Corruption in Committees: An Experimental Study of Information Aggregation through Voting[1]

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Abstract

We investigate experimentally the effects of corrupt experts on information aggregation in committees. We find that nonexperts are significantly less likely to delegate through abstention when there is a probability that experts are corrupt. Such decreased abstention, when the probability of corrupt experts is low, actually increases information efficiency in committee decision-making. However, if the probability of corrupt experts is large, the effect is not sufficient to offset the mechanical effect of decreased information efficiency due to corrupt experts. Our results demonstrate that the norm of "letting the expert decide" in committee voting is influenced by the probability of corrupt experts, and that influence can have, to a limited extent, a positive effect on information efficiency.

1 Introduction

Individuals often vote in situations where they have less than perfect information about the choices before them. Moreover, information is typically asymmetrically distributed, where some voters have better knowledge about the choices than others. In a common interest situation one norm is to delegate to the so-called experts, the individuals who are known to have better information. However, suppose that there is a possibility that the expert is biased, either because she has private preferences independent of her information or due to corruption. At what point should an individual who has less information cease to delegate decision-making and participate in the choice process as well, even though they know that given the poor quality of their own information, they may be making the wrong choice?

In this paper we consider experimental voting games in which individuals face this dilemma. Information asymmetries can be particularly problematic in voting. That is, the only time that an individual's vote matters is when that vote is pivotal, either forces a tie or breaks a tie. But if an individual is uninformed or has substantially less information than other voters, then a pivotal vote may mean canceling out the vote of a more informed voter. If both voters have the same underlying preferences (i.e. would make the same choices if fully informed), the uninformed voter's participation has resulted in a worse outcome. Feddersen and Pesendorfer (1996, 1999), in a seminal set of papers, pointed out that voters with low information levels should avoid this "swing voter's curse" and rationally abstain, delegating the choice to fully informed voters. Battaglini, Morton, and Palfrey (2008, 2010) find support for such "delegation through abstention."

However, abstention is not necessarily the best response of less informed voters if none of the voters has full information. As Morton and Tyran (2011) show, when no voter is fully informed equilibria also exist in which all voters participate even though they differ in the quality of their information. When the difference in information qualities is large, then equilibria with abstention by those who have lower level information are informationally efficient. But when the difference in information qualities is small, equilibria in which all voters participate are informationally efficient. Using experiments, Morton and Tyran show that the equilibria with delegation through abstention are attractive to voters. Even when it is informationally efficient for all voters to participate, about half the time less informed voters abstain, delegating the decision to more informed voters. Thus, they find that individuals are strongly inclined to "let the experts decide" when voting.

In these experiments a common interest situation prevailed. That is, if all voters were fully informed they would agree and make the same decision. A more realistic situation is when some voters will choose to vote a certain way independent of their information. For example, the voter may be "corrupt" in the sense that she ignores what she knows is best given the information she has, and always votes for an outcome preferred by some outside party. In such a case even a voter with low information may find it optimal to participate. If the direction of bias is known by uninformed voters, Feddersen and Pesendorfer demonstrate that uninformed voters have an incentive to vote to offset the known bias, so that unbiased informed voters are likely pivotal. Battaglini, Morton, and Palfrey find support for uninformed voters choosing to offset biases, supporting the theory.

Often, though, uninformed voters do not know whether an individual is corrupt or not, nor do they know the direction of the bias. For example, consider a legislative committee deciding what it the best policy for increasing educational attainment – higher wages for teachers or using standardized tests for students. Most members of the committee have some information about which is the best policy, but their information is not perfect. One member of the committee has higher quality information, but she also, because she is an expert in the field of education, may have contacts with either teacher unions or standardized test companies and prefer one of these policies independent of the effects on educational attainment (either because of private payoffs or personal relationships). The less informed members of the committee know that she is an expert in the area, but do not know whether she has a bias or the direction of that bias since the expert will likely hide this information. In such a case the less informed voters face a dilemma: Should they abstain and delegate the decision to the expert or vote their own information, albeit imperfect? Even if the more informed voter is biased, the aggregation of the information of the less informed voters in the face of the bias may be sufficient to offset the bias and lead to a better outcome.

In this paper we experimentally investigate the effects of unknown biases of experts in voting games. We find that when the probability of a bias is small, there is significantly less abstention by non-experts and as such the negative effect of corrupt experts is offset. However, as the probability of a bias increases, the decreased abstention is not sufficient to offset the decrease in informational efficiency caused by corrupt experts. Our results demonstrate that the tendency to delegate to experts through abstention is strong, even when the experts may be corrupt.

In the next Section of the paper we present our theoretical predictions. We discuss our experimental design in Section 3 and in Section 4 our experimental results. Section 5 presents concluding remarks.

2 Voting Game with Corrupt Experts

2.1 Basic Setup

We consider a voting game with three voters. Participants choose whether to vote for one of two options, a or b, or abstain. The option that receives a majority of the votes is declared the winner and ties are broken randomly. There are two states of the world A and B. The probability that state A occurs is given by $\pi = 0.5$.

Voter i receives an imperfect signal of the world, $\sigma_i \in \{a, b\}$. There are two types of voters, those who receive high-quality signals and those that receive low-quality signals.[1] Define p as the probability that a voter with high-quality signals receives an a signal when the state of the world is A and a b signal when the state of the world is B and q as the probability that a voter with low-quality signals receives an a signal when the state of the world is A and a b signal when the state of the world is B. Thus, the probability that a voter with high-quality signals receives an a signal when the state of the world is B and a b signal when the state of the world is A is given by $1 - p$ and $1 - q$ is similarly defined for voters with low-quality signals. We assume that $1 \geq p \geq q > 0.5$.

Voters with low-quality signals are all swing voters, that is, they receive utility equal to 1 if either option a is selected in state of the world A or b is chosen in state of the world B,

[1] For ease of exposition we will use the female pronoun for voters with high-quality signals and the male pronoun for voters with low-quality signals.

and 0 otherwise. Thus, they prefer to select the option that matches the state of the world. Voters with high-quality signals can be of two types. With probability s ($1 \geq s \geq 0$) they are also swing voters and have the same preferences as the voters with low-quality signals and with probability $1 - s$ they are "corrupt" or "biased" and have preferences either for option a or b. That is, if the voter has an A bias they receive utility equal to 1 if option a is chosen regardless of the state of the world and utility equal to 0 otherwise, a B biased voter has the opposite preferences. We assume that the probability that a voter with a high-quality signal has an A bias is independent of the state of the world and is given by $\alpha = 0.5$. We assume that these probabilities and numbers of voters who receive high- and low-quality signals are common knowledge. Therefore, all voters know if a voter receives high-quality signals but know only the probability that such a voter is corrupt and the probability that, if corrupt, she has an A bias.[2]

In our voting game, one voter receives high-quality signals and will be labeled voter H when it is unknown whether she is corrupt. We label the voter with high-quality information who is a swing voter (non-corrupt) as HS. We label the voter with high-quality information who is corrupt as HC. Similarly, we label the two voters with low-quality signals as voters $L1$ and $L2$.

2.2 Pure Strategy Equilibria

2.2.1 All Vote Equilibria

In solving for the voting equilibria, we assume that voters condition their vote choice on being pivotal. Given that voting has a zero cost, voters' participation decisions do not depend on the size of the probability of being pivotal. Given that the probability of being pivotal is always positive voters choose as if they are pivotal. It is straightforward to show that HC will always vote her preferences and participate. We also assume that if $L1$ or $L2$ vote, they vote their signal. Given that we have assumed that $\alpha = 0.5$, these voters have no incentive to vote strategically for an option that is contrary to their signal to offset the possible vote of HC. This allows us to focus on the case where the voters with low-quality signals choose between abstaining or voting.[3] We solve for the Bayesian-Nash pure strategy equilibria to this game under these assumptions.

First, we examine whether an equilibrium exists where no-one votes. In this case, any voter can decide the outcome and all votes are potentially pivotal. The expected utility from not voting for each voter given others' abstention is equal 0.5 since the election is a tie. Obviously in such a case corrupt voters will vote their preferences as noted above. For swing voters, the expected utility from voting for each voter given others' abstention is equal to the probability of making a correct decision which is p for swing voters with high-quality

[2] Of course there are many examples of committee decision-making in which biases are known, contrary to our assumption. As discussed above, these cases are analyzed in the seminal papers by Feddersen and Pesendorfer and the experiments of Battaglini, et al. (2010). Since our focus is on corruption which might be illegal and lead to prosecution, we assume that experts have an incentive to hide their biases and nonexperts do not know if a particular expert is biased or not, but instead only knows the general probability that corruption exists.

[3] For exploration of such offset voting see Battaglini, Morton, and Palfrey (2008, 2010).

information and q for voters with low-quality information. Since both p and q are greater than 0.5, it cannot be an equilibrium for all swing voters to abstain.

Second, we investigate whether an equilibrium exists where everyone votes. Since we have an odd number of voters, in the case of everyone voting, there is only one pivotal event in the absence of one's vote, a tie. So voters' choices of whether to vote or not are conditioned on there being a tie vote if they choose not to participate. A voter has her own signal as information, but a voter also potentially has information conveyed in the event of a pivotal vote. This insight is the crucial contribution of the Feddersen and Pesendorfer models. This information can influence the choices of HS, $L1$, and $L2$. Obviously, HC will participate if others are voting because if she can break a tie, the payoff will be substantial. Since HC does not care about the state of the world, then the information contained in the event of being pivotal does not affect her choices.

Consider an HS voter who has received an a signal. Voter HS's vote only matters if voters $L1$ and $L2$'s votes are tied which would occur if one gets an a signal and the other has a b signal. Label this event PIV^{HS}. Voter HS compares her utility from abstaining to voting conditioned on this pivotal event. If voter HS abstains, in the pivotal event she receives an expected utility of 0.5 since the outcome of the election would be a tie and a and b are equally likely to win.

Label $EU_H\left(\text{All Vote}|\sigma_H = a, PIV^H\right)$ voter H's expected utility of voting when $L1$ and $L2$ participate given the pivotal event. $EU_{HS}\left(\text{All Vote}|\sigma_{HS} = a, PIV^{HS}\right)$ is a function then of the likelihood that A is the true state of the world conditioned on HS's signal and the pivotal event as follows:

$$EU_{HS}\left(\text{All Vote}|\sigma_{HS} = a, PIV^{HS}\right) = \Pr(A|\sigma_{HS} = a, PIV^{HS}) * 1 + \Pr(B|\sigma_{HS} = a, PIV^{HS}) * 0 \tag{1}$$

From Bayes' Rule, the expected utility then is equal to the probability that A is the true state of the world given that the high-quality voter gets an a signal and the two low-quality voters' signals are split. Furthermore, this expected utility can be shown to simply equal p when $\pi = 0.5$:

$$EU_{HS}\left(\text{All Vote}|\sigma_{HS} = a, PIV^{HS}\right) = \Pr(A|\sigma_{HS} = a, PIV^{HS}) \tag{2a}$$

$$= \frac{\Pr(\sigma_{HS}=a, PIV^{HS}|A)\pi}{\Pr(\sigma_{HS}=a, PIV^{HS}|A)\pi + \Pr(\sigma_{HS}=a, PIV^{HS}|B)(1-\pi)} \tag{2b}$$

$$= \frac{2pq(1-q)0.5}{2pq(1-q)0.5 + 2(1-p)q(1-q)0.5} = p \tag{2c}$$

Since $p > 0.5$, voter HS should participate and vote for a. Similarly, if voter HS receives a b signal, she should vote for b.

Now consider voters with low-quality information. Take voter $L1$ and assume he has received an a signal. Voter $L1$'s vote only matters if the election is a tie without his vote. As discussed above, $L2$ votes his signal as does HS. Voter $L1$'s vote only matters if the election is a tie without his vote, so either voter HS has an a signal or HC votes for a and voter $L2$ has a b signal or vice versa. Call this pivotal event PIV^L. As with voter HS, if voter $L1$ abstains, in the pivotal event the election is a tie and voter $L1$'s expected utility is 0.5.

Similarly, as with voter HS, voter $L1$'s expected utility if he votes for a in the pivotal event is given by the probability that the true state of the world equals A in the pivotal event. Furthermore, from Bayes' Rule this expected utility can be shown to equal q when $\pi = 0.5$:

$$EU_{L1}\left(\text{All Vote}|\sigma_{L1} = a, PIV^L\right) = \Pr(A|\sigma_{L1} = a, PIV^L) \tag{3a}$$

$$= \frac{\Pr(\sigma_{L2}=a, PIV^L|A)\pi}{\Pr(\sigma_{L1}=a, PIV^L|A)\pi + \Pr(\sigma_{L1}=a, PIV^L|B)(1-\pi)} \tag{3b}$$

$$= \frac{\left(s\left(pq(1-q)+(1-p)q^2\right)+(1-s)\left(0.5q(1-q)+0.5q^2\right)\right)0.5}{(s(pq(1-q)+(1-p)q^2)+(1-s)(0.5q(1-q)+0.5q^2))0.5+\left(s\left((1-p)q(1-q)+p(1-q)^2\right)+(1-s)((0.5q(1-q)+0.5(1-q)^2)\right)0.5} \tag{3c}$$

$$= q \tag{3d}$$

As with voter HS, since $q > 0.5$, voter $L1$ should vote for a. Similarly, if voter $L1$ receives a b signal he should vote for b. The case of voter $L2$ is analogous. Thus, an equilibrium exists in which all voters vote their signals in this case. In the rest of the paper we will label this type of equilibrium an All Vote Equilibrium. It is also straightforward to show that no equilibrium exists in which only the voters with low-quality information participate since in that case the voter with high-quality information, voter H, has an incentive to vote as we have seen above.

2.2.2 Swing Voter's Curse Equilibria

Now we examine whether equilibria exist in which only the voter with high-quality information, voter H, participates. We know from the analysis above that if the two voters with low-quality information are abstaining, the optimal response for voter HS is to vote her signal and for voter HC to vote her preferences. What remains is to determine if it is an optimal response for the two voters with low-quality information to abstain given that voter H is participating.

Suppose voter $L1$ receives an a signal. Since only voter H is participating, voter $L1$'s vote is pivotal only if that vote is different from voter H's, in which case voter $L1$ will force a tie election and voter $L1$'s utility is equal to 0.5. What happens if $L1$ abstains? In the pivotal event when $L1$'s signal differs from HS or from HC's bias, H will decide the election. So $L1$'s expected utility in the pivotal event is the probability that H's vote is correct in the pivotal event. Given that $L1$ has received an a signal, the pivotal event is that HS has received a b signal or that HC has a B bias.

$$EU_{L1}\left(\text{SVC}|(\sigma_{HS} = b \text{ or } s = 0) \wedge \sigma_{L1} = a\right) \tag{4a}$$

$$= s\Pr(B|\sigma_{HS} = b \ \wedge \sigma_{L1} = a) + (1-s)0.5\Pr(B|\sigma_{L1} = a) \tag{4b}$$

$$= s\frac{p(1-q)}{p(1-q)+(1-p)q} + (1-s)0.5(1-q) \tag{4c}$$

It is straightforward to show that $EU_{L1}\left(\text{SVC}|(\sigma_{HS} = b \text{ or } s = 0) \wedge \sigma_{L1} = a\right) = 0.5$ if $p = q \wedge s = 1$, and is greater than 0.5 if $p > q \wedge s = 1$. Thus, it is an optimal response for

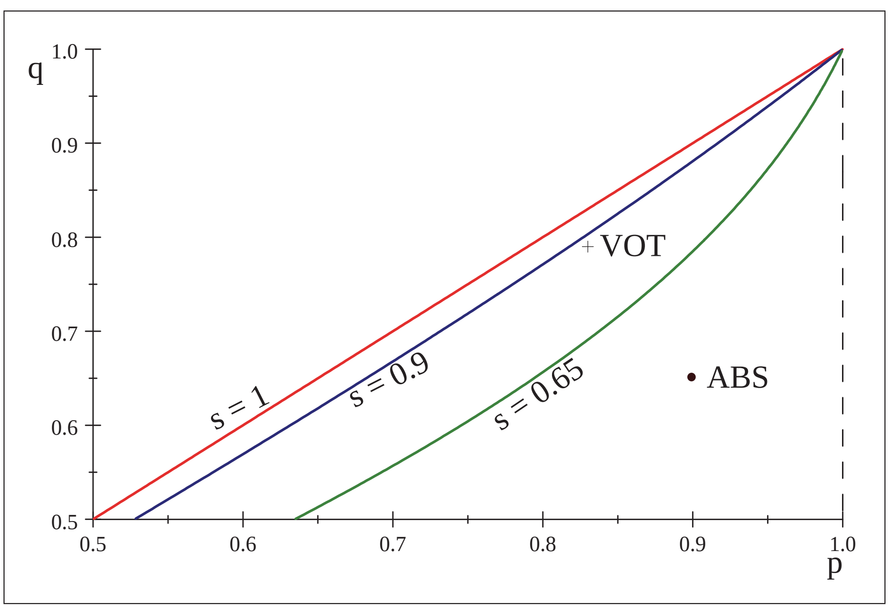
$L1$ to abstain if HS is voting her signal and $L2$ is abstaining since HS has better quality information when $s = 1$. Similarly, we can show that voter $L2$'s optimal response is to abstain as well under these conditions. Thus a swing voter's curse equilibria is possible when $s = 1$. We will label this equilibrium the SVC equilibrium.

However, as s declines, the range of values of p and q for which a swing voter's curse equilibria exists is reduced. Specifically, a SVC equilibrium exists when the following condition holds:

$$s \geq 0.5 \frac{q}{0.5q + \frac{p}{p(q-1) + q(p-1)}(q-1) - 0.5} \tag{5}$$

In our experiment, we use values of $s = 1, 0.9,$ and 0.65. Figure 1 below shows the regions of combinations of p and q in which an SVC equilibrium exists for each of these values of s. SVC equilibria exist for combinations of p and q on and below the line marked $s = 1$, when $s = 1$; etc. Figure 1 also presents the values of p and q used in our two main distributions in our experiment which we label VOT and ABS. The point marked VOT, shown as a cross on the figure, represents the case where $p = 0.83$ and $q = 0.79$. For this combination, an SVC equilibrium exist for values of $s = 1$ or 0.9, but not for $s = 0.65$. The point marked ABS, shown as a closed dot on the figure, represents the case where $p = 0.9$ and $q = 0.65$. In this case an SVC equilibrium exists for all three values of s.

Figure 1: Regions of SVC Equilibria



Regions of SVC equilibrium exist for the values of p and q below the line for the associated value of s. VOT and ABS mark the two primary treatments used in the experiment.

Finally, note that there are no asymmetric equilibria in which the two voters with low-quality information choose different pure strategies. As we have seen voter H always votes. And, given that voter H is voting if one voter with low-quality information has an optimal response to vote, so does the other voter with low-quality information. Such an All Vote equilibrium always exists. Furthermore, in the SVC equilibrium both voters with low-quality information optimally abstain. Thus voters with low-quality information face strategic uncertainty since they would prefer to coordinate on the same actions, either voting or nonvoting.

2.2.3 Mixed-Strategy Equilibria

The voting game also has a symmetric mixed-strategy equilibrium in which the two non-experts randomize between voting and abstaining. As noted above, given our refinement HS has a dominant strategy of voting her signal regardless of the strategies chosen by $L1$ and $L2$.[4] Define r as the symmetric mixed-strategy equilibrium probability that an L voter abstains. By definition this value is such that each L voter is indifferent between abstaining and voting given that HS is voting her signal and HC is voting her bias and the other L voter is abstaining with probability r. It is given by the following:

$$r = \frac{-s + 2ps + 2qs - 4q^2 + 8pq^2s - 8pqs + 1}{-4p + 2q - 2s + 4ps + 2qs - 4q^2 + 8pq^2s - 8pqs + 2} \tag{6}$$

For a given value of s, this probability increases with values of q, decreases with values of p, and increases as the difference between p and q declines. That is, if the difference between p and q is large, then abstaining by both L voters is more likely to lead to the correct choice. Thus, for say $L1$ to be indifferent between abstaining and voting, then $L2$ must be voting with a high probability, otherwise $L1$ would prefer the pure strategy of abstaining. For example, when $s = 1$ in our ABS treatment (with $p = 0.9$ and $q = 0.65$), $r = 0.31$. But when when $s = 1$ in our VOT treatment (with $p = 0.83$ and $q = 0.79$), $r = 0.82$.

The relationship between s and r depends on the values of p and q. When the difference between p and q is large as in our ABS treatment, as s decreases, r increases; when $s = 0.9$, $r = 0.32$, and when $s = 0.65$, $r = 0.33$. But when the difference is not large as in our VOT treatment, as s decreases, r also decreases; when $s = 0.9$, $r = 0.76$, and when $s = 0.65$, $r = 0.71$ The intuition is that as s decreases, the benefits of delegating to an expert declines and thus the difference between p and q is less relevant.

2.2.4 Probability of Correct Decisions and Informational Efficiency

To determine the relative informational efficiency of the two types of equilibria, we calculate the probability that the majority votes correctly in the two possible equilibria; the equilibrium where all vote and the SVC equilibrium. We focus on informational efficiency in the sense of the extent that the outcome chosen by the majority is best for non-corrupt voters. Thus, we ignore the utility gained by corrupt voters when their preferred option is chosen but it is not informationally efficient. Essentially, we implicitly assume that the overwhelming majority of individuals who are represented by the committee members wish the committee to choose the option that matches the state of the world. The private interests that might

[4] Our refinement rules out voters using participation strategies contingent on their signals (which we do not observe in our experiments). But if $L1$ and $L2$ used such a strategy, for example voting their signal with a signal a, but abstaining with a signal b, then if q is sufficiently close to p, the best response for HS with a signal a would be to abstain.

benefit if that option is not chosen are ignored in our analysis under the assumption that the value they gain in such a case is significantly smaller than that gained by the public from choosing the option that matches the state of the world.

Assuming the true state of the world is A, then in the All Vote equilibrium the probability that the majority votes correctly is equal to the probability that at least two of the three voters receive an a signal which is given by (since everyone votes, there are no tie elections):

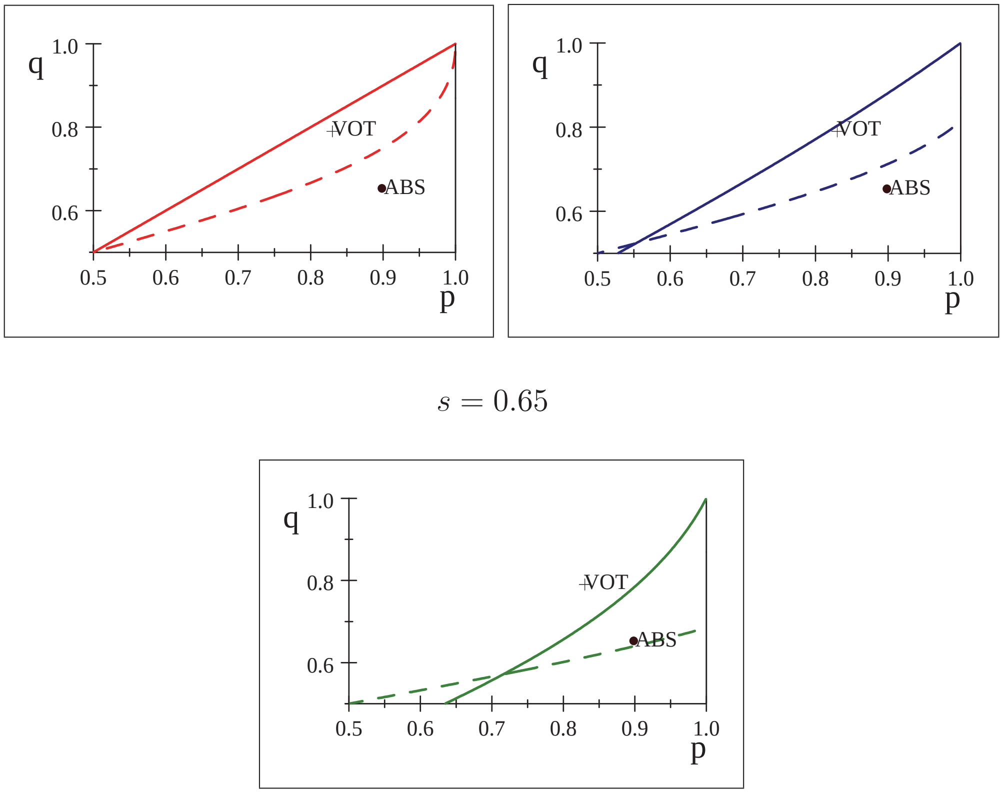
$$\begin{aligned}\Pr(\text{Majority Correct Decision}) &= s\left(2pq(1-q)+q^2\right) \\ &\quad +(1-s)\left(0.5(2q(1-q)+q^2)+0.5q^2\right)\end{aligned}$$

In contrast, in the SVC equilibrium, the probability that the majority votes correctly is simply equal to the probability that voter H votes correctly, which is $sp+(1-s)0.5$. Thus when $\frac{sq^2+(1-s)\left(0.5(2q(1-q)+q^2)+0.5q^2-0.5\right)}{s(1-2q(1-q))} > p$, the informationally efficient equilibrium is the All Vote equilibrium and when $\frac{sq^2+(1-s)\left(0.5(2q(1-q)+q^2)+0.5q^2-0.5\right)}{s(1-2q(1-q))} < p$ the informationally efficient equilibrium is the SVC case. The two equilibria are equivalent in efficiency when $\frac{sq^2+(1-s)\left(0.5(2q(1-q)+q^2)+0.5q^2-0.5\right)}{s(1-2q(1-q))} = p$.

Figures 2a,b, and c illustrate how informational efficiency varies with the values of p and q when $s = 1$, 0.9, and 0.65. The solid lines represent the boundary values of p and q for the different values of s for which an SVC equilibrium exists. The dotted lines represent the values of p and q such that $\frac{sq^2+(1-s)\left(0.5(2q(1-q)+q^2)+0.5q^2-0.5\right)}{s(1-2q(1-q))} = p$ for the three different values of s. For combinations of p and q below the dotted lines, SVC is the informationally efficient equilibrium and for combinations above the dotted lines, the All Vote equilibrium is informationally efficient. Note that for all values of s, the informationally efficient equilibrium in the VOT treatment is for all to vote. For values of $s = 1$ and 0.9, the informationally efficient equilibrium in the ABS treatment is the SVC equilibrium, but when $s = 0.65$, it is more informationally efficient for all to vote in ABS.

Figure 2: Informational Efficiency Regions

$s = 1$ $s = 0.9$



SVC possible below solid lines.
SVC efficient below dashed lines,
All Vote efficient above dashed
lines. VOT and ABS mark
primary treatments.

2.3 Additional Distributions

We also conducted sessions with two additional distributions as controls in which voters do not vary in signal quality, that is, there are no experts. In HOM83 $p = q = 0.83$ and in HOM79 $p = q = 0.79$. Although there are no experts, we considered the situation in which one voter may be corrupt. Specifically, assume that with probability $1 - s$, one voter has either an a or b bias, with equal probability. As above, if a voter is corrupt, she will always vote her bias. More complicated is the choice facing a voter who is not corrupt. Following the reasoning above an All Vote equilibrium exists and it is informationally efficient. As discussed in Morton and Tyran (2011) swing-voter-curse equilibria exist when $s = 1$ where only one voter participates. However, these equilibria involve choosing the weakly dominated strategy of abstaining and significant coordination between voters as to which single voter will participate. When $s < 1$, however, these equilibria no longer exist because for non-biased voters abstention is now strongly dominated by voting one's signal given that the voter knows that there is a positive probability that one of the other voters has a bias and will always vote her bias. Hence, we expect that in the homogeneous distributions all voters should participate.

We use these homogeneous distributions to compare the behavior of experts and non-experts in the VOT distribution. That is, we expect to find in the VOT distribution, regardless of the probability of corrupt experts, all individuals voting. Thus, our expectation is that there should be no difference in behavior between non-experts in VOT and individuals in HOM79 by probability of bias or corruption and similarly that there should be no difference in behavior between experts in VOT and individuals in HOM83 by probability of bias or corruption.

Finally, we conducted sessions with an additional treatment in which there were two experts and one nonexpert using the same p, q combination as in VOT, which we label VOTB. In VOTB, when $s < 1$, both of the experts were potentially biased. As Morton and Tyran (2011) show, in this case there is no equilibrium in which the non-experts should delegate through abstention when $s = 1$. The same logic holds when the experts were potentially biased. Hence, voters should not delegate through abstention in VOTB regardless of the probability of corrupt experts.[5]

2.4 Summary of Parameters in Treatments

We conducted 12 treatments in our experiment with a total of 162 subjects. For each distribution of (p, q) we varied the value of s. For distributions of VOT and ABS we varied $s = 1, 0.9, 0.65$ (these treatments are labeled VOT1, VOT.9, VOT.65, ABS1, ABS.9, and ABS.65, respectively) and for the other treatments we varied $s = 1, 0.9$ (these treatments are labeled in a similar fashion, i.e. HOM791, HOM79.9, etc.). In Table 1 below we summarize our treatments by parameters and the informationally efficient equilibrium for each. Specifically, except for the treatments ABS1 and ABS.9, it is informationally efficient for all voters to participate and vote their signals. In those treatments the SVC equilibrium (where non-experts delegate their votes through abstention) is informationally efficient. Furthermore, All Vote Equilibria exists in all of the treatments, but SVC equilibria that do not involve weakly dominated strategies do not exist in the homogeneous treatments or the VOTB treatments.

[5] Similar to the homogeneous distributions when $s = 1$ a type of swing voter's curse equilibrium exists in which only one expert votes. However, this equilibrium involves using weakly dominated strategies and coordination of the two experts. Furthermore, when $s < 1$, such abstention is strongly dominated and the only equilibrium is for all to vote.

Table 1: Treatments

						Equilibria		
Treatment	p	q	H	L	s	**SVC Exists**	**Infor. Eff.**	**Pr. Correct**
VOT1	0.83	0.79	1	2	1	Yes	All Vote	0.90
VOT.9	0.83	0.79	1	2	0.9	Yes	All Vote	0.89
VOT.65	0.83	0.79	1	2	0.65	Yes	All Vote	0.86
ABS1	0.9	0.65	1	2	1	Yes	SVC	0.90
ABS.9	0.9	0.65	1	2	0.9	Yes	SVC	0.86
ABS.65	0.9	0.65	1	2	0.65	Yes	All Vote	0.77
HOM791	0.79	0.79	0	3	1	No	All Vote	0.89
HOM79.9	0.79	0.79	0	3	0.9	No	All Vote	0.88
HOM831	0.83	0.83	0	3	1	No	All Vote	0.92
HOM83.9	0.83	0.83	0	3	0.9	No	All Vote	0.91
VOTB1	0.83	0.79	2	1	1	No	All Vote	0.91
VOTB.9	0.83	0.79	2	1	0.9	No	All Vote	0.89

Table 1 also summarizes the probability of the group making the correct decision for each treatment in the informationally efficient equilibrium in the last column. Note that ABS1 and VOT1 yield the same probability that the group votes correctly by experimental design, i.e. 90% probability. Not surprisingly, as s decreases, the probability the group chooses correctly declines. However, the decline is much steeper for the ABS treatments than for the VOT treatments. This steeper decline occurs because in the ABS treatment having a corrupt expert has a more sizeable effect on the probability the group chooses correctly both in the SVC and All Vote equilibria given the larger difference between the quality of expert information and the information of non-experts.

2.5 Predictions

Morton and Tyran (2011) present results on voting behavior in previous sessions for the treatments ABS1, VOT1, and VOTB1. They find that in ABS1 nearly 88% of non-experts delegate through abstention and strong support for the SVC equilibrium. They also find that a large minority of non-experts delegate through abstention in the VOT1 treatment (42%) where it is informationally efficient for all to participate and in the VOTB1 treatment (28%) where abstention is not an equilibrium for these voters. These results suggest that non-experts are strongly attracted to the norm of letting the expert decide when information is asymmetric, even when it is not informationally efficient. We expect to find similar results in our treatments with $s = 1$. As a consequence, we also expect that information aggregation will be more likely in ABS1 than in VOT1 (ABS1 will be more informationally efficient). Morton and Tyran also find that when information qualities are homogeneous (there are no experts), abstention rates are significantly lower when the information quality is higher (experts also tend to participate more in the other treatments when information quality is higher).

The main focus of our analysis, however, is on the effects of the possibility of corrupt experts on the willingness of non-experts to delegate to them. From an efficiency standpoint, the possibility of corrupt experts does not affect the optimal behavior of voters except in the ABS treatments. That is, the informationally efficient equilibria are the same for all the VOT and HOM treatments regardless of the probability of corruption or bias. The only difference is in the ABS treatments in which delegation through abstention is informationally efficient in ABS1 and ABS.9 but All Vote is informationally efficient in ABS.65. However, the previous results suggest that voters are influenced by norms of behavior to delegate through abstention to experts even when it is not informationally efficient. Our expectation is that this norm is less powerful when there is some probability that the experts are corrupt.

Furthermore, as noted above, the probability of the group making the correct decision decreases with corruption or bias in the VOT, ABS, VOTB, and HOM treatments. However, if it is the case that corruption or bias lead to less abstention by non-experts in treatments where such abstention is not informationally efficient, then it is possible that corrupt experts might actually increase the probability of a group making the correct decision. Thus, our prediction about the effect of corrupt experts on the probability that the group chooses correctly in the ABS.65 and the VOT, and VOTB treatments is ambiguous. Biased or corrupt experts mechanically reduce informational efficiency but greater participation by non-experts might increase informational efficiency.

Similarly, if abstention is lower with corrupt voters in the HOM treatments, then informational efficiency may increase as well with the possibility of such voters and the effects of corrupt voters in these treatments is also ambiguous. These main predictions are summarized below:

Prediction 1 (Abstention Norm & Corrupt Experts) *We expect that non-experts will be less likely to abstain as the probability of corrupt experts increases. Specifically, abstention will be lower in ABS.9 than in ABS1 and lower in ABS.65 than in ABS.9. We expect similar relationships between VOT1, VOT.9, and VOT.65; between VOTB1 and VOTB.9; between HOM791 and HOM79.9; and between HOM831 and HOM83.9.*

Prediction 2 (Corruption & Informational Efficiency) *We expect informational efficiency to be lower when delegation through abstention is informationally efficient and experts are potentially corrupt than without corrupt experts; that is, we expect informational efficiency to be lower in ABS.9 than in ABS1. However, the predicted effect on informational efficiency of corrupt experts in ABS.65, and the VOT and VOTB treatments is ambiguous. Voting by corrupt experts reduces informational efficiency mechanically, but if non-experts participate more than without corrupt experts, informational efficiency may increase. The predicted effect on informational efficiency of corrupt voters in the HOM treatments is also ambiguous for similar reasons.*

3 Experimental Analysis

3.1 Procedures

The experiment was conducted at the Laboratory for Experimental Economics at the University of Copenhagen using ORSEE to recruit subjects, see Grenier (2004). The experiment was conducted via computers using z-Tree software, see Fischbacher (2007). Subjects were not allowed to communicate outside of the computer interface. Instructions were read aloud and subjects answered a set of control questions to verify their understanding of the experimental procedures. The instructions for the experiment are provided in Appendix A.

In the beginning of the experiment subjects were randomly divided into groups of three and remained in the same groups throughout the experiment, using partners matching. Groups were anonymous, that is, subjects did not know which of the other subjects were in their groups. We used fixed matching and repeated interaction for two reasons: (1) experimental research on coordination games has demonstrated that fixed matching procedures facilitate coordination of subjects on efficient equilibria and (2) the naturally occurring voting situations that motivate our analysis tend to be in committees that engage in repeated interaction.[6]

Each election of the experiment proceeded as follows. First subjects could see two boxes on their computer screens, a red and a blue box. One of the boxes was randomly chosen to hold a prize. The box chosen was the same for all groups in each period, but randomized across periods. Subjects were only told that the prize was with equal probability in one of the boxes, but not which box. Each subject was given a private signal, either red or blue, about which box might hold the prize. The quality of the signals depended upon a voter's type and were fixed at the values in Table 1 above. In treatments where the signal qualities were not homogeneous, which subjects were designated to receive a high-quality signal and which were designated to receive a low-quality signal was randomly chosen each period. Subjects knew the quality of their own signal and the qualities of the two other group members' signals, but only the content of their own signal.

In treatments where $s = 1$, all subjects, after receiving their signals, chose whether to vote for red, blue, or abstain. Ties were broken by a random draw. If the majority voted correctly, the subjects were given a payoff of 30 points and if the majority voted incorrectly they were given -70 points. We used the large negative number to make the choice salient to the subjects. Subjects did not receive a show-up fee for participation. Although subjects' earnings in a period could possibly be negative, since payoffs were cumulated across periods and the overall probability of a positive payoff was high, no subject was in danger of going bankrupt (the constraint of positive payoffs was never binding for any subject) and the negative payoffs in a given period were credible (subjects earned on average 13.86 points per period).

In treatments where $s < 1$, some subjects were told that they were a "color type" with probability $1 - s$. If so, they were either a red-type or a blue-type with equal probability. In the treatments with heterogeneous signal qualities, only the high-quality subjects could be color types. In the treatments with homogeneous signal qualities, one subject was randomly chosen to be the color-type (with probability $1 - s$). If chosen to be a color-type, the subject was forced to vote for her color.[7] Her earnings were not related to the position of the prize, but were equal to 30 points if the group chose her color and -70 if the group did not choose her color. At the end of the experiment the total points earned by subjects were converted

[6] See Clark and Sefton (2001) and Devetag and Ortmann (2007). Ali et al. (2008) compare fixed and random matching committee voting without abstention and find that the results are qualitatively similar.

[7] We implemented this design feature to ensure that corrupt experts chose as modeled and to prevent other-regarding concerns from affecting corrupt experts' choices. Since our main focus is on the choice of nonexperts given the possibility of a corrupt expert, we wish to disentangle possible effects of an expert having other-regarding preferences.

to Danish Kroner (DKK) at a rate of 6 points per DKK.[8]

The experiment was conducted in seven sessions, ranging from 18-24 subjects per session. In each session, subjects first played one of the voting games without corrupt voters (ABS1, VOT1, HOM791, HOM831, or VOTB1) for 30 periods. Then they played a corresponding voting game with corrupt voters for the next 30 periods. Hence we have within-subject comparisons of voting behavior of voting games without corruption to those with corruption and between-subject comparisons of $s = 0.9$ and $s = 0.65$. Table 2 below summarizes the sessions and number of subjects for each.

Table 2: Treatments by Session

	Periods		No. of
Session	**1-30**	**31-60**	**Subjects**
1	ABS1	ABS.9	24
2	ABS1	ABS.65	24
3	VOT1	VOT.9	24
4	VOT1	VOT.65	18
5	HOM791	HOM79.9	24
6	HOM831	HOM83.9	24
7	VOTB1	VOTB.9	24

3.2 Results

3.2.1 Individual Behavior in Primary Treatments

We begin with an examination of voting behavior in our six primary treatments of ABS1, ABS.9, ABS.65, VOT1, VOT.9, and VOT.65. In all of our statistical analysis of voting behavior (in the primary treatments and in the control treatments) we use each individual voting choice as an independent observation. In all our treatments, we expect that experts who are not corrupt should vote their signals. We find that abstention or voting contrary to one's signal is rare, in aggregate, these subjects vote their signals 98% of the time, which is largely the same when disaggregated by treatment and session.[9] Since all subjects were non-corrupt experts at some point during each treatment, these results demonstrate a basic understanding of the experimental design.

In contrast, we expect differences in behavior by treatment among non-experts. The average abstention rates are also presented by session and period in a session in Figure 3. In Table 3 we summarize the voting behavior of non-experts in the primary treatments by session in the last 15 periods of each treatment (again averaging each choice as an independent observation).[10] We focus on the last 15 periods of each treatment given the evidence of learning as demonstrated in Figure 3.

[8] At current exchnge rates, 1 DKK = \$0.18.

[9] Table B1 in the supplemental data appendix summarizes aggregate individual behavior of non-corrupt experts in our primary treatments.

[10] See Table B2 in the supplemental data analysis Appendix B for complete results.

Figure 3

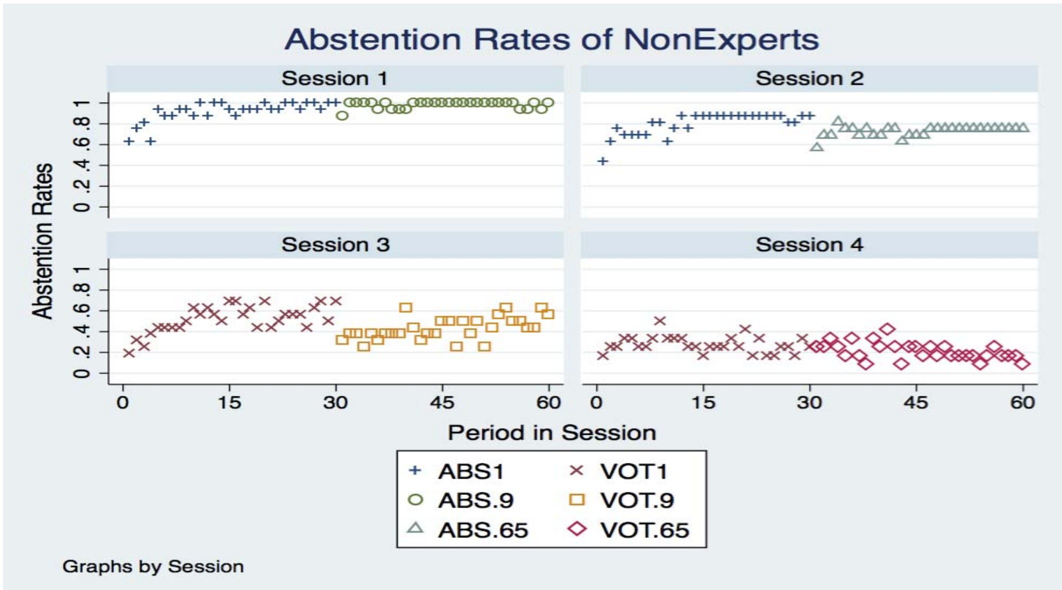


Table 3: Non-expert Voting Behavior in Primary Treatments in Last 15 periods

Signal			Percent Vote Choices			
Quality	Session	Treatment	Abstain	Signal	Not Sig.	Obs.
$q = 0.65$	1	ABS1	0.96	0.03	0.01	240
		ABS.9	0.99	0.01	0.00	240
	2	ABS1	0.87	0.10	0.03	240
		ABS.65	0.75	0.23	0.02	240
$q = 0.79$	3	VOT1	0.57	0.39	0.04	240
		VOT.9	0.47	0.48	0.05	240
	4	VOT1	0.26	0.69	0.05	180
		VOT.65	0.18	0.80	0.03	180

As noted above, in these treatments there are generally two equilibria in pure strategies, one where everyone votes (All Vote) and one where only experts vote (SVC). We first consider the effects of introducing corrupt experts in the ABS treatments. In ABS1 and ABS.9, the informationally efficient equilibrium is the SVC equilibrium but in ABS.65 it is the All Vote equilibrium. We find that the majority of non-experts' choices are highly consistent with the SVC equilibrium in these three treatments, even in ABS.65, with 91%, 99%, and 74% of non-experts abstaining in ABS1, ABS.9, and ABS.65, respectively. Note that these abstention rates are far from those predicted by the mixed strategy equilibria (0.31, 0.32, and 0.33, respectively). However, these voters are influenced by the relatively high probability that the expert is corrupt and less likely to abstain. Specifically, although we find no significant difference in within-subject comparisons of abstention rates in ABS1 and ABS.9 in session 1, there is significantly higher abstention in within-subject comparisons of ABS1 with ABS.65 in session 2.[11] Hence, we find some support for Prediction 1 in the ABS treatments with respect to the comparison of ABS1 with ABS.65.

In the VOT treatments, the informationally efficient choice is for non-experts to vote their signals in all three cases, rather than abstain, and in VOT.65 it is the only equilibrium in pure strategies. As in Morton and Tyran (2011), we find less abstention in the VOT treatments than in the ABS treatments (44%, 47%, and 18%, for VOT1, VOT.9, and VOT.65, respectively). Again, these percentages do not approximate the mixed strategy equilibrium predictions of (0.82, 0.76, and 0.71, respectively).

In Prediction 1, we predict that the degree of abstention should decrease with an increase in the probability of corrupt experts in the VOT treatments as well. We find that is indeed the case although the results are not significant at conventional levels. In session 3, abstention in VOT.9 is 47%, which is significantly less than the 58% abstention rate of the same voters in VOT1 at a 6% confidence level and in session 4, abstention in VOT.65 is 18%, which is significantly less than the 25% abstention rate of the same voters in VOT1 at a 10% confidence level.[12] It is noteworthy that we find significant differences between sessions 3 and 4 in VOT1 behavior, even though in both of these sessions subjects participated in VOT1 in the first 30 periods and were not told about the second treatment in the latter 30 periods.[13]

In summary, then, we find evidence that non-experts are attracted to delegation through abstention even when it is informationally efficient not to do so (although this tendency appears highly variable). However, knowledge that experts may be corrupt significantly reduces the tendency to abstain in such cases even when the probability of corrupt experts is low or the tendency is low. We can summarize our analysis of individual behavior then in the following result:

Result 1 (Individual Behavior in Primary Treatments) *When it is informationally efficient for nonexpert voters to delegate through abstention, non-experts do so even when there is a small probability that experts are corrupt. When it is informationally efficient for non-experts to not delegate through abstention, non-experts are less likely to do so, although a significant, but variable, minority abstains. For higher probabilities of corrupt experts, abstention of non-experts is significantly lower.*

3.2.2 Group Behavior and Informational Efficiency in Primary Treatments

Table 4 below summarizes group choices by session and treatment in the last 15 periods. Group choices are classified by whether they are consistent with the SVC equilibrium or

[11] The χ^2 statistic for the comparison of overall voting behavior in session 1 equals 4.37, Pr = 0.11 and in session 2 equals 15.08, Pr = 0.00. A Fisher exact test yields Pr = 0.10 in session 1 and 0.00 in session 2. These results are supported by looking at behavior by subject. In session 1 one of the 24 subjects significantly change behavior between ABS1 and ABS.9 (abstaining less), while in session 2 four of the 24 subjects change their behavior between ABS1 and ABS.65.

[12] The χ^2 statistic for the first comparison equals 5.80, Pr = 0.06 and for the second comparison equals 4.86, Pr = 0.10. Fisher's exact test yiels Pr = 0.06 in the first and 0.11 in the second. When we examine subject behavior, we find that four out of 24 subjects significantly abstain less in VOT.9 in session 3 and two out of 18 subjects do so in VOT.65 in session 4.

[13] The χ^2 statistic for the comparison of these two sessions choices in VOT1 = 42.29, Pr = 0.00.

the All Vote Equilibrium. In all of our statistical analysis of group choices (in the primary treatments and in the control treatments), we use each group choice as an independent observation. In keeping with voting behavior, we find that in the last 15 periods in each treatment there is no significant difference in the percent group choices in ABS1 and ABS.9 in Session 1, but significantly less SVC outcomes and more All Vote outcomes in ABS.65 as compared to ABS1 in Session 2.[14] In the VOT treatments, where All Vote is always the informationally efficient equilibrium, we find evidence in support of our prediction that corrupt experts lead to greater coordination on that equilibrium. In the last 15 periods of each treatment in session 3, 30% of groups coordinate on All Vote in VOT.9 as compared to 21% in VOT1 in the same session, although the difference is not significant. In session 4, we also find a difference in the same direction, 72% of groups coordinate on All Vote in VOT.65 as compared to 56% in VOT1 in the same session, which is significant at the 6% level.[15]

Table 4: Group Choices in Primary Treatments in Last 15 Periods

		Percent Choices			Mean Information Efficiency		
Session	**Treatment**	**SVC**	**All Vote**	**Obs.**	**Observed***	**Predicted**	**Ratio**
1	ABS1	0.93	0.00	120	0.89	0.90	0.99
	ABS.9	0.98	0.00	120	0.87	0.86	1.01
2	ABS1	0.86	0.07	120	0.86	0.90	0.96
	ABS.65	0.73	0.21	120	0.75	0.77	0.97
3	VOT1	0.38	0.22	120	0.78	0.90	0.87
	VOT.9	0.30	0.30	120	0.85	0.89	0.96
4	VOT1	0.14	0.56	90	0.85	0.90	0.94
	VOT.65	0.11	0.72	90	0.84	0.86	0.98
*We code ties as 50% chance of a correct group decision.							

In summary, we find evidence that biased experts lead to somewhat less coordination on SVC equilibria and more on the All Vote equilibria when All Vote is informationally efficient, but no effect when SVC is informationally efficient. This result is summarized below:

Result 2 (Corrupt Experts & Equilibria) *When SVC is informationally efficient, corrupt experts have little effect on the likelihood of equilibria, but when All Vote is informationally efficient, groups are less likely to coordinate on SVC equilibria with corrupt experts.*

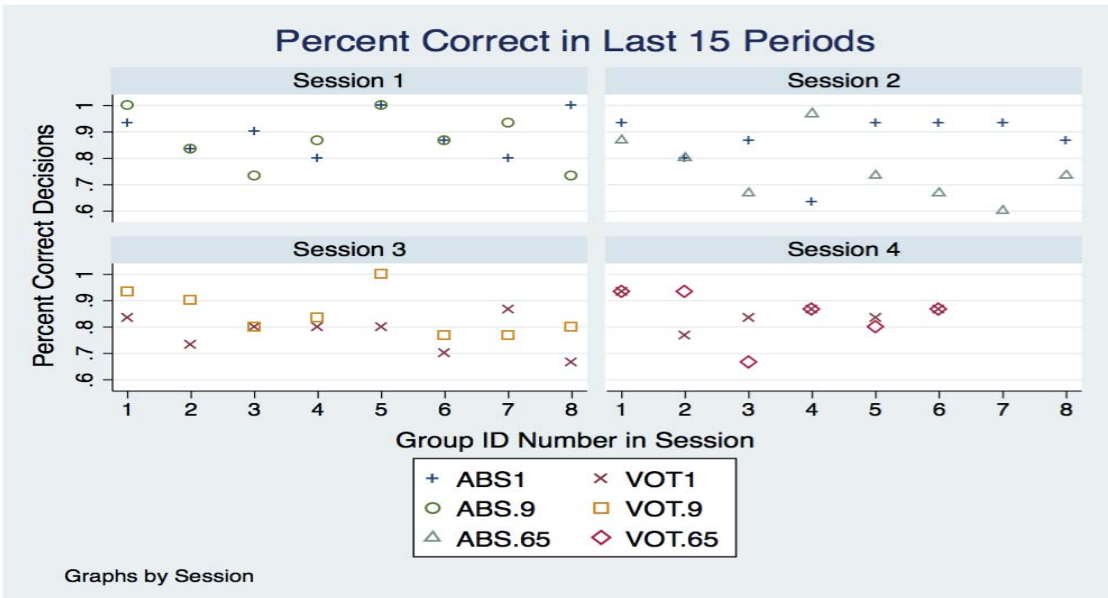
We now turn to the effect of corrupt experts on the informational efficiency of group choices and our Prediction 2. Table 4 presents measures of informational efficiency in terms

[14] The χ^2 statistic for Session 1 equals 3.15, Pr = 0.08 and for Session 2 equals 10.01, Pr = 0.01. The Fisher exact test probability for Session 1 is 0.14 and Session 2 is 0.00. In both sessions, two out of eight groups engage in significantly different behavior between treatments. We restrict our comparison to the within-subjects comparisons given the clear difference between the two sessions in ABS1 behavior, as discussed above.

[15] The χ^2 statistic for Session 3 equals 2.78, Pr = 0.25 and in Session 4 equals 5.75, Pr = 0.06. The Fisher exact test yields a probability of 0.26 for Session 3 and 0.05 for Session 4. We find that one of our eight groups in Session 3 significantly change behavior with the treatment change, while two out of six groups in Session 4 do so.

of the percent of group correct decisions by session and treatment. We also compare these percentages to the predicted percentages in the informationally efficient equilibrium for each treatment. The ratio of the observed to the predicted percentages is in the last column of the table. Figure 4 presents the average percentages of group correct decisions by treatment and session for the last 15 periods in each treatment.

Figure 4



We turn now to our evaluation of Prediction 2. We expect that informational efficiency will be lower in ABS.9 than in ABS1, both due to decreased abstention by non-experts and mechanically due to corrupt experts voting. We find that the average of correct group choices is lower in ABS.9 as compared to ABS1 in session 1 in the last 15 periods of each treatment, but the difference is not significant.[16]

In our other comparisons of voting games with and without corrupt experts (ABS.65 with ABS1, VOT.9 with VOT1, and VOT.65 with VOT1) the predicted effect on informational efficiency is ambiguous as the mechanical effect of corrupt experts will reduce informational efficiency but decreased abstention by non-experts may increase informational efficiency. That is, the mechanical effect is a direct or exogenous effect of corrupt experts while the decreased abstention by non-experts is an indirect or behavioral effect. The effect on informational efficiency overall thus depends on whether the indirect behavioral effect outweighs the exogenous direct effect. We find that the direction of the effect of corrupt experts depends on the size of the probability that an expert is corrupt. That is, we find that when the potential of corrupt experts is low (10%) compared to zero probability, groups are more informationally efficient, but when the potential of corrupt experts is high (35%) compared to zero probability, groups are less informationally efficient. When the direct effect is weak, then it is over-compensated by the indirect effect, but when it is sufficiently strong,

[16]A Mann-Whitney test yields a z statistic of 0.60, Pr = 0.55.

the behavioral response of the indirect effect is insufficient to compensate it. Specifically, comparing VOT.9 than VOT1 for session 3 (85% compared to 78%) shows an increase in efficiency, although the difference is insignificant.[17] However, when we examine average performance by group in the last 15 periods in session 3 in Figure 4, we find that 6 out of 8 groups are more informationally efficient in VOT.9 than in VOT1 and only one group out of 8 is less informationally efficient. Thus, it appears that the decreased abstention due to corrupt experts does lead to more informational efficiency, offsetting the mechanically effect of corrupt experts.

Comparing ABS.65 to ABS1 in session 2 we find the opposite relationship (75% compared to 86%). The comparison is significant at the 3% confidence level.[18] Examination of Figure 4 shows 6 out of 8 groups less informationally efficient in ABS.65 than in ABS1 in the last 15 periods and only one out of 8 more informationally efficient. We find the same lower efficiency in VOT.65 compared to VOT1, but the difference is minimal and not significant (84% compared to 85%).[19] The evidence suggests, then, that decreased abstention due to corrupt experts is not sufficient to increase informational efficiency and offset the mechanical effect of corrupt experts. This result is summarized below:

Result 3 (Corrupt Experts and Information Efficiency) *We find some evidence that when the potential of corrupt experts is low, reductions in abstention of non-experts can increase informational efficiency, offsetting the mechanical effect of corrupt experts. But when the potential of corrupt experts is relatively large, reductions in abstention of non-experts is insufficient to increase informational efficiency and the mechanical effect on efficiency of corrupt experts can lead to less efficient group choices.*

3.2.3 Homogeneous Treatments

As discussed above, we conducted four homogeneous treatments: HOM791, HOM79.9, HOM831, and HOM83.9. Table 5 below summarizes the individual behavior of non-corrupt voters in these treatments in the last 15 periods of each. We expect (Prediction 1) that abstention will be lower in the treatments with potentially corrupt voters (HOM79.9 and HOM83.9 are predicted to have lower abstention rates than HOM791 and HOM831, respectively). We find, however, no significant difference in abstention rates in these two comparisons. The only effect we find on voting behavior is that non-biased voters are significantly more likely to vote their signal (make fewer mistakes) in HOM83.9 than in HOM831, suggesting that the presence of potentially corrupt voters focuses the subjects attention to their task in this session.[20]

Table 5: Unbiased Voting Behavior by Homogeneous Treatment (Last 15 Periods)

[17] The Mann Whitney z statistic equals 1.57, Pr = 0.12.
[18] The Mann Whitney z statistic equals 2.11, Pr = 0.03.
[19] The Mann Whitney z statistic equals 0.16, Pr = 0.88.
[20] The Mann Whitney z statistic equals 2.13, Pr = 0.03.

Signal			Percent Vote Choices			
Quality	**Session**	**Treatment**	**Abstain**	**Signal**	**Not Sig.**	**Obs.**
$q = 0.79$	5	HOM791	0.07	0.83	0.09	360
		HOM79.9	0.08	0.85	0.07	347*
$q = 0.83$	6	HOM831	0.07	0.89	0.04	360
		HOM83.9	0.06	0.93	0.01	350*
*We report only behavior of non-corrupt voters.						

Of particular usefulness, is to compare the unbiased voting behavior in the HOM79 treatments with the voting behavior of non-experts in the VOT treatments and the unbiased voting behavior in the HOM83 treatments with the voting behavior of experts in the VOT treatments. We find further support for the norm of delegating through abstention through such a comparison. That is, we find that non-experts in VOT1 abstain significantly more than the unbiased voters in HOM791 who have the same quality of information (44% compared to 7%) and non-experts in VOT.9 abstain significantly more than the unbiased voters in HOM79.9 (47% compared to 8%).[21] In contrast, we find that experts in VOT1 treatment abstain significantly less than unbiased voters in HOM831, even though they have the same quality of information (2% compared to 8%) and experts in VOT.9 abstain significantly less than unbiased voters in HOM83.9 (0.5% versus 5%).[22] Thus, we find further evidence that the norm of delegating through abstention is strong in the VOT treatments (affecting the behavior of both non-experts and experts) when we compare voters with the same quality of information but where information qualities are homogeneous.

As with the primary treatments, we also compare group outcomes in the homogeneous treatments, which is presented in Table 6. In general, not surprisingly, group outcomes follow the same trends found in voting behavior. That is, we find no significant differences between the treatments with no potentially corrupt voters and those with potentially corrupt voters.

Table 6: Group Choices in Homogeneous Treatments and Efficiency

		Percent Choices		Mean Information Efficiency		
Session	**Treatment**	**All Vote**	**Obs.**	**Observed***	**Predicted**	**Ratio**
5	HOM791	0.58	120	0.80	0.89	0.90
	HOM79.9	0.63	120	0.82	0.88	0.93
6	HOM831	0.73	120	0.90	0.92	0.98
	HOM83.9	0.83	120	0.89	0.91	0.98
*We code ties as 50% chance of a correct group decision.						

We summarize these results below:

Result 4 (Homogenous Signals) *When signals are homogeneous in quality, non-corrupt voters do not lead to significantly less abstention, although there is some slight evidence*

[21] The Mann Whitney z statistic = 11.61, Pr = 0.00 for the first comparison and 11.27, Pr = 0.00 for the second.

[22] The Mann Whitney z statistic for the first comparison equals 2.59, Pr = 0.01 and for the second equals 2.75, Pr = 0.01.

that they focus voters attention more on the task. We also find that the abstention rates of these voters are less than non-experts in asymmetric information treatments, but greater than experts in asymmetric information treatments.

3.2.4 VOTB Treatments

As in the homogeneous treatments, the only equilibrium that does not involve weakly dominated strategies in VOTB is for all subjects to vote. However, recall that in VOTB there are two experts and one nonexpert, so if non-experts have a tendency to want to follow the norm of delegating to experts, we might observe abstention of non-experts even though such behavior is not consistent with any equilibrium. In fact, Morton and Tyran (2011), found that 28% of non-experts abstained in their VOTB1 sessions.

Voting behavior of both experts and non-experts in session 7 where we combined VOTB1 with VOTB.9 is summarized below in Table 7. We find that a little over half of non-experts abstain in VOTB1, 53%, which is significantly more than the percentage that abstain in VOTB.9, 36%.[23] Hence, we find that the potential that experts are corrupt appears to significantly decrease the tendency of these voters to delegate through abstention.

Table 7: Voting Behavior by VOTB Treatments (Last 15 Periods)

Voter		Percent Vote Choices			
Type	**Treatment**	**Abstain**	**Signal**	**Not Sig.**	**Obs.**
Nonexperts	VOTB1	0.53	0.43	0.05	120
	VOTB.9	0.36	0.59	0.05	120
Unbiased Experts	VOTB1	0.08	0.90	0.01	240
	VOTB.9	0.09	0.90	0.01	226*
*We report only behavior of unbiased experts.					

In Table 8 we consider the effects of corrupt experts on group equilibria convergence and informational efficiency as in the above discussion. Not surprisingly, since more non-experts are voting in VOTB.9, we find that significantly more groups converge on the All Vote equilibrium in VOTB.9 than VOTB1 (58% compared to 40%).[24] Nevertheless, we find that the greater participation of non-experts is insufficient to offset the mechanical loss in informational efficiency from corrupt experts. That is, even with the high abstention rate of non-experts, groups were correct in VOTB1 85% of the time, which is significantly greater than the 73% observed in VOTB.9.[25] This difference is partly explained by the fact that both experts were potentially corrupt, therefore the incidence of corrupt experts was higher than in the other treatments with $s = 0.9$; for example, 10% of groups in VOT.9 contained a corrupt expert, compared to 15% of groups in VOTB.9 (although it was possible for both experts to be biased, we did not observe any groups with two corrupt experts). These results are summarized below:

[23] The Mann Whitney z statistic equals 2.50, Pr = 0.01.
[24] The Mann Whitney z statistic equals 2.62, Pr = 0.01.
[25] The Mann Whitney z statistic = 2.52, Pr = 0.01.

Result 5 (Two Experts) *We find that participation of non-experts is greater and convergence on the All Vote equilibrium is more likely when experts are potentially corrupt in the voting situation with two experts and one nonexpert. However, the greater participation is insufficient to offset the mechanical effects of corrupt experts on informational efficiency.*

Table 8: Group Choices in VOTB Treatments and Efficiency (Last 15 Periods)

	Percent Choices		Mean Information Efficiency		
Treatment	**All Vote**	**Obs.**	**Observed***	**Predicted**	**Ratio**
VOTB1	0.40	120	0.85	0.91	0.93
VOTB.9	0.58	120	0.73	0.89	0.82
*We code ties as 50% chance of a correct group decision.					

4 Concluding Remarks

Delegating difficult decisions to experts is a common norm in many contexts, including committee decision-making where information is asymmetrically distributed. Our results validate the finding of Morton and Tyran (2011) that delegation to experts through abstention when information is asymmetrically distributed is a strong norm in committee voting. We find that such delegation is a choice of a large percentage of non-experts even when it is informationally efficient for All Vote and even when it is not equilibrium behavior (in the case of two experts).

But experts can be corrupt. In this paper we investigate experimentally whether the existence of corrupt experts reduces the tendency of non-experts to delegate through abstention. We find that indeed, non-experts are more likely to participate when experts are potentially corrupt, even when it is informationally efficient for them to continue to abstain. Furthermore, we find that when the probability of corrupt experts is not large, the added participation can increase the informational efficiency of the committee, offsetting the mechanical reduction in informational efficiency of corrupt experts. Yet, if that probability becomes sizeable, then the increase in participation of non-experts is insufficient to offset the reduction in informational efficiency due to corrupt experts. The positive possibility of corrupt experts, then, appears to have a non-monotonic effect on informational efficiency. That is, it has a positive effect on informational efficiency if that possibility is small, but a negative effect once the probability of bias or corruption is sizeable. Our results then suggest that the possibility of a small amount or corruption or bias can have a beneficial effect on informational efficiency in that it induces non-experts to participate in decision-making when it is informationally efficient for them to do so.

Our conclusions should be interpreted with care of course since they are based on a simple model in which the probability of an expert having a bias or being corrupt is exogenously determined. In a more general model, the value for an expert of voting against her information probably depends on the relative value she attaches to making the "right choice" (on behalf say of her constituency) versus the private benefit she might receive. The private benefit comes from the willingness to pay of the lobbying group or briber. But in equilibrium, the briber's willingness to pay will depend on how powerful the bribed is within the committee, which will depend on the distribution of information, the size of the committee, and importantly, the participation rates of non-experts. Hence, the increased participation of non-experts could possibly be an interesting "check" on corruption within committees, reducing the value to the lobbying group from bribing the expert, and as a consequence reducing the probability of corruption. Our results, therefore, may imply that in a more general model of committee voting in which non-experts behaviorally react to the possibility of corruption, this reaction reduces the outside benefits and the incidence of such corruption.

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Appendix A: Instructions for Online Publication

INSTRUCTIONS FOR TREATMENTS WITHOUT BIASED VOTERS

Welcome to the experiment. Please do not communicate during the experiment. If you have any questions please raise your hand. You can earn money in this experiment. The amount of money you earn depends on your decisions and the decisions of other participants. All earnings will be paid to you immediately after the experiment. During the experiment, your income will be calculated in points. After the experiment, your income will be converted into Danish kroner (DKK) according to the following exchange rate: 6 points = 1 DKK. The experiment has 60 periods. All participants are randomly divided into groups of three. The group composition remains constant throughout the experiment. That is, you will be in a group with the same two participants. All participants are anonymous; nobody knows which other participants are in their group, and nobody will be told who was in which group after the experiment.

Each period is structured as follows: (1) A prize is placed in one of two boxes ("red" or "blue"), (2) Each group member receives information about where the prize is hidden, (3) Each group member votes for "red" or "blue", (4) Group decision, (5) Each group member receives earnings according to the group decision, and (6) Each group member receives feedback.

In the beginning of each period, a prize is placed in one of two boxes; a red box and a blue box. It is equally likely that the prize is placed in either box. That is, there is 50 % probability that the prize is placed in the blue box and 50 % probability that the prize is placed in the red box. The group's task is to choose a box. Each group member can vote for the box he/she thinks contains the prize. The box that receives the majority of the votes is the group decision. In case of a tie a computer will pick one of the two boxes. There is 50 % probability that either of the two boxes is picked.

Each member of the group earns points as follows:

1. 30 points for each group member if the group finds the prize.
2. -70 points for each group member if the group does not find the prize.

Your earnings are determined exclusively by the group decision. The group decision depends on the votes of all three members. If the group decision is correct, all group members earn 30 points. If the group decision is wrong, all group members earn -70 points. These earnings are independent of how a particular group member voted. Consider the following example. You have voted for the red box and the two other group members both voted for the blue box. This means, that the group decision is the blue box.

1. Suppose the prize was placed in the blue box. Then, each group member, including you, earns 30 points.
2. Now suppose the prize was placed in the red box. Then, each group member, including you, earns -70 points.

The table below illustrates that the only thing influencing your earnings is whether the group finds the prize. The only way you can influence your earnings, is by affecting the decision of the group:

	The group is **correct**	The group is **wrong**
You voted for the **correct** box	30	-70
You voted for the **wrong** box	30	-70
You did **not vote**	30	-70

In each period each group member has three options: (1) Vote for the red box, (2) Vote for the blue box, or (3) Abstain (do not cast a vote).

ABS-VOT & VOT-ABS: [In the beginning of each period each participant receives information about where the prize is placed. The information participants receive is not 100 % reliable but it is always more likely to be correct than wrong. The participants will not receive equally reliable information; one of the members in a group will receive more reliable information than the other two who get equally reliable information. Reliability refers to how often the information is correct.]

HOM65-ABS & VOT-VOTB-HOM79: [In the beginning of each period each participant receives information about where the prize is placed. The information participants receive is not 100 % reliable but it is always more likely to be correct than wrong. The participants will not necessarily receive equally reliable information; for example, one of the members in a group can receive more reliable information than the other two who get equally reliable information. Reliability refers to how often the information is correct.]

ABS-VOT & HOM65-ABS: [For example, in a given period, one member of the group receives information that is correct 90 % of the time, whereas the information that the other two members receive is correct 65 % of the time.]

VOT-ABS & VOT-VOTB-HOM79: [For example, in a given period, one member of the group receives information that is correct 83 % of the time, whereas the information that the other two members receive is correct 79 % of the time.]

ABS-VOT & HOM65-ABS: [To illustrate, suppose the prize is placed in the red box. The group member with the most reliable information will receive the information "red" 90 % of the time and "blue" 10 % of the time.]

VOT-ABS & VOT-VOTB-HOM79: [To illustrate, suppose the prize is placed in the red box. The group member with the most reliable information will receive the information "red" 83 % of the time and "blue" 17 % of the time.]

Your information is personal, that is, it is independent of the other member's information. The two group members with less reliable information do not necessarily get the same information. Suppose you receive information that is correct 65 % of the time, another member of your group also receives information that is correct 65 % and the last member receives information that is correct 90 % of the time. In this case it is possible that you receive the information "red" while the other two members receive the information "blue". It is randomly decided at the beginning of each period who gets which type of information. The reliability of the information can change during the experiment, in which case you will be informed.

[Subjects are shown the feedback screen.] After each period, all group members receive feedback as follows: (1) The reliability of each group member's information and their choice (red, blue or abstain), (2) The outcome of the period; that is, whether the group decision was correct or not, and (3) The history of results in periods with different number of voters. That is, the number of periods with different number of voters and the corresponding average earnings. Do you have any questions?

INSTRUCTIONS FOR TREATMENTS WITH BIASED VOTERS ($s = 0.9$ treatments):

In phase 2 it might occur that the group member with more reliable information are color-types (either red-type or blue-type). The probability that a group member with more reliable information is a color-type is 10%. If a group member is a color-type, it is randomly decided which color-type he is, i.e. there is a 50% probability that he is a red-type and a 5 % probability that he is a blue-type. A group member who is a color-type is always forced to vote for his color. His earnings are not related to the position of the prize, but are calculated as follows:

I. 30 points if the group chose his color

II. -70 points if the group did not choose his color.

Group members who are not a color-type can vote or abstain and their earnings are calculated as in phase 1. Before they vote they don't know if another group member is a color-type or not, but in the feedback they receive the informaiton.

If no group member is a color-type, everything is the same as in phase 1.

Example

You are a group member with more reliable information and you are a red-type. Therefore, you are forced to vote for red. The other two group members are not color-types. One of them votes for blue, one votes for red. So the group decision is red.

Consequently, you earn 30, independently where the prize was placed, because you are a red-type.

The two other group members earn 30 if the prize was placed in the red box and -70 if it was placed in the blue box.

5 Appendix B: Supplemental Data for Online Publication

Table B1: Noncorrupt Expert Voting Behavior in Primary Treatments

Signal Quality	Session	Treatment	Percent Vote Choices: Abstain	Signal	Not Sig.	Obs.
$p = 0.9$	1	ABS1	0.00	1.00	0.00	240
		ABS.9	0.00	1.00	0.00	217*
	2	ABS1	0.004	0.99	0.004	240
		ABS.65	0.00	1.00	0.00	154*
$p = 0.83$	3	VOT1	0.03	0.96	0.02	240
		VOT.9	0.01	0.98	0.01	215*
	4	VOT1	0.02	0.96	0.02	180
		VOT.65	0.02	0.96	0.03	114*

*We only report the choices of experts not selected as biased.

Table B2: Nonexpert Voting Behavior by Treatment and Session

Signal Quality	Session	Treatment	Periods in Treatment	Percent Vote Choices Abstain	Signal	Not Sig.	Obs.
$q = 0.65$	1	ABS1	All	0.92	0.06	0.02	480
			1-15	0.87	0.10	0.03	240
			16-30	0.96	0.03	0.01	240
		ABS.9	All	0.98	0.02	0.00	480
			1-15	0.98	0.03	0.00	240
			16-30	0.99	0.01	0.00	240
	2	ABS1	All	0.80	0.17	0.03	480
			1-15	0.73	0.24	0.3	240
			16-30	0.87	0.10	0.03	240
		ABS.65	All	0.73	0.25	0.02	480
			1-15	0.70	0.28	0.02	240
			16-30	0.75	0.23	0.02	240
$q = 0.79$	3	VOT1	All	0.52	0.43	0.05	480
			1-15	0.46	0.48	0.06	240
			16-30	0.57	0.39	0.04	240
		VOT.9	All	0.43	0.53	0.05	480
			1-15	0.38	0.57	0.05	240
			16-30	0.47	0.48	0.05	240
	4	VOT1	All	0.27	0.69	0.04	360
			1-15	0.29	0.68	0.03	180
			16-30	0.26	0.69	0.05	180
		VOT.65	All	0.21	0.77	0.02	360
			1-15	0.24	0.74	0.01	180
			16-30	0.17	0.80	0.03	180

Table B3: Group Choices in Primary Treatments and Efficiency

		Periods in	Percent Choices			Mean Information Efficiency		
Session	**Treatment**	**Treatment**	**SVC**	**All Vote**	**Obs.**	**Observed***	**Predicted**	**Ratio**
1	ABS1	All	0.84	0.00	240	0.89	0.90	0.99
		1-15	0.74	0.00	120	0.88	0.90	0.98
		16-30	0.93	0.00	120	0.89	0.90	0.99
	ABS.9	All	0.97	0.00	240	0.87	0.86	1.01
		1-15	0.95	0.00	120	0.86	0.86	1.00
		16-30	0.98	0.00	120	0.87	0.86	1.01
2	ABS1	All	0.75	0.10	240	0.83	0.90	0.92
		1-15	0.63	0.14	120	0.80	0.90	0.89
		16-30	0.86	0.07	120	0.86	0.90	0.96
	ABS.65	All	0.69	0.20	240	0.76	0.77	0.99
		1-15	0.64	0.19	120	0.78	0.77	1.01
		16-30	0.74	0.22	120	0.75	0.77	0.97
3	VOT1	All	0.31	0.23	240	0.78	0.90	0.87
		1-15	0.26	0.25	120	0.79	0.90	0.88
		16-30	0.37	0.22	120	0.78	0.90	0.87
	VOT.9	All	0.25	0.34	240	0.85	0.89	0.96
		1-15	0.18	0.38	120	0.84	0.89	0.94
		16-30	0.32	0.31	120	0.85	0.89	0.96
4	VOT1	All	0.15	0.54	180	0.85	0.90	0.94
		1-15	0.16	0.53	90	0.84	0.90	0.93
		16-30	0.14	0.56	90	0.85	0.90	0.94
	VOT.65	All	0.11	0.64	180	0.79	0.86	0.92
		1-15	0.10	0.57	90	0.74	0.86	0.86
		16-30	0.11	0.72	90	0.84	0.86	0.98
*We code ties as 50% chance of a correct group decision.								

Table B4: Voting Behavior of Unbiased Voters by Homogeneous Treatment

Signal Quality	Session	Treatment	Periods in Treatment	Percent Vote Choices Abstain	Signal	Not Sig.	Obs.
$q = 0.79$	5	HOM791	All	0.07	0.85	0.08	720
			1-15	0.06	0.87	0.07	360
			16-30	0.07	0.83	0.09	360
		HOM79.9	All	0.10	0.84	0.06	696*
			1-15	0.12	0.82	0.06	349*
			16-30	0.08	0.85	0.07	347*
$q = 0.83$	6	HOM831	All	0.08	0.86	0.06	720
			1-15	0.09	0.84	0.08	360
			16-30	0.07	0.89	0.04	360
		HOM83.9	All	0.05	0.93	0.02	697*
			1-15	0.05	0.93	0.02	347*
			16-30	0.06	0.93	0.01	350*

*We report only behavior of non-corrupt voters.

Table B5: Group Choices in Homogeneous Treatments and Efficiency

		Periods in	Percent Choices		Mean Information Efficiency		
Session	**Treatment**	**Treatment**	**All Vote**	**Obs.**	**Observed***	**Predicted**	**Ratio**
5	HOM791	All	0.62	240	0.81	0.89	0.91
		1-15	0.66	120	0.82	0.89	0.92
		16-30	0.58	120	0.80	0.89	0.90
	HOM79.9	All	0.63	240	0.79	0.88	0.90
		1-15	0.62	120	0.76	0.88	0.86
		16-30	0.63	120	0.82	0.88	0.93
6	HOM831	All	0.68	240	0.86	0.92	0.93
		1-15	0.63	120	0.83	0.92	0.90
		16-30	0.73	120	0.90	0.92	0.98
	HOM83.9	All	0.81	240	0.88	0.91	0.97
		1-15	0.79	120	0.88	0.91	0.97
		16-30	0.83	120	0.89	0.91	0.98
*We code ties as 50% chance of a correct group decision.							

Table B6: Voting Behavior by VOTB Treatment

Voter Type	Treatment	Periods in Treatment	Percent Vote Choices Abstain	Signal	Not Sig.	Obs.
Nonexperts	VOTB1	All	0.53	0.41	0.06	240
		1-15	0.53	0.40	0.08	120
		16-30	0.53	0.43	0.05	120
	VOTB.9	All	0.37	0.60	0.03	240
		1-15	0.38	0.60	0.02	120
		16-30	0.36	0.59	0.05	120
Unbiased Experts	VOTB1	All	0.08	0.90	0.01	480
		1-15	0.08	0.90	0.02	240
		16-30	0.08	0.90	0.01	240
	VOTB.9	All	0.09	0.90	0.01	445*
		1-15	0.09	0.90	0.01	219*
		16-30	0.09	0.90	0.01	226*
*We report only behavior of unbiased experts.						

Table B7: Group Choices in VOTB Treatments and Efficiency

	Periods in	Percent Choices		Mean Information Efficiency		
Treatment	**Treatment**	**All Vote**	**Obs.**	**Observed***	**Predicted**	**Ratio**
VOTB1	All	0.37	240	0.85	0.91	0.93
	1-15	0.33	120	0.85	0.91	0.93
	16-30	0.40	120	0.85	0.91	0.93
VOTB.9	All	0.57	240	0.78	0.89	0.88
	1-15	0.56	120	0.83	0.89	0.93
	16-30	0.58	120	0.73	0.89	0.82
*We code ties as 50% chance of a correct group decision.						