret-Voting (85.37%) than Public-Voting (84.25%) (diff = 1.11, p-value = 0.52), whereas under High-Bias treatments the fraction of correct decisions is significantly larger under Public-Voting (77.77%) than Secret-Voting (66.48%) (diff = 11.29, p-value = 0.00).[27] Note that the directions of these results are in line with the comparative static predictions of our model. Interestingly, the difference between treatments increase when we consider only the decisions taken in the last five rounds of each session. Under Low-Bias treatments the quality of decisions becomes significantly larger under Secret-Voting (88.88%) than Public-Voting (76.85%) (diff = 12.03, p-value = 0.00), whereas under High-Bias treatments the proportion of correct decisions remains significantly larger under Public-Voting (83.33%) than Secret-Voting (64.81%) (diff = 18.51, p-value = 0.02).

5.2 Individual Voting Behavior

Next, we examine the individual decisions of subjects. Table 3 provides a summary of the voting behavior of uninformed voters, i.e. subjects making decisions in rounds where they do not receive any message about the state of the world.[28] In Panel A of Table 3, we report the results for the full sample. Under Low-Bias treatments uninformed voters are significantly more likely to abstain under Secret-Voting (50.37%) than Public-Voting (21.60%) (diff = 28.77, p-value = 0.03), while being significantly less likely to vote for their biases under Secret-Voting (39.82%) than Public-Voting (60.69%) (diff = 20.86, p-value = 0.05).[29] Moreover, under High-Bias treatments the majority of uninformed voters follow their biases under both Secret-Voting (80.98%) and Public-Voting (87.22%), as predicted by our model. In Panel B of Table 3, we show that these results are robust to focusing only on the last five rounds of each session

[27] The p-values for the mean comparison tests reported throughout this section are computed based on simple OLS regressions. To account for arbitrary correlation in the behavior of subjects interacting in the same session, the standard errors are clustered at the matching-group level. We note that adjusting the standard errors to account for the small number of clusters using the approach proposed by Ibragimov and Müller [27] does not change any of our results.

[28] Those are the incompetent members in the jargon of our theoretical model.

[29] As we show in Table A.1 in the Online Appendix, our results are robust to controlling for period fixed effects and a number of individual characteristics, including gender, age, a measure of risk aversion, whether the subject took classes on statistics, economics and game theory, whether she took part in an experiment in the past, and her performance in the comprehension quiz.

and, if anything, the observed behavior changes in the expected direction.[30]

While these results are consistent with the main comparative static predictions of our model, certain aspects of the observed behavior are difficult to rationalize based on theory alone. In particular, a considerable fraction of uninformed subjects vote *against* their biases. Note that this type of behavior is particularly frequent under Low-Bias/Public-Voting, where 17.70% of uninformed voters do so. A possible explanation for this result could be attributed to the fact that some individuals vote against their biases in an attempt to guess the state of the world based on "subjective beliefs".[31] We also observe a considerable proportion of uninformed voters abstaining under Low-Bias/Public-Voting (21.60%) and High-Bias/Secret-Voting (14.57%) in spite of the relatively large incentives to vote in both of these treatments.

Table 4 provides a summary of the behavior of informed voters who received a signal different than their biases. These subjects face a trade-off between voting for the correct alternative and following their biases.[32] Panel A of Table 4 reports the results for the full sample. Under High-Bias treatments, we find that informed voters are significantly more likely to vote correctly under Public-Voting (79.27%) than Secret-Voting (40.78%) (diff = 38.49, p-value = 0.00), while being significantly less likely to follow their biases under Public-Voting (16.14%) than Secret-Voting (49.87%) (diff = 33.73, p-value = 0.00). Moreover, consistently with the predictions of the model, under Low-Bias treatments the overwhelming majority of informed subjects vote correctly under both Secret-Voting (95.41%) and Public-Voting (97.66%).[33] In Panel B of Table 4, we show that these results are robust to focusing only on the last five rounds of each session. Interestingly, the percentage of individuals who vote in accordance with their signals under High-Bias/Public-Voting increase substantially from 79.27% to 92.85%.

As before, certain aspects of the observed behavior are different than those predicted by our model. In particular, a substantial fraction of informed subjects who received a signal different than their biases vote correctly (40.78%) or abstain (9.33%) under

[30] Specifically, abstentions increase slightly under Low-Bias/Secret-Voting (51.25%), while voting for the bias increases in all treatments, particularly under High-Bias/Secret-Voting (84.27%) and High-Bias/Public-Voting (93.15%).

[31] These findings are consistent with experimental results obtained by Elbittar et al [8], who argue that a large proportion of uninformed subjects vote based on hunches or guesses ("subjective beliefs"). Similar results were also obtained by Guarnaschelli et al [25] and Bouton et al [4]. We will return to this discussion later in subsection 5.4.

[32] Among informed voters who received a signal equal to their biases, there is no trade-off − in fact, 99.2% of these subjects vote for the correct alternative.

[33] As we show in Table A.2 in the Online Appendix, our results are robust to controlling for period fixed effects and a number of individual characteristics.

High-Bias/Secret-Voting, whereas in equilibrium we would expect them to follow their biases. A potential explanation for this result could be attributed to the fact that both common value (10 points) and bias (14 points) are relatively close in magnitude under this treatment, which may have led some informed subjects to vote correctly − in which case they would also gain one extra point − or simply abstain. Moreover, the fact that abstentions remain relatively high even in the last rounds of a session may indicate a reluctance to vote against the state, perhaps due to psychological costs associated with doing the "wrong" thing.

5.3 Voting Profiles

Next, we examine the frequency with which voting profiles conform exactly to each of the three classes of equilibrium predicted to exist by our theory. To do so, we restrict the sample to include only group decisions that involved at least one uninformed voter and one informed voter who received a signal different than her bias. This restriction allows us to associate each voting profile with a single class of equilibrium. As shown in Table 5, under Low-Bias treatments the proportion of voting profiles that are exactly consistent with a fully-competent equilibrium is significantly larger under Secret-Voting (40.33%) than Public-Voting (15.35%) (diff = 24.98, p-value = 0.04), as expected. Conversely, the fraction of voting profiles consistent with a partially-competent equilibrium is smaller under Secret-Voting (31.93%) than Public-Voting (45.27%), although this difference is not statistically significant (diff = 13.34, p-value = 0.22). Moreover, under High-Bias treatments the proportion of voting profiles that are exactly consistent with a biased equilibrium is significantly larger under Secret-Voting (29.38%) than Public-Voting (10.74%) (diff = 18.64, p-value = 0.00), whereas the fraction of profiles that are compatible with a partially-competent equilibrium is smaller under Secret-Voting (31.02%) than Public-Voting (64.44%) (diff = 33.42, p-value = 0.00), as expected.

While the general pattern of the results are in line with the comparative static predictions of our model, some voting profiles do not conform to any type of equilibrium. In Table 5, we refer to those profiles as "Other". Note that the fraction of profiles that fall into this category tends to be large under Low-Bias/Public-Voting (39.38%) and High-Bias/Secret-Voting (37.56%). Indeed, as discussed above, a substantial proportion of uninformed subjects vote against their biases under Low-Bias/Public-Voting, while a large fraction of informed voters who receive a signal different than their biases vote correctly under High-Bias/Secret-Voting.

5.4 Discussion and Robustness

We further analyze the results of the experiment to examine whether differences in individual characteristics, such as gender, risk aversion and performance in the comprehension quiz, affect the way subjects make decisions in the lab. Interestingly, we find that male and female subjects behave in significantly different ways in certain cases, while other characteristics do not seem to be systematically related to observed behavior. Our main finding is reported in Figure 3, which summarizes the choices of uninformed voters by gender under Low-Bias treatments.[34] Note that female subjects abstain significantly less under both secret and public voting. Specifically, under Secret-Voting women are 27.37 percentage points (pp) less likely to abstain than men (p-value = 0.00), while being 16.69 pp more likely to vote for their biases (p-value = 0.07) and 10.68 pp more likely to vote against their biases (p-value = 0.00).[35] Previous experimental studies such as Grosser and Seebauer [24] and Elbittar et al. [8] have found that a substantial fraction of subjects vote when uninformed. Our findings complement this literature by suggesting that women may be more inclined to follow their subjective beliefs.

Finally, we conclude our discussion with a brief overview of the results obtained in a previous version of this experiment. The design employed in our earlier study was very similar to the one described above, with two main differences. First, career-concern rewards were set to zero under secret voting, $R^{\mathsf{s}} = 0$.[36] Second, a within-subjects design was implemented where in each session the value of the bias term was kept constant and participants were exposed to both Public-Voting and Secret-Voting treatments.[37] In Online Appendix C, we provide a detailed description of the

[34] Out of 216 participants, 121 declared themselves to be women, 89 declared themselves to be men and 6 preferred not to answer the gender question. For the present analysis, we exclude subjects who did not report their gender.

[35] These results are robust to controlling for period fixed effects and other individual characteristics. Note also that under Public-Voting women are 18.36 pp less likely to abstain relatively to men, 16.84 pp more likely to vote for their biases and 1.52 pp more likely to vote against their biases, although none of these differences are statistically significant.

[36] This assumption was originally intended to sharpen the contrast between public and secret voting. In principle, however, even a small but strictly positive carrer-concer reward could have an unanticipated effect on experimental results.

[37] While each approach has its own advantages, there are reasons to believe that the between-subjects design may be more suitable in the context of our study, particularly because it eliminates the need to account for sequencing effects. See discussion in subsection C.2.4 in the Online Appendix.

experimental design and results obtained in our earlier study. The experiment was conducted in 6 sessions and had the participation of 144 different subjects.[38] Overall, our findings were remarkably similar to those discussed above. Specifically, we found as before that under Low-Bias treatments uninformed voters were significantly more likely to abstain under Secret-Voting (44.17%) than Public-Voting (18.98%) (diff = 25.18, p-value = 0.00).[39] Moreover, under High-Bias treatments informed voters who received a signal different than their biases were significantly more likely to vote correctly under Public-Voting (84.60%) than Secret-Voting (21.86%) (diff = 62.74, p-value = 0.00).

These results provide additional support for our main findings. Interestingly, the biggest difference between the two versions of our experiment refers to the results obtained for the High-Bias/Secret-Voting treatment, where all subjects are expected to vote for their biases. Specifically, in our earlier experiment, where the career-concern reward under secrecy was set to $R^s = 0$, the percentage of informed subjects who voted correctly was 21.86%, while raising the career-concern reward to $R^s = 1$ lead to an increase in this proportion to 40.78% (diff = 18.29, p-value = 0.00).[40] Conversely, the percentage of informed subjects who voted for their biases decreased from 63.44% to 49.87% (diff = 13.56, p-value = 0.03). A potential explanation for this result could be attributed to a "nudge effect" caused by the addition of a small but strictly positive reward associated with doing the "right" thing for the group.

Finally, consistently with the results discussed above, we also found in our previous experiment that female subjects were less likely to abstain. In particular, while the fraction of men who abstained under Low-Bias/Secret-Voting was 52.6%, the proportion of women who did so was 38.2%, although this difference was not statistically significant (diff = 14.36, p-value = 0.14).

[38] All subjects who took part in our previous study were not invited to participate in the final experiment.

[39] The p-values for the mean comparison tests are computed based on simple OLS regressions with standard errors clustered at the session level. We note that adjusting the standard errors to account for the small number of clusters using the approach proposed by Ibragimov and Müller [27] does not change our results. See details in Online Appendix C.

[40] As usual, we focus our analysis on the behavior of informed voters who received a signal different than their biases.

6 Extensions

We conclude our analysis by returning to the basic model and examining a few additional issues. In Online Appendix B.1, we provide a characterization of the institutional preferences of committee members. We show that, overall, due to the dilution effect, competent members are more inclined towards transparency while incompetent members tend to prefer secrecy. Moreover, we derive conditions under which committee members may actually prefer the voting rule which leads to the worst decisions in expectation.

Next, in Online Appendix B.2, we extend our basic model to allow for a behind closed-doors deliberation prior to voting stage, where committee members may choose to share their private information. In this setting, we show that information is not always aggregated and we identify situations where competent members may have an incentive to strategically withhold information and then vote correctly in order to separate themselves from the incompetent members. Furthermore, we find that the level of transparency may induce a trade-off between the quality of information aggregation at the deliberation stage and the quality of decisions at the voting stage. Under certain conditions, secrecy may actually make it more likely that information about the state is shared at the deliberation stage, while transparency creates an incentive for informed individuals to vote correctly at the voting stage.

In the remainder of this section we study how our main results would change if we considered an alternative type of secret voting.

Alternative Secret Voting. In our main analysis we assumed that the total number of votes for each alternative was observed under secrecy. We now consider an alternative setting where only the final outcome x is observed. Note that under this alternative type of secret voting, which we denote by s', career-concern rewards are given by

$$r_{i,\mu_e}^{\omega,\mathsf{s}'} = \Pr_{\mu_e}(\tau_i = \mathsf{c} | v_i = \omega) \frac{\mathbb{E}_{\mu_e}(V^C | x, \omega)}{n} \tag{10}$$

where the main difference with respect to our previous analysis is that the external evaluator needs to form an expectation about the total number of correct votes $\mathbb{E}_{\mu_e}(V^C | x, \omega)$ based on his beliefs μ_e, and conditional on the committee's decision x and the state of the world ω, whereas V^C was directly observed before (see equation 4).

In equilibrium, committee members correctly anticipate the voting behavior of other members as well as the beliefs of the external evaluator. In particular, they know that conditional on the outcome x the number of correct votes expected by the evaluator is $\mathbb{E}_{\mu_e}(V^C|x,\omega)$. Assuming that the state of the world ω is observed, the expected career-concern reward of a member as a function of her vote is[41]

$$\widetilde{r}_i^{\omega,\mathsf{s}'}(v_i) = \Pr(\tau_i = \mathsf{c}|v_i = \omega)\tfrac{1}{n}[\rho^{\omega}(v_i)\,\mathbb{E}(V^C|x = A,\omega) + (1-\rho^{\omega}(v_i))\mathbb{E}(V^C|x = B,\omega)] \tag{11}$$

where, as defined before, $\rho^{\omega}(v_i)$ denotes the probability that the committee's decision is A when her vote is v_i, conditional on the state of the world ω. The term inside brackets captures of the expected number of correct votes, from the point of view of the member, given v_i and ω. Observe that, in this case, a member's vote affects her expected career-concern reward only by changing the probability that each outcome is obtained $\rho^{\omega}(v_i)$, while $\mathbb{E}(V^C|x = A,\omega)$ and $\mathbb{E}(V^C|x = B,\omega)$ remain fixed given ω and do not depend in any way on v_i.

Under majority rule and conditional on x and ω, the external evaluator computes the expected number of correct votes in accordance with the following expressions

$$\mathbb{E}(V^C|x = \omega,\omega) = \mathbb{E}(V^C|V^C \geq V^I,\omega)$$

and

$$\mathbb{E}(V^C|x \neq \omega,\omega) = \mathbb{E}(V^C|V^C \leq V^I,\omega)$$

where V^I denotes the total number of incorrect votes cast by the committee. Note that a correct decision $x = \omega$ allows the evaluator to infer that $V^C \geq V^I$, while an incorrect decision $x \neq \omega$ implies the opposite.

Our analysis follows similar steps to the ones previously taken. First, we can show that Lemmas $1-3$ still apply to this alternative setting. Thus, competent members never abstain in equilibrium. Furthermore, in equilibrium

$$\mathbb{E}(V^C|x = \omega,\omega) > \mathbb{E}(V^C|x \neq \omega,\omega)$$

i.e. the expected number of correct votes is always strictly larger when the decision is correct. Therefore, conditional on $\omega = A$, the expected career-concern reward of a

[41] As before, we omit reference to the beliefs of the external evaluator and the committee member to simplify the notation.

committee member is such that

$$\widetilde{r}_i^{\omega=A,\mathtt{s}'}(A) > \widetilde{r}_i^{\omega=A,\mathtt{s}'}(\emptyset) > \widetilde{r}_i^{\omega=A,\mathtt{s}'}(B)$$

with similar inequalities holding for the case where the state of the world is B. The key difference with respect to our previous analysis is that carer-concern rewards are now strictly larger when a member abstains rather than when she votes incorrectly. Intuitively, an abstention is not as severely punished in this case, given that only the final decision is observed. Thus, overall, the incentives for an incompetent member to abstain increase substantially under this alternative setting.

Moreover, a version of Lemma 4 still holds in this case. Specifically, as before, we can show that if a competent member biased towards A votes for A when the state is B, then in equilibrium all incompetent members biased towards A must vote for A. However, contrarily to Lemma 4, we can no longer guarantee that incompetent members biased towards B will vote, since the incentives to abstain are larger in this case. Still, in a symmetric environment with $q = p = 1/2$ it can be shown that the set of possible equilibria can be categorized into the same three classes described in Proposition 1.

Focusing on the symmetric case, we are able to provide a complete characterization of the equilibrium when only the final decision is observed under secret voting. To simplify exposition and facilitate comparison across different types of voting rules, we concentrate our analysis on the case where $n = 3$, the smallest committee size which still leads to interesting insights about the role of transparency in the design of committee decision-making rules.

Proposition 9. *Suppose that $n = 3$ and $q = p = 1/2$, then under voting rule* $\mathtt{s}'$ *we have:*

i. A fully-competent equilibrium can be supported if and only if:

$$\gamma \leq \overline{\gamma}_{full}^{\mathtt{s}',n=3}(\alpha, \phi, \sigma) \equiv \sigma\alpha + \frac{\sigma^2\phi}{1 - \frac{1}{2}(1-\sigma)^3}$$

ii. A partially-competent equilibrium can be supported if and only if:

$$\gamma \leq \overline{\gamma}_{part}^{\mathtt{s}',n=3}(\alpha, \phi, \sigma) \equiv \alpha + \frac{4\sigma\phi}{(1+\sigma)(2-\sigma)(2+\sigma)}$$

iii. A biased equilibrium can be supported if and only if:

$$\gamma \geq \underline{\gamma}_{bias}^{\mathtt{s}',n=3}(\alpha,\phi,\sigma) \equiv \alpha + \frac{\sigma\phi}{2}$$

Furthermore, $\underline{\gamma}_{bias}^{\mathtt{s}',n=3}(\alpha,\phi,\sigma) < \overline{\gamma}_{part}^{\mathtt{s}',n=3}(\alpha,\phi,\sigma)$.

The distinctive feature of the equilibrium structure under secret voting $\mathtt{s}'$ is related to the condition for the existence a fully-competent equilibrium. Note that, contrarily to the other voting rules, under secret voting $\mathtt{s}'$, career-concerns actually make a fully-competent equilibrium more likely to exist. Intuitively, career-concern rewards are now directly tied to the quality of the committee's decisions − and not to the correctness of individual votes − giving incompetent members more incentive to abstain. Formally, as the weight attached to career-concerns increases, a fully-competent equilibrium becomes more likely to exists under $\mathtt{s}'$, $\partial\overline{\gamma}_{full}^{\mathtt{s}',n=3}/\partial\phi > 0$, whereas the opposite holds for both public voting and secret voting $\mathtt{s}$ (see Proposition 7, item *i*). Furthermore, a fully-competent equilibrium is more likely to exist under $\mathtt{s}'$ when the fraction of competent members increases, $\partial\overline{\gamma}_{full}^{\mathtt{s}',n=3}/\partial\sigma > 0$, whereas the opposite holds for both of the other voting rules (see Proposition 7, item *ii*). Intuitively, an incompetent member is more willing to abstain under $\mathtt{s}'$, thereby delegating the decision to others, when she knows that the committee members are competent with high probability.

Proposition 10. *Suppose that $n = 3$ and $q = p = 1/2$, then:*

i. For a fully-competent equilibrium, we have:

$$\overline{\gamma}_{full}^{\mathtt{p},n=3}(\alpha,\phi,\sigma) < \overline{\gamma}_{full}^{\mathtt{s},n=3}(\alpha,\phi,\sigma) < \overline{\gamma}_{full}^{\mathtt{s}',n=3}(\alpha,\phi,\sigma)$$

A fully-competent equilibrium is most likely to exist under secret voting $\mathtt{s}'$ and least likely to exist under public voting $\mathtt{p}$.

ii. For a partially-competent equilibrium, we have:

$$\overline{\gamma}_{part}^{\mathtt{s}',n=3}(\alpha,\phi,\sigma) < \overline{\gamma}_{part}^{\mathtt{s},n=3}(\alpha,\phi,\sigma) < \overline{\gamma}_{part}^{\mathtt{p},n=3}(\alpha,\phi,\sigma)$$

A partially-competent equilibrium is most likely to exist under public voting $\mathtt{p}$ and least likely to exist under secret voting $\mathtt{s}'$.

iii. For a biased equilibrium, we have:

$$\underline{\gamma}_{bias}^{\mathtt{p},n=3}(\alpha,\phi,\sigma) > \underline{\gamma}_{bias}^{\mathtt{s},n=3}(\alpha,\phi,\sigma) > \underline{\gamma}_{bias}^{\mathtt{s}',n=3}(\alpha,\phi,\sigma)$$

A biased equilibrium is most likely to exist under secret voting $\mathtt{s}'$ *and least likely to exist under public voting* $\mathtt{p}$.

The order of thresholds in each case is intuitive and consistent with the idea that voting rule $\mathtt{s}'$ represents an extreme form of secret voting, where very little information is revealed about the individual behavior of committee members. In particular, observe that a reduction in the degree of transparency (from $\mathtt{p}$ to $\mathtt{s}'$) makes both a fully competent and a biased equilibrium more likely to exist, whereas an increase in the degree of transparency (from $\mathtt{s}'$ to $\mathtt{p}$) makes a partially competent equilibrium more likely to exist. Thus, the general mechanism highlighted in our main discussion is robust to considering voting rule $\mathtt{s}'$. In particular, more secrecy provides incentives for incompetent members to abstain, whereas more transparency provides incentives for competent members to vote correctly.

Finally, focusing on a fully-competent equilibrium, which is the class of equilibrium for which the qualitative differences between secret voting $\mathtt{s}$ and $\mathtt{s}'$ are most striking, we show that the results derived above extend to larger committees with size $n \geq 3$.

Proposition 11. *Suppose that* $q = p = 1/2$*, then a fully-competent equilibrium can be supported under voting rule* $\mathtt{s'}$ *if and only if:*

$$\gamma \leq \overline{\gamma}_{full}^{\mathtt{s}'}(\alpha,\phi,\alpha,n) \equiv \frac{(n-1)\,\sigma}{2+(n-3)\,\sigma}\left(\alpha + \frac{\sigma\phi}{1-\frac{1}{2}(1-\sigma)^n}\right)$$

where $\partial\overline{\gamma}_{full}^{\mathtt{s}'}(\alpha,\phi,\alpha,n)/\partial\phi > 0$. *Furthermore,* $\overline{\gamma}_{full}^{\mathtt{s}}(\alpha,\phi,\alpha,n) < \overline{\gamma}_{full}^{\mathtt{s}'}(\alpha,\phi,\alpha,n)$, *i.e. a fully-competent equilibrium is more likely to exist under* $\mathtt{s}'$ *than* $\mathtt{s}$.

Interestingly, based on the expression derived above, we can show that $\lim_{n\to\infty}\overline{\gamma}_{full}^{\mathtt{s}'}(\cdot) = \alpha+\sigma\phi$. Thus, it follows that contrarily to the other voting rules information can still be fully aggregated in large committees under voting rule $\mathtt{s}'$, provided that $\gamma \leq \alpha+\sigma\phi$.

7 Conclusion

We presented a new model of voting in committees where members are heterogeneous in competence and bias, they are career-concerned and can abstain. We identified a novel trade-off: transparency of individual votes attenuates the pre-existing biases of competent members and exacerbates the biases of incompetent members. Public voting leads to better decisions when the magnitude of the bias is large, while secret voting performs better otherwise. Finally, we provided experimental evidence that is consistent with the main predictions of the model. Our analysis has implications for the design of committee decision-making rules. The basic model suggests that voting should be public in committees where members are highly influenced by ideological or self-interested motives such as congressional committees. Conversely, voting should be kept secret when the dissent among members due to individual biases is relatively small, as it is perhaps the case of committees of experts and top bureaucrats responsible for technical decisions.

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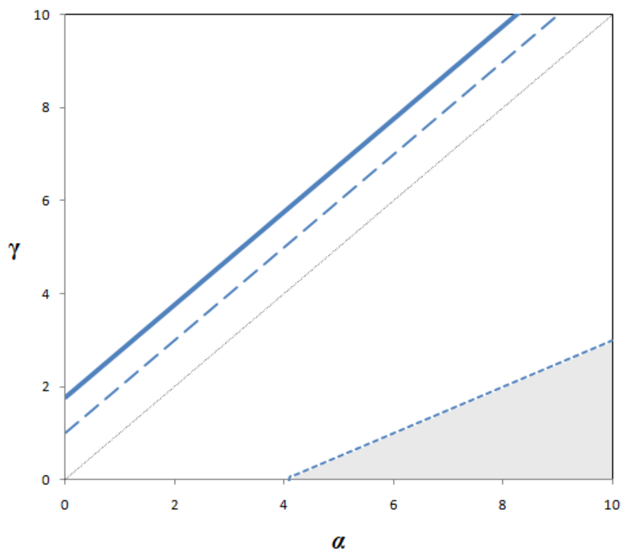
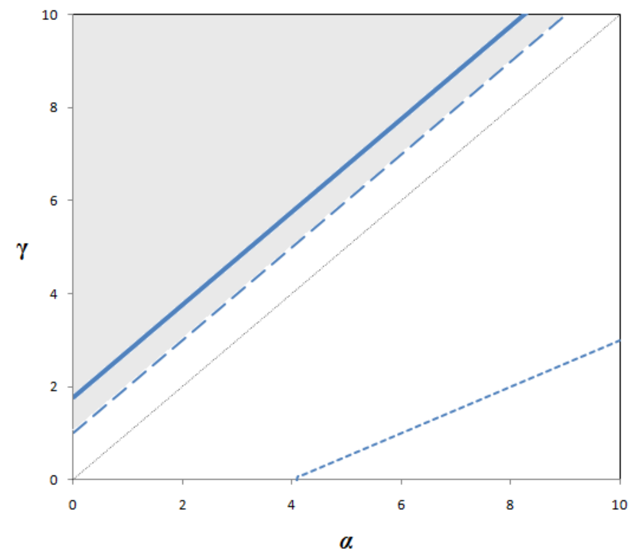
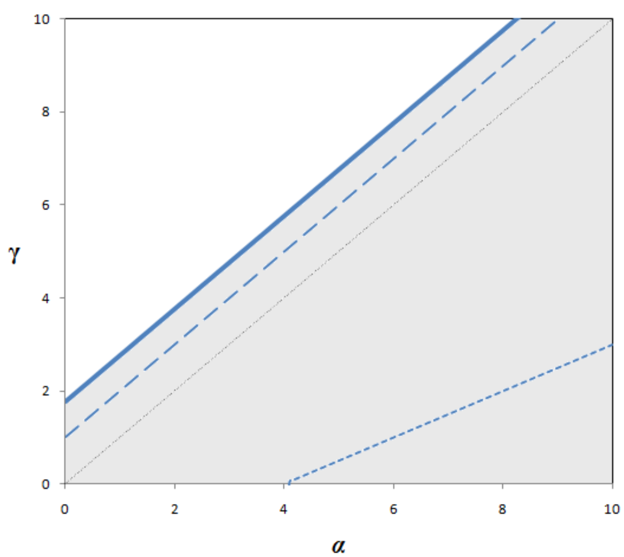
Figures and Tables



Panel a. Fully Competent Equilibrium



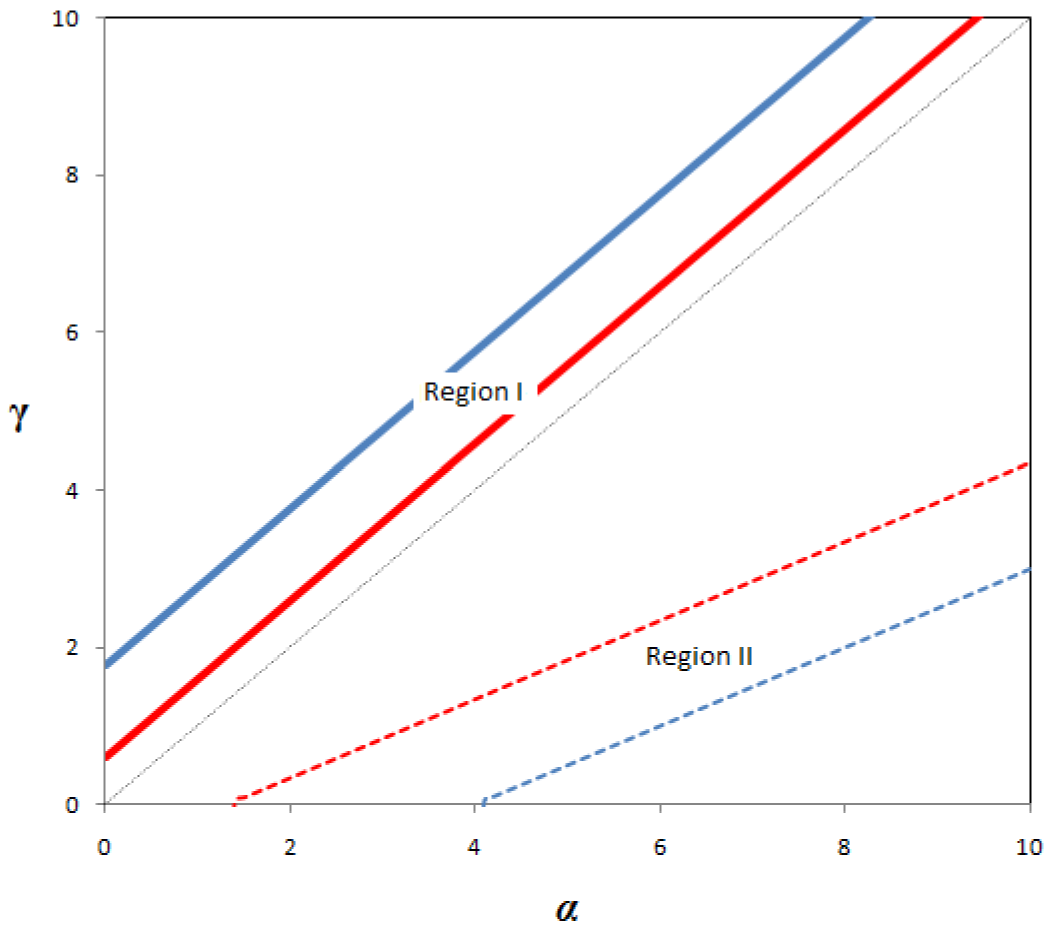
Panel c. Biased Equilibrium



Panel b. Partially Competent Equilibrium

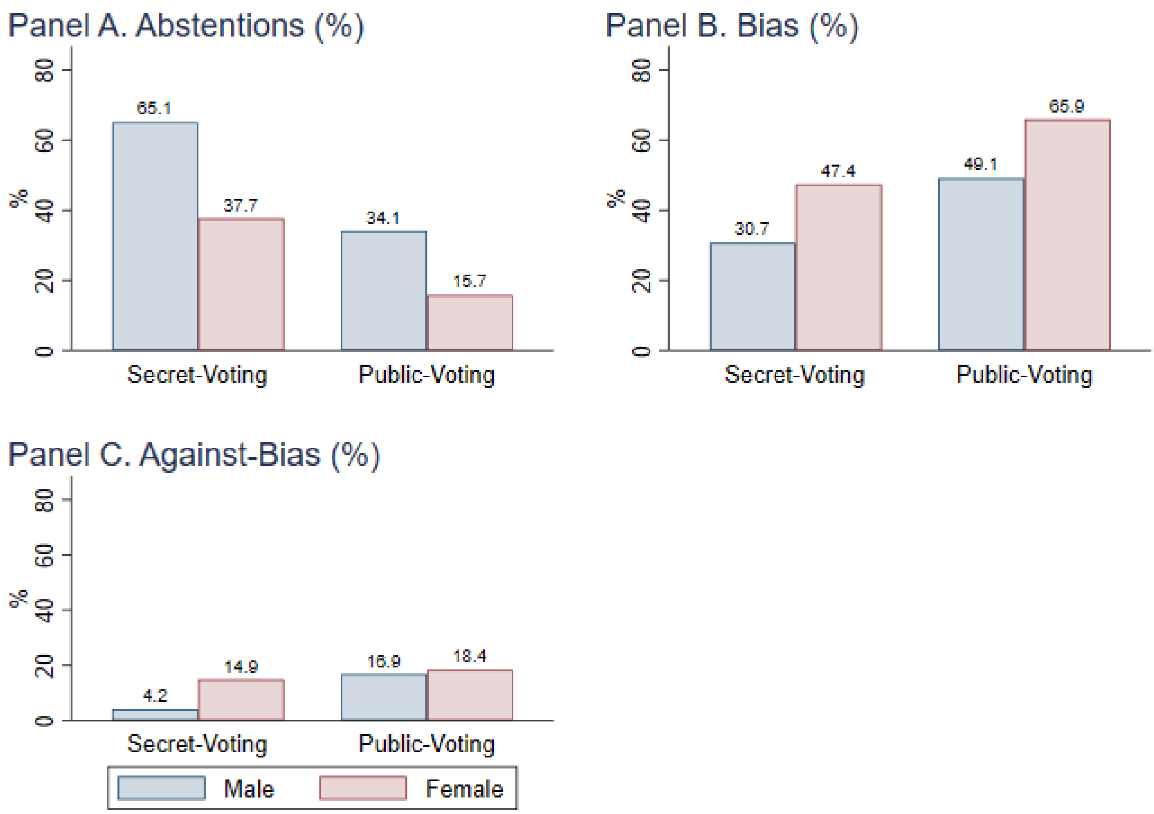
Notes. This figure illustrates the regions of the parameters where each class of equilibrium can be sustained under voting rule λ, assuming p=0.5, q=0.5, n=3, ϕ=1 and σ=0.5. The structure of equilibria looks similar under secret and public voting, although the exact regions where each class of equilibrium exists differ. *Panel a* represents shaded in grey the region of the parameters where a fully-competent equilibrium can be sustained. P*anel b* represents shaded in grey the region of the parameters where a partially-competent equilibrium can be sustained. Finally, *panel c* represents shaded in grey the region where a biased equilibrium exists. Observe that the shaded areas may overlap in some regions, indicating the existence of multiple equilibria. The 45-degree line is depicted as a small dotted line.

Figure 1. Equilibria: The Symmetric Case



Notes. This figure provides a comparison of the regions of the parameters where a fully-competent and a partially-competent equilibrium can be sustained under each voting rule. The relevant thresholds for public and secret voting are depicted in blue and red, respectively. Region I represents the region of parameters where a partially-competent equilibrium can be sustained under public but not secret voting, while region II represents the region of parameters where a fully-competent equilibrium can be sustained under secret but not public voting. The 45-degree line is depicted as a small dotted line. The parameter values used for the construction of this graph were: p=0.5, q=0.5, n=3, ϕ=1 and σ=0.5.

Figure 2. Comparative Static Results



Notes. This figure provides a summary of the voting behavior of uninformed subjects by gender under Low-Bias treatments.

Figure 3. Male versus Female Subjects (Uninformed, Low Bias treatments)

Treatment	alpha (common value)	gamma (bias)	R (carrer-concerns)	Predicted Equilibria
Low-Bias/Secret-Voting	10	1	1	Fully-competent or Partially-competent
Low-Bias/Public-Voting	10	1	9	Partially-competent
High-Bias/Secret-Voting	10	14	1	Biased
High-Bias/Public-Voting	10	14	9	Partially-competent

Notes. This table presents the choice of parameters and the predicted equilibria for each treatment. A fully-competent equilibrium is such that all informed subjects vote in accordance with their signals and all uninformed subjects abstain, a partially-competent equilibrium is such that all informed subjects vote in accordance with their signals and all uninformed subjects vote for their biases, and a biased equilibrium is such that all subjects vote for their biases.

Table 1. Treatments

Treatment	Correct Decisions (%)		Correct Decisions - Predicted (%)
	Full Sample	Last 5 Rounds	
Low-Bias/Secret-Voting	85.56	84.72	93.00 / 84.00
Low-Bias/Public-Voting	84.31	88.19	84.00
High-Bias/Secret-Voting	59.58	57.64	50.00
High-Bias/Public-Voting	81.53	81.25	84.00
Obs	720	144	

Notes. This table reports the proportion of correct decisions observed under each treatment in the full sample and in a subsample considering only the last five rounds of each session. The last column reports the fraction of correct decisions predicted to hold in equilibrium according to the model.

Table 2. Decisions

Treatment	Obs	Uninformed Voters		
		Abstention (%)	Bias (%)	Against-Bias (%)
A. Full Sample				
Low-Bias/Secret-Voting	796	50.37 †	39.82 †	9.79
Low-Bias/Public-Voting	847	21.60	60.69 †	17.70
High-Bias/Secret-Voting	789	14.57	80.98 †	4.43
High-Bias/Public-Voting	814	5.77	87.22 †	7.00
B. Last 5 Rounds				
Low-Bias/Secret-Voting	160	51.25 †	40.00 †	8.75
Low-Bias/Public-Voting	182	18.68	62.63 †	18.68
High-Bias/Secret-Voting	159	11.32	84.27 †	4.40
High-Bias/Public-Voting	146	1.36	93.15 †	5.47

Notes. This table summarizes the voting behavior of uninformed subjects by treatment in the full sample (panel A) and in a subsample considering only the last five rounds of each session (panel B). † indicates expected equilibrium behavior according to the model.

Table 3. Individual Choices: Uninformed Voters

Treatment	Obs	Informed Voters with Signal ≠ Bias		
		Signal (%)	Bias (%)	Abstention (%)
A. Full Sample				
Low-Bias/Secret-Voting	393	95.41 †	1.78	2.79
Low-Bias/Public-Voting	385	97.66 †	2.07	0.25
High-Bias/Secret-Voting	407	40.78	49.87 †	9.33
High-Bias/Public-Voting	415	79.27 †	16.14	4.57
B. Last 5 Rounds				
Low-Bias/Secret-Voting	79	93.67 †	1.26	5.06
Low-Bias/Public-Voting	74	98.64 †	1.35	0.00
High-Bias/Secret-Voting	86	40.69	51.16 †	8.13
High-Bias/Public-Voting	84	92.85 †	5.95	1.19

Notes. This table summarizes the voting behavior of informed subjects who received a signal different than their biases by treatment in the full sample (panel A) and in a subsample considering only the last five rounds of each session (panel B). † indicates expected equilibrium behavior according to the model.

Table 4. Individual Choices: Informed Voters

Treatment	Obs	Fully-Competent (%)	Partially-Competent (%)	Biased (%)	Other (%)
Low-Bias/Secret-Voting	238	40.33 †	31.93 †	0.04	27.70
Low-Bias/Public-Voting	254	15.35	45.27 †	0.00	39.38
High-Bias/Secret-Voting	245	2.04	31.02	29.38 †	37.56
High-Bias/Public-Voting	270	1.85	64.44 †	10.74	22.97

Notes. This table reports by treatment the proportion of voting profiles that are exactly consistent with each of the three classes of equilibrium predicted to exist by the model. The sample is restricted to include only voting profiles involving at least one uninformed subject and one informed subject who received a signal different than her bias. Voting profiles that do not conform to any of the predicted equilibria are classified as "Other". † represents the expected voting profile according to the model.

Table 5. Voting Profiles