Information Aggregation Through Costly Political Action

By SUSANNE LOHMANN*

Information about various policy alternatives is dispersed among the individual members of a society. Prior to a vote over the alternatives, some people take costly political action to signal their private information to voters. By informing voting decisions, political action has potential to decrease the likelihood that voters cast "mistaken" votes. Perhaps surprisingly, pre-election communication may be counterproductive. The dispersed information is partially aggregated by the vote, and political action may contribute "noise" to the voting process. In some cases, the voting mechanism is more likely to implement the full-information voting outcome in the absence of pre-election political action. (*JEL* D72, D82, H41)

Information pertinent to individual decisions "never exists in concentrated or integrated form, but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess" (F. A. Hayek, 1945 p. 519). Every society faces the economic problem of utilizing information that is not known to anyone in its totality. Dispersed information can be aggregated in a number of ways. For example, prices formed in market trading have the potential to transmit private information held by market participants. Perhaps less obviously, the price system coexists with political mechanisms, some of which also aggregate information.

In democratic societies, voters regularly choose between competing political programs by majority rule. Their private information about the consequences of various policies affects their votes. The majority-rule voting mechanism thus allows for some aggregation of information (Marie Jean Antoine Nicolas Caritat Condorcet, 1785).

Prior to a vote, people often take political action. By signing petitions, taking part in demonstrations, or participating in violent riots, they may signal their dissatisfaction with the status quo. To the extent that these protest activities are informative about policy consequences, they may affect other individuals' voting decisions. Thus, information may also be aggregated through political action.

In many cases, the analysis of the properties of the price mechanism has been based on the simplifying assumption that the transaction costs of information aggregation are zero. In contrast, the private costs of taking political action are central to the analysis of mass participation. Mancur

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Olson (1965) argues that political participation is plagued by a free-rider problem. According to Olson, the probability that one individual's action will be decisive for political outcomes is negligible in a large society. He concludes that rational, self-interested individuals do not have incentives to engage in costly political action. Based on Olson's analysis, ongoing and extensive mass participation is thought of as an impractical means by which individuals can express their policy preferences.

This paper analyzes political action as a signaling phenomenon. I establish that rational, self-interested individuals may engage in costly political action despite the presence of a free-rider problem. Their actions are informative for voters who rationally take a cue from the size of the protest movement against the status quo. The political-action mechanism aggregates some of the individuals' private information prior to the vote at a cost privately incurred by activists. This mechanism coexists with the voting mechanism that costlessly aggregates some of the dispersed information via the vote.

By informing voting decisions, political action has the potential to increase the likelihood that the full-information voting outcome is achieved. Perhaps surprisingly, however, pre-election communication may be counterproductive. Given that some information is aggregated by the vote, the marginal contribution of the political-action mechanism may consist in adding noise. In some cases, the full-information voting outcome is *ex ante* more likely to be implemented by the voting mechanism in the absence of pre-election political action.

The remainder of the paper is organized as follows. Section I discusses why the free-rider problem identified by Olson (1965) is partially overcome in a setting that links signaling and participation games. Section II develops a signaling model of political action. Section III characterizes a political-action and voting equilibrium. Section IV examines the link between pre-election political action and the likelihood that the full-information voting outcome is implemented. Section V contains the conclusion.

I. Signaling and Participation

The analysis is based on the following setting. In a majority-rule referendum voters choose between two distinct policies: the status quo and a policy alternative.[1] Voters have preferences over policy outcomes, which depend on the policy chosen in the referendum and on the state of the world. Consequently, the individuals' policy preferences are a function of the state of the world.

Voters have traditionally been thought of as rationally ignorant (Anthony Downs, 1957). While this assumption is plausible for expert knowledge that is costly to obtain, it is less appealing for types of knowledge that are costless by-products of practical experience. In their daily lives, people obtain information about the consequences of various policies for their wealth or well-being. One individual's experience leads to a fairly imprecise estimate of the benefits to be derived from various policies in the future, whereas the collective experiences of all individuals reflect these benefits quite accurately.

If no information is publicly revealed prior to the vote, people's voting decisions are a function of their private information only. The voting mechanism then allows for some aggregation of information. In many states of the world, a majority of the imperfectly informed voters choose the alternative that would also be implemented if the voters were fully informed. However, in some states of the world, a majority of voters may vote in favor of one policy although they would be better off under the alternative policy.

If the information dispersed in the population were partially or fully revealed prior to the vote, people might be less likely to cast mistaken votes. In this situation, some

[1]The analysis also applies to a majority-rule election over two candidates who have fixed and distinct policy positions. Moreover, this article analyzes the case in which political action is directed at voters and influences voting decisions; Lohmann (1993a) examines the related case in which political action informs the policy decision made by a policymaker.

individuals may have incentives to signal their private information to the electorate and influence the voting outcome. They can transmit their information by being counted as part of a protest movement against the status quo.

The electorate understands the individuals' incentives to engage in political action as a function of their private information. Using a simple statistic, the publicly observed number of political actions, voters update their beliefs on the state of the world and consequently on the relative benefits to be derived from the status quo and the policy alternative. Since their updated beliefs affect their votes, the probability that the status quo is overturned is a function of the observed number of political actions. This functional relationship, in turn, determines the individuals' incentives to take political action.

Olson's (1965) analysis suggests that the nonnegligible private costs of political participation create disincentives for rational, self-interested individuals to participate if they are part of a large society. However, in a seminal paper on the game-theoretic foundations of voting, John Ledyard (1984) shows that zero voting turnout cannot be an equilibrium for some set of strictly positive costs of voting if the alternatives are distinct and the population is of finite size. Expected voter turnout is strictly positive for some nonempty set of strictly positive voting costs. Subsequent work by Thomas Palfrey and Howard Rosenthal (1985) suggests that expected voter turnout is close to zero if the electorate is large and imperfectly informed. Faced by the empirical fact that electoral turnout is typically huge, they conclude that "we have come full circle and are once again beset by the 'paradox of not voting'" (p. 64).

This paper examines the case in which a costless vote is preceded by costly political action.[2] As suggested by Ledyard's analysis, the probability that one individual's political action will be decisive for the outcome is strictly positive in a finite-sized society, even if the society is very large. Thus, expected political-action turnout is strictly positive for some strictly positive costs of taking political action.

Moreover, this paper synthesizes participation and signaling games by casting political action as a signaling phenomenon. Political action informs voters' decisions and thus affects policy outcomes. In this setting, a small number of political actions may have a decisive effect for two reasons. First, people's policy preferences are correlated. One individual's experience, if made public, affects other individuals' policy preferences. As a consequence, the information that is revealed through the political actions of very few people has the potential to affect a large number of voting decisions. Second, when extracting information from the observed number of political actions, voters take into account the individuals' incentives to engage in political action. If these incentives are known to be weak, the voters' decision rules endogeneously allow for a small number of political actions to be decisive. In contrast to voting studies, an analysis of political action does not have to explain huge turnout. On the contrary, the puzzle that requires explanation is that small numbers can often make a "big splash" (Norman Nie and Sidney Verba, 1975 p. 27).

II. The Model

The society consists of n people, indexed by $i = 1, \ldots, n$. The size of the population, n, is odd and large but finite. An individual i has the loss function

$$L_i = (x - x_i)^2 + d_i c \tag{1}$$

where x is the policy outcome; x_i is individual i's ideal point for policy outcomes; c is the cost incurred by individual i when taking political action, $c > 0$; d_i is an index variable which takes on value 1 if individual i takes political action, and value 0 other-

[2] For strictly positive but not prohibitive costs of voting, individuals may nevertheless have incentives to take costly political action prior to an election in order to affect both electoral turnout and the votes of individuals who turn out.

wise. For simplicity, the ideal points are assumed to be uniformly distributed between $-\bar{x}$ and $\bar{x}$, $\bar{x} > 0$. The parameter $\bar{x}$ measures the heterogeneity of the population. The distribution of ideal points is common knowledge, but each individual is privately informed about her own ideal point.

The policy outcome x is determined by the policy p and the state of the world s:

$$x = p - s. \tag{2}$$

The state of the world s is drawn from a commonly known uniform distribution $\beta(s)$ which has strictly positive support on the unit interval. The policy p is chosen from the set $\{Q, A\}$, where both the status quo Q and the policy alternative A are exogeneously fixed and distinct points on the unit interval, $0 < Q < A < 1$. The median individual, whose ideal point is equal to 0, is indifferent between the status quo and the policy alternative for the state of the world $s = (Q + A)/2$. A majority is better off under the status quo for states of the world that satisfy $s \in [0, (Q + A)/2)$, and under the policy alternative for others, $s \in ((Q + A)/2, 1]$.

People ultimately care about policy outcomes. Since the policy and the state of the world jointly determine the policy outcome, the individuals' preferences over policies depend on the state of the world. New information that is revealed about the state of the world s has the potential to allow for the implementation of a policy p that offsets the effect of s. However, the policy preferred by an individual also depends on her preferences over policy outcomes, as summarized by her ideal point x_i. Some individuals with extreme preferences may not have incentives to reveal their information truthfully. Finally, the specification of the cost term in the utility function implies that information revelation through political action comes at a cost privately incurred by activists.

The time sequence of events is graphed in Figure 1. Nature draws the state of the world s. Then each individual privately observes an independent realization of a binary signal σ. The probability that any individual observes the realization $\sigma = 1$ is equal to s, while the probability of the realization $\sigma = 0$ is given by $1 - s$. Thus, the realization of σ is informative about the state of the world. Given that the individual experiences are made privately, each individual is very imperfectly informed about the state of the world s. In the aggregate, the population is better informed since it observes n independent draws of the signal σ. However, at this time, no single individual is informed about the aggregate number of individuals of type $\sigma = 1$ or $\sigma = 0$.

At the political-action stage of the game, the individuals are differentiated with respect to their ideal points x_i and their realizations of the signal σ. Formally, the individuals' political-action strategies are given by $\pi(i, \sigma)$. An individual who takes political action ($\pi = 1$) privately incurs the cost c; an individual who abstains ($\pi = 0$) does not.[3]

In this paper, I focus on the case in which it is commonly understood that an individual who takes political action wishes to indicate that she is of type $\sigma = 1$ (or, equivalently, that she is against the status quo). That is, individuals can choose whether to send the costly message "I am type $\sigma = 1$" or to abstain from sending this message. The analysis of the case in which the message implicit in a political action is "I am type $\sigma = 0$" (or, equivalently, "I am in favor of the status quo") is symmetric. In Lohmann (1993b), I modify the framework developed here to examine the case in which individuals may become active on both sides of the issue; that is, they can send one or both of the messages "I am type $\sigma = 1$" and "I am type $\sigma = 0$," or abstain.

After m political actions are publicly observed, a referendum takes place. Formally, the individuals' voting strategies are given by $\nu(i, \sigma, m)$. Each individual either votes

[3] In the equilibrium characterized in Section III, mixed strategies of taking political action or abstaining are dominated due to the heterogeneity of the population. Individuals characterized by a given information set at the political-action stage have a strict preference for taking political action against the status quo if their ideal points lie strictly above a cutoff point and for abstaining if their ideal points lie strictly below that point. Only the (knife-edge) individual whose ideal point is exactly equal to the cutoff point is indifferent.

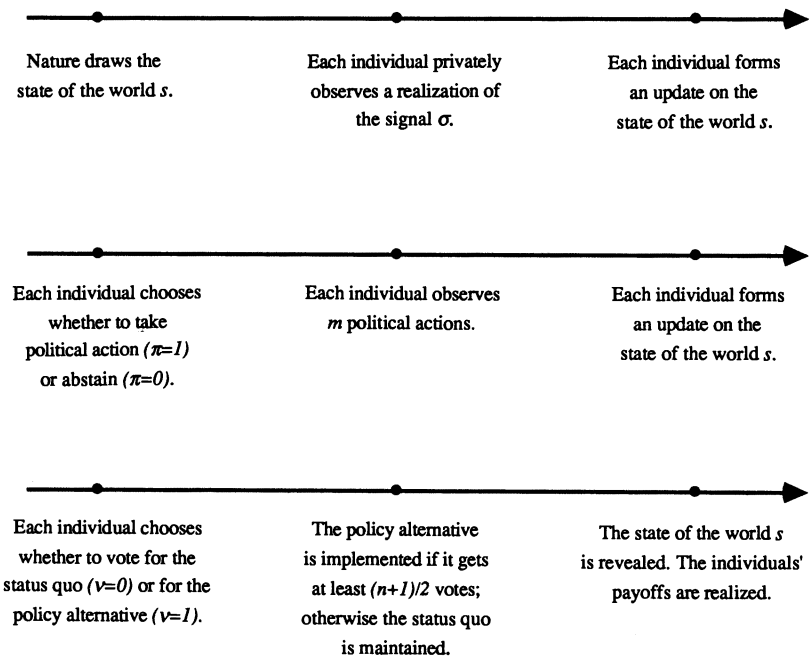

FIGURE 1. TIME SEQUENCE OF EVENTS

for the status quo ($v = 0$), or she casts her vote in favor of the policy alternative ($v = 1$).[4] The status quo is overturned if the number of votes for the policy alternative, N, is greater than or equal to the simple majority $(n+1)/2$. After the vote, the individual losses are realized as a function of the state of the world and the policy chosen in the referendum.

The structure of the game is common knowledge. The equilibrium concept employed is a refinement of sequential equilibrium. The concept of sequential equilibrium (David Kreps and Robert Wilson, 1982) restricts the individuals to use Bayes' Rule to update on the state of the world when they are privately informed about their realization of the signal σ or publicly informed about the aggregate number of political actions, m. These updates take into account the individuals' political-action and voting strategies, their beliefs at the political-action and voting stages, and the common priors on nature's actions.

By definition, individuals do not have incentives to deviate from their equilibrium strategies. In some cases, the number of political actions that may be observed if some individual deviates is realized with probability zero in equilibrium. The individual incentives to deviate will depend on their expectations about the voters' responses to an out-of-equilibrium number of political actions. The assumption of Bayesian rationality does not place restrictions on voters' out-of-equilibrium inferences. To close the model, I refine the equilibrium concept by imposing the following restriction. Voters believe that the minimum number of individuals compatible with

[4]In the equilibrium characterized in Section III, mixed voting strategies are weakly dominated due to the costlessness of the vote and the heterogeneity of the electorate. Individuals characterized by a given information set at the voting stage have weakly undominated strategies of voting for the policy alternative if their ideal points lie strictly above a cutoff point and for the status quo if their ideal points lie strictly below that point.

the observed number of political actions have deviated from their equilibrium strategies.[5]

Moreover, I restrict individuals to use weakly undominated voting strategies. That is, an individual who is indifferent between voting for the status quo or the alternative casts her vote for the policy she prefers given her current information set. This restriction eliminates implausible voting equilibria of the following kind. Suppose all voters believe that one policy will win by more than one vote so that no individual can affect the voting outcome by changing her vote. Then each individual is indifferent between voting for or against any policy. In this case, some individuals might vote in favor of a less preferred policy. As a consequence, one policy may be chosen even though the alternative policy is preferred by a majority.

Due to the sequential nature of the game, individuals are unable to commit to particular voting strategies at the political-action stage and cannot change their political-action strategies once they have reached the voting stage. Thus, each individual's best response at the voting stage, $\nu(i,\sigma,m)$, can be taken as given in the derivation of her best response at the political-action stage, $\pi(i,\sigma)$; and $\pi(i,\sigma)$ can be taken as given in the derivation of $\nu(i,\sigma,m)$. An equilibrium of the game is defined as follows.

Definition: An equilibrium of the game is given by the individuals' political-action strategies, $\{\pi(i,\sigma)\}$; their beliefs at the political-action stage, $\{\beta(s|\sigma)\}$; their voting strategies $\{\nu(i,\sigma,m)\}$; and their beliefs at the voting stage, $\{\beta(s|i,\sigma,m)\}$. Their strategies and beliefs are consistent with one another and fulfill the following conditions:

(i) Individual i's political-action strategy $\pi(i,\sigma)$ minimizes her expected loss at the political-action stage:

$$(3)\quad E(L_i|\sigma) = \int \{\Pr[N < (n+1)/2](Q-s-x_i)^2 + \Pr[N \geq (n+1)/2] \times (A-s-x_i)^2\}\beta(s|\sigma)\,ds + \Pr(d_i = 1)c$$

where $E(\cdot)$ is an expectations operator.

(ii) Individual i uses Bayes' rule to update information that $\beta(s|\sigma)$ is the posterior density of the state of the world s conditional on the private information σ.

(iii) Individual i's voting rule $\nu(i,\sigma,m)$ minimizes her expected loss at the policy decision stage:

$$(4)\quad E(L_i|i,\sigma,m) = \int \{\Pr[N < (n+1)/2](Q-s-x_i)^2 + \Pr[N \geq (n+1)/2] \times (A-s-x_i)^2\}\beta(s|i,\sigma,m)\,ds.$$

(iv) Individual i uses Bayes' rule to update information that $\beta(s|i,\sigma,m)$ is the posterior density of the state of the world s conditional on her private information (i,σ) and the public information m. Moreover, her out-of-equilibrium inferences are formed

[5] One motivation for this refinement is that individuals might make mistakes (Reinhard Selten, 1975); that is, some individuals might mistakenly not follow their equilibrium prescription to take political action or abstain. In principle, the model could be modified to allow for random mistakes. However, I conjecture that this extension would add another layer of uncertainty without qualitatively changing the results. For simplicity, I prefer to refine the equilibrium concept by imposing a plausible restriction on the individuals' out-of-equilibrium beliefs.

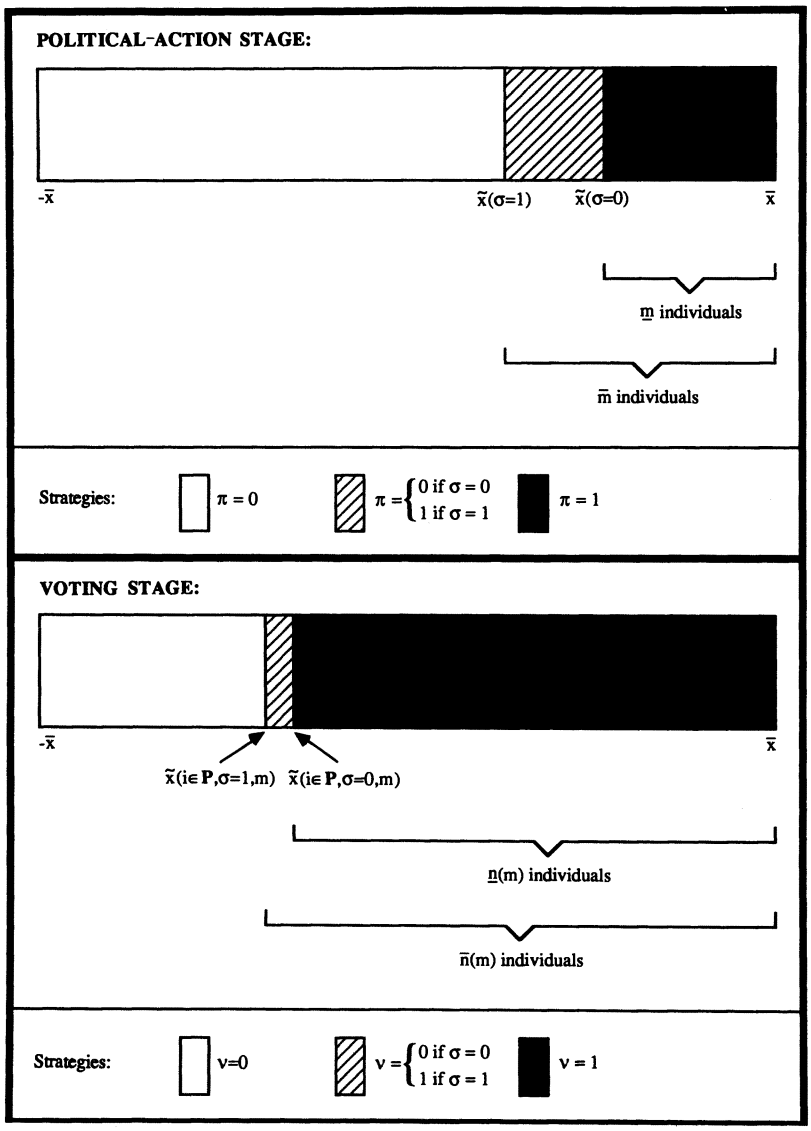

FIGURE 2. POLITICAL ACTION AND VOTING PATTERNS

according to the rule

$$(5)\qquad \beta(s|i,\sigma,m) = \begin{cases} \beta(s|i,\sigma,\overline{m}) & \text{if } m > \overline{m} \\ \beta(s|i,\sigma,\underline{m}) & \text{if } m < \underline{m} \end{cases}$$

where $\overline{m}$ and $\underline{m}$ are the maximum and minimum numbers of political actions that can be observed in equilibrium with strictly positive probability.

III. Political Action and Voting Equilibrium

This section characterizes a partially revealing political action and voting equilibrium (see Fig. 2).[6] I first analyze the political-action stage, then the voting stage.

[6]This equilibrium coexists with a zero political-action equilibrium.

$$(8)\quad \int \sum_{m=\underline{m}+1}^{\overline{m}} \{\Pr[N \geq (n+1)/2|m] - \Pr[N \geq (n+1)/2|m-1]\} \times \{[Q-s-\tilde{x}(\sigma=0)]^2 - [A-s-\tilde{x}(\sigma=0)]^2\} \times b(m-\underline{m}-1; \overline{m}-\underline{m}-1, s)\beta(s|\sigma=0)\,ds = c$$

$$(9)\quad \int \sum_{m=\underline{m}+1}^{\overline{m}} \{\Pr[N \geq (n+1)/2|m] - \Pr[N \geq (n+1)/2|m-1]\} \times \{[Q-s-\tilde{x}(\sigma=1)]^2 - [A-s-\tilde{x}(\sigma=1)]^2\} \times b(m-\underline{m}-1; \overline{m}-\underline{m}-1, s)\beta(s|\sigma=1)\,ds = c$$

At the political-action stage, people form beliefs about the state of the world based on their private information:

$$(6)\quad \beta(s|\sigma) = \begin{cases} 2(1-s) & \text{if } \sigma = 0 \\ 2s & \text{if } \sigma = 1. \end{cases}$$

Individuals of type $\sigma = 0$ tend to be more favorably disposed toward the status quo than are individuals of type $\sigma = 1$:

$$(7)\quad E(s|\sigma=0) = \tfrac{1}{3} < E(s|\sigma=1) = \tfrac{2}{3}.$$

People make their political-action decisions rationally anticipating the voters' decision rules that imply a mapping of the realized number of political actions into the probability that the status quo is overturned. Each individual compares the cost of taking a political action to the expected private benefits derived from a policy shift, multiplied by the expected probability that her action will be decisive in triggering a policy shift. The equilibrium is characterized by two political-action cutoff points, $\tilde{x}(\sigma=0)$ and $\tilde{x}(\sigma=1)$.[7]

An individual of type $\sigma = 0$ whose ideal point is exactly equal to $\tilde{x}(\sigma=0)$ is indifferent between taking political action in favor of the policy alternative and abstaining. The cutoff point $\tilde{x}(\sigma=0)$ is implicitly defined by the indifference condition in equation (8), above, where $b(a_1; a_2, a_3)$ is the binomial probability that a_2 Bernoulli trials result in a_1 successes if the probability of a success is given by a_3. Individuals of type $\sigma = 0$ whose ideal points lie strictly above the cutoff point $\tilde{x}(\sigma=0)$ have a strict preference for taking political action. If their ideal points lie strictly below the cutoff point $\tilde{x}(\sigma=0)$, they strictly prefer to abstain.

An individual of type $\sigma = 1$ whose ideal point is exactly equal to $\tilde{x}(\sigma=1)$ is indifferent between taking political action in favor of the policy alternative and abstaining. The cutoff point $\tilde{x}(\sigma=1)$ is implicitly defined by the indifference condition given in equation (9), above. Individuals of type $\sigma = 1$ whose ideal points lie strictly above the cutoff point $\tilde{x}(\sigma=1)$ have a strict preference for taking political action. If their ideal points lie strictly below the cutoff point $\tilde{x}(\sigma=1)$, they strictly prefer to abstain.

Thus, the individuals' political-action strategies can be summarized by the following cutoff-point rule:[8]

$$(10)\quad \pi(i,\sigma) = \begin{cases} 1 & \text{if } x_i \in [\tilde{x}(\sigma=0), \bar{x}] \text{ or if} \\ & \quad x_i \in [\tilde{x}(\sigma=1), \tilde{x}(\sigma=0)) \\ & \quad \text{and } \sigma = 1 \\ 0 & \text{otherwise.} \end{cases}$$

In equilibrium only individuals in the separating set $\mathbf{S} = \{i | x_i \in [\tilde{x}(\sigma=1), \tilde{x}(\sigma=0))\}$

[7]The pure-strategy cutoff-point equilibrium characterized here does not necessarily exist. Lohmann (1993b) derives the conditions for nonexistence and characterizes the mixed-strategy equilibrium that may arise in this situation.

[8]I assume that the (knife-edge) indifferent individual takes political action. The results are not qualitatively affected by this assumption.

engage in informative political action. These individuals take action conditional on being of type $\sigma = 1$. The actions of individuals whose ideal points lie above the cutoff point $\tilde{x}(\sigma = 0)$ and the abstentions of individuals whose ideal points lie below the cutoff point $\tilde{x}(\sigma = 1)$ are uninformative.

The number of individuals in the separating set **S** is given by $\overline{m} - \underline{m}$, where $\overline{m}$ and $\underline{m}$ are defined to be the natural numbers of individuals whose ideal points lie in the intervals $[\tilde{x}(\sigma = 1), \bar{x}]$ and $[\tilde{x}(\sigma = 0), \bar{x}]$, respectively. (These numbers are determined by the fixed distribution of the individuals' ideal points.) Upon observing m political actions, voters perfectly infer that there are $m - \underline{m}$ individuals of type $\sigma = 1$ whose ideal points lie in the separating interval.[9] The posterior probability that $m - \underline{m}$ out of $\overline{m} - \underline{m}$ individuals are of type $\sigma = 1$ is given by the binomial probability that $\overline{m} - \underline{m}$ Bernoulli trials result in $m - \underline{m}$ successes if the probability of a success is given by $s, b(m - \underline{m}; \overline{m} - \underline{m}, s)$.

A voter in the pooling set $\mathbf{P} = \{i | x_i \in [-\bar{x}, \bar{x}] \setminus [\tilde{x}(\sigma = 1), \tilde{x}(\sigma = 0))\}$ has some residual private information. (The "\" is set notation standing for "without.") If she is of type $\sigma = 0$, she knows for sure that one individual in the pooling interval is of type $\sigma = 0$. Her posterior density is given by

$$(11)\quad \beta(s | i \in \mathbf{P}, \sigma = 0, m) = \frac{b(m - \underline{m}; \overline{m} - \underline{m}, s)\beta(s|\sigma = 0)}{\int b(m - \underline{m}; \overline{m} - \underline{m}, s)\beta(s|\sigma = 0)\, ds} = \frac{b(m - \underline{m}; \overline{m} - \underline{m} + 1, s)}{\int b(m - \underline{m}; \overline{m} - \underline{m} + 1, s)\, ds}.$$

A voter in the pooling set **P** who is of type $\sigma = 1$ knows for sure that one individual in the pooling interval is of type $\sigma = 1$.

[9]The analysis is easily extended to allow for incomplete information about the distribution of the individual's ideal points.

She forms the posterior density

$$(12)\quad \beta(s | i \in \mathbf{P}, \sigma = 1, m) = \frac{b(m - \underline{m}; \overline{m} - \underline{m}, s)\beta(s|\sigma = 1)}{\int b(m - \underline{m}; \overline{m} - \underline{m}, s)\beta(s|\sigma = 1)\, ds} = \frac{b(m - \underline{m} + 1; \overline{m} - \underline{m} + 1, s)}{\int b(m - \underline{m} + 1; \overline{m} - \underline{m} + 1, s)\, ds}.$$

A voter in the separating set **S** does not have any residual private information. Her posterior density on the state of the world is given by

$$(13)\quad \beta(s | i \in \mathbf{S}, \sigma, m) = \begin{cases} \dfrac{b(m - \underline{m}; \overline{m} - \underline{m} - 1, s)\beta(s|\sigma = 0)}{\int b(m - \underline{m}; \overline{m} - \underline{m} - 1, s)\beta(s|\sigma = 0)\, ds} & \text{if } \sigma = 0 \\ \dfrac{b(m - \underline{m} - 1; \overline{m} - \underline{m} - 1, s)\beta(s|\sigma = 1)}{\int b(m - \underline{m} - 1; \overline{m} - \underline{m} - 1, s)\beta(s|\sigma = 1)\, ds} & \text{if } \sigma = 1 \end{cases} = \frac{b(m - \underline{m}; \overline{m} - \underline{m}, s)}{\int b(m - \underline{m}; \overline{m} - \underline{m}, s)\, ds}.$$

For a given realization of m, a voter of type (i, σ) whose ideal point is given by $\tilde{x}(i, \sigma, m)$ is indifferent between the status quo and the policy alternative:

$$(14)\quad \int [Q - s - \tilde{x}(i, \sigma, m)]^2 \beta(s | i, \sigma, m)\, ds = \int [A - s - \tilde{x}(i, \sigma, m)]^2 \beta(s | i, \sigma, m)\, ds.$$

All individuals of type (i, σ) whose ideal points are strictly greater than their type-specific cutoff point $\tilde{x}(i, \sigma, m)$ have a strict preference for the policy alternative over the status quo; all those whose ideal points lie below that point strictly prefer the status

quo. Equations (11)–(14) imply that

$$(15)\quad \tilde{x}(i\in\mathbf{P},\sigma=1,m)<\tilde{x}(i\in\mathbf{S},\sigma,m)<\tilde{x}(i\in\mathbf{P},\sigma=0,m)$$

$$(16)\quad \tilde{x}(i\in\mathbf{P},\sigma=1,m)=\tilde{x}(i\in\mathbf{P},\sigma=0,m+1)$$

$$(17)\quad \partial\tilde{x}(i,\sigma,m)/\partial m<0.$$

Let $\tilde{m}_{\mathrm{Q}}$ be the critical number of political actions such that the natural number of individuals whose ideal points lie in the interval $[-\bar{x},\tilde{x}(i\in\mathbf{P},\sigma=1,m=\tilde{m}_{\mathrm{Q}}))$ is given by $(n+1)/2+1$. Similarly, $\tilde{m}_{\mathrm{A}}$ is defined to be the critical number of political actions such that the natural number of individuals whose ideal points lie in the interval $[\tilde{x}(i\in\mathbf{P},\sigma=0,m=\tilde{m}_{\mathrm{A}}),\bar{x}]$ is given by $(n+1)/2+1$. Then if the realized number of political actions m is weakly smaller than $\tilde{m}_{\mathrm{Q}}$, a majority of individuals will vote for the status quo; if the realized number of political actions m is weakly greater than $\tilde{m}_{\mathrm{A}}$, a majority of individuals will cast their votes in favor of the policy alternative.[10] In each case, no individual is decisive for the voting outcome, and thus each individual votes for the candidate she prefers given her current information set.

For $m\in(\tilde{m}_{\mathrm{Q}},\tilde{m}_{\mathrm{A}})$, each individual's vote may be decisive for the voting outcome, and each individual has incentives to condition her vote on the information revealed by her being decisive (David Austen-Smith, 1990; Timothy J. Feddersen and Wolfgang Pesendorfer, 1993). That is, each individual's voting decision is based on her Bayesian update on the state of the world s that is conditioned on exactly $(n-1)/2$ other individuals voting for the policy alternative. Conditional on being decisive, an individual of type (i,σ) whose ideal point is given by $\hat{x}(i,\sigma,m)$ is indifferent between voting for the status quo and the policy alternative. This cutoff point implicitly solves the indifference condition

$$(18)\quad \int[Q-s-\hat{x}(i,\sigma,m)]^2\delta(s|i,\sigma,m)\,ds=\int[A-s-\hat{x}(i,\sigma,m)]^2\delta(s|i,\sigma,m)\,ds$$

where $\delta(s|i,\sigma,m)$ are the individual's posterior beliefs on the state of the world s conditional on being decisive for the voting outcome,

$$(19)\quad \delta(s|i,\sigma,m)=\frac{b[(n-1)/2-\underline{n};\bar{n}-\underline{n}-1,s]\beta(s|i,\sigma,m)}{\int b[(n-1)/2-\underline{n};\bar{n}-\underline{n}-1,s]\beta(s|i,\sigma,m)\,ds}$$

and $\underline{n}$ and $\bar{n}$ are the minimum and maximum numbers of votes that are cast for the policy alternative in equilibrium, respectively, given the realized number of political actions, m. All individuals whose ideal points lie above their type-specific voting cutoff points $\hat{x}(i,\sigma,m)$ vote for the policy alternative; all others cast their votes in favor of the status quo.

Thus, the individuals' voting behavior can be summarized by the following cutoff-point rule:

$$(20)\quad \nu(i,\sigma,m)=\begin{cases}1 & \text{if } x_i\in[x^*(i\in\mathbf{P},\sigma=0,m),\bar{x}]\text{; or if}\\ & x_i\in[x^*(i\in\mathbf{S},\sigma,m),\,x^*(i\in\mathbf{P},\sigma=0,m))\\ & \quad\text{and } i\in\mathbf{S}\text{; or if}\\ & x_i\in[x^*(i\in\mathbf{P},\sigma=1,m),\,x^*(i\in\mathbf{P},\sigma=0,m)),\\ & \quad i\in\mathbf{P}\text{ and }\sigma=1\\ 0 & \text{otherwise}\end{cases}$$

[10] I assume that the (knife-edge) individual who is indifferent between voting for the status quo and the policy alternative casts her vote in favor of the latter. The results are not qualitatively affected by this assumption.

where

$$(21)\quad x^*(i,\sigma,m) = \begin{cases} \tilde{x}(i,\sigma,m) & \text{if } m \in [0,\tilde{m}_Q] \text{ or } m \in [\tilde{m}_A,n] \\ \hat{x}(i,\sigma,m) & \text{if } m \in (\tilde{m}_Q,\tilde{m}_A). \end{cases}$$

It follows that the minimum and maximum numbers of votes for the policy alternative in equilibrium are given by $\underline{n}(m)$ and $\bar{n}(m)$, respectively, where $\underline{n}(m)$ is the natural number of individuals whose ideal points lie in the set

$$\{x_i | x_i \in [x^*(i \in \mathbf{P}, \sigma = 0, m), \bar{x}] \cup \{[\tilde{x}(\sigma = 1), \tilde{x}(\sigma = 0)) \cap [x^*(i \in \mathbf{S}, \sigma, m), x^*(i \in \mathbf{P}, \sigma = 0, m))\}\}$$

and $\bar{n}(m)$ is the natural number of individuals whose ideal points lie in the set

$$\{x_i | x_i \in [x^*(i \in \mathbf{P}, \sigma = 1, m), \bar{x}] \cup \{[\tilde{x}(\sigma = 1), \tilde{x}(\sigma = 0)) \cap [x^*(i \in \mathbf{S}, \sigma, m), x^*(i \in \mathbf{P}, \sigma = 0, m))\}\}.$$

(These numbers are determined by the fixed distribution of the individuals' ideal points.)

Given the individuals' cutoff-point voting rules, the probability that the status quo will be overturned as a function of the realized number of political actions m can be summarized by

$$(22)\quad \Pr[N \geq (n+1)/2 | m] = \begin{cases} 0 & \text{if } m \in [0,\tilde{m}_Q] \\ \sum_{N=(n+1)/2}^{\bar{n}} b(N - \underline{n}; \bar{n} - \underline{n}, s) & \text{if } m \in (\tilde{m}_Q,\tilde{m}_A) \\ 1 & \text{if } m \in [\tilde{m}_A,n]. \end{cases}$$

In summary, the individuals' incentives to take political action affect the voters' decision rules that imply a mapping of the observed number of political actions into the probability that the status quo is overturned. This functional relationship, in turn, determines the individuals' incentives to take political action.

For some strictly positive but not prohibitive costs, some individuals may have incentives to engage in informative political action despite the free-rider problem that arises in the presence of a cost of taking action. However, some information is trapped due to the heterogeneity of the population and the cost of taking action. The private information held by individuals with extreme preferences is not revealed due to the distributional effects of information revelation. Extremist activists are trapped into taking costly but uninformative action in their futile attempt to manipulate voters' decisions. They know that voters discount the political-action turnout for extremist political action. Given the voters' updating rules, they are "forced" to take political action to prevent an unacceptable reduction in the probability that a majority will vote in favor of the policy alternative. Moreover, some individuals abstain because they are close to indifferent between the status quo and the policy alternative and do not find it worthwhile to incur the cost of taking action. They free-ride on the efforts of the activists who take informative political action. Other individuals with extreme preferences for the status quo abstain because they do not want to increase the likelihood that the status quo is overturned.[11]

[11] Lohmann (1993b) modifies the framework developed here, allowing individuals to become active in favor of the status quo or the policy alternative, or to abstain. The following pattern of participation emerges. Extremists on both sides of the issue turn out independently of their private information. Some moderates who favor the status quo become active in favor of the status quo conditional on their private information. Similarly, some moderates who are against the status quo take informative political action in favor of the policy alternative. Other moderates who are close to indifferent between the status quo and the policy alternative abstain independently of their private information.

Voters only observe a simple aggregate statistic, the realized number of political actions. They do not observe the identity (preferences and information set) of any particular individual who takes action or abstains. As a consequence, they cannot distinguish whether an activist is taking informative or manipulative political action. Similarly, they do not know the motives of any particular individual who abstains. However, since some individuals take political action conditional on their private information, voters can extract some information from the aggregate number of political actions. In solving their Bayesian inference problem, they take into account that some individuals take uninformative political action, while others abstain regardless of their private information. In particular, the analysis implies that the voters' decision rules endogeneously allow for a small number of political actions to be decisive if the individuals' incentives to take political action are known to be weak.

IV. Pre-Election Political Action and Mistaken Voting Outcomes

The full-information voting outcome is defined as the outcome that would be achieved if all the information dispersed in the population were revealed prior to the vote. By informing voting decisions, political action has the potential to increase the *ex ante* likelihood that the full-information outcome is achieved. Taking as given that the population is engaged in an equilibrium with strictly positive expected turnout at the political-action stage, the *ex ante* likelihood of a mistaken voting outcome is smaller, the larger is the size of the separating interval **S**.

Perhaps surprisingly, however, the marginal contribution of the political-action mechanism may consist in adding noise. In some cases, the full-information voting outcome is *ex ante* more likely to be implemented by the voting mechanism in the absence of pre-election political action. The following example illustrates this possibility.

Consider the case in which the population is relatively homogeneous ($\bar{x}$ is small relative to the normalized variance of the states of the world, one-twelfth), and the policies Q and A are located approximately symmetrically around one-half such that

(23)
$$\frac{\int sb[(n+1)/2;n,s]\,ds}{\int b[(n+1)/2;n,s]\,ds} \geq (Q+A)/2$$

(24)
$$\frac{\int sb[(n-1)/2;n,s]\,ds}{\int b[(n-1)/2;n,s]\,ds} < (Q+A)/2$$

If individuals were fully informed about the number of individuals of type $\sigma = 0$ and $\sigma = 1$, the policy alternative would be unanimously chosen if the number of individuals of type $\sigma = 1$ is greater than or equal to $(n+1)/2$; otherwise all individuals would vote for the status quo. If each individual is privately informed about her type σ, the voting mechanism implements the full-information outcome with probability 1 *in the absence of pre-election political action*. All individuals of type $\sigma = 0$ vote in favor of the status quo, while all individuals of type $\sigma = 1$ vote in favor of the policy alternative. Thus, the status quo is overturned if and only if $(n+1)/2$ individuals are of type $\sigma = 1$.

In this situation, pre-election political action would be counterproductive. Due to the cost of taking action, some individuals would abstain. By chance, the fraction of individuals of type $\sigma = 1$ whose ideal points lie in the separating interval **S** may not be representative of that fraction in the population at large. Thus, the *ex ante* probability that the full-information voting outcome will be achieved would be less than 1. The zero political-action equilibrium, which is also associated with a zero aggregate deadweight cost of taking action, dominates in terms of the *ex ante* expected aggregate loss. This example suggests that the informational

contribution of the political-action mechanism depends on the degree to which the dispersed information is aggregated by the voting mechanism.[12]

V. Conclusion

This paper has examined the situation in which information pertinent to individual voting decisions is dispersed in the population. Some individuals with moderate preferences engage in costly political action to signal their private information to voters. Other individuals, who have more extreme preferences, take action independently of their private information in a futile attempt to manipulate the voters' decisions. Voters take a cue from the size of the protest movement against the status quo, rationally discounting the observed turnout for extremist political action.

By informing voting decisions, political action has the potential to decrease the *ex ante* likelihood of a mistaken voting outcome. However, political action is counterproductive if the voting mechanism is more likely to implement the full-information voting outcome in the absence of pre-election communication. In this situation, political action only adds noise.

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[12]A welfare analysis of the political-action mechanism is developed in Lohmann (1993c).