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The effect of information on voting behavior and electoral outcomes: An experimental study of direct legislation*

ARTHUR LUPIA
Department of Political Science, University of California at San Diego, La Jolla, CA 92093-0521

1. Introduction

The extent to which an electoral outcome is responsive to a voter's preferences over outcomes depends on the voter's ability to express her preferences in the act of voting. For instance, if a voter knows everything there is to know about the consequences of her voting decision, then her vote will be a relatively accurate measure of her preferences. In contrast, if a voter is uncertain about the personal consequences of her voting behavior, then the correspondence between the vote she casts and her preferences over possible electoral outcomes will be less clear.

In this paper, I use a series of experiments to examine the relationships between the observed voting behavior of relatively uninformed voters and the voting behavior that these same voters would have exhibited had they been completely informed about the consequences of their actions. My goal in running these experiments is to show what we can infer about individual and collective preferences from observed voting behavior. The experiments are based on observations of, and prior theoretical research on, direct legislation elections (i.e. the referendum and initiative). In direct legislation elections, voters, as opposed to elected representatives, are given an opportunity to accept or reject specific resolutions to particular collective choice problems. I use the experiments to identify conditions under which relatively uninformed voters can use simple cues to cast the same votes they would have cast had they been better or completely informed. That these conditons resemble regular characteristics of actual direct legislation elections suggests that voters who economize on information costs are often able to govern effectively. These

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findings also provide insights into the conditions under which we can treat observed voting behavior and electoral outcomes as reliable measures of individual and collective preferences.

The design of the experiment is based on previous theoretical (Lupia, 1992) and experimental (McKelvey and Ordeshook, 1984, 1985) work. The experiments are my second attempt to test theoretically generated direct legislation hypotheses with individual level data – the first attempt was an exit poll I designed and administered with similar theoretical predictions in mind (Lupia, 1994). The benefits of complementing the theoretical construct, and empirical support already provided by the survey instrument, with experiments are substantial. A laboratory experimental setting allows us to control many elements of the political landscape that are impossible to control with a survey instrument. An important example is voter preferences. In order to isolate and identify the effect of information on direct legislation, we must be able to identify, and hold constant, the effect of voter preferences on strategies and outcomes. The use of experiments makes individual voter preferences easier to control and document. Overall, the combination of surveys and laboratory experiments permits a more comprehensive test of hypotheses generated by the theory than would be possible through the exclusive use of either instrument.

The sequence of the paper is as follows. In Section 2, I describe the spatial model upon which the experiment is based. In Section 3, I detail the experimental design. In Section 4, I present and analyze data from the experiment. Section 5 offers concluding remarks. Other details of the experiment are included in an appendix.

2. A model of direct legislation

I model the *direct legislation environment* as a one period, multi-stage game of incomplete information. The object of the game is to choose one policy from a finite continuum of possible policy alternatives. One completely informed monopoly agenda setter, who is chosen at random from a population of potential agenda setters (and is, henceforth, referred to as "the setter"), can propose one alternative to a common knowledge status quo. The setter's willingness to propose an alternative may be affected by an exogenously determined cost of contesting the election. If the setter decides not to contest the election, the game ends and the status quo is the outcome. If the setter decides to contest the election, voters must vote for either the status quo, about which they are completely informed, or the setter's proposed alternative, about which they possess incomplete information. Some of the setter's actions may provide additional information to voters about the alternative. All players have policy preferences and majority rule determines the outcome of the election.

In order to identify the "effects" of information in the direct legislation environment, I solve for equilibria in two substantively relevant "game types" and one "control" game type. In the "control" game type, the setter and the voters do not communicate. In the other game types, different forms of communication are possible. I compare the equilibria of the game types in order to identify the effect of information asymmetries and communication opportunities on the correspondence between individual preferences and electoral outcomes in direct legislation environments. All players know the relevant game type, with certainty, when it is their turn to choose a strategy.

NI = No information transmitted between the setter and voters.
CE = Voters observe setter's decision to pay a price to contest the election.
CI = Voters have complete information.

Consider the policy space [0,999]. There exists a exogenously determined and common knowledge Status quo, $SQ \in [0,999]$. It is common knowledge that the game is being played by $n + 1$ players. "n", ($N = \{1, \ldots, n\}$), of the players are called "voters" and one player, who has complete information, is called the "setter".

The setter's ideal point, $X \in [0,999]$, is drawn from the cumulative distribution function F, which has density f. The distribution F represents the prior beliefs that voters have about the setter's ideal point. Each voter's ideal point, $T_i \in [0,999]$, is drawn from the cumulative distribution function G, which has density g. All players know their own ideal points, no voter knows any other voter's ideal point, and all players know the distribution from which any other player's ideal point is drawn.

The setter makes the first move in the game by choosing a strategy that has two components. The first component of the strategy, $s_1(X)$, is whether or not to contest the election. In this model, the decision to contest the election is non-trivial because the setter will face a non-negative, common knowledge cost of entry, $K \in \Re^+$, if she decides to contest. I define the setter's entry decision as $s_1(X) \in \{0,1\}$, which equals 1 if the setter decides to contest the election, and 0 otherwise. If the setter decides not to contest the election, the game ends and SQ is the outcome. The second component of the setter's strategy, $s_2(X) \in [0,999]$, is to choose a location for (the exact content of) the "alternative to the status quo." If the setter contests the election, she must choose $s_2(X)$. The strategy chosen by the setter takes the form: $s(X) = (s_1(X), s_2(X))$. For notational simplicity, I, henceforth, denote $s(X)$ as s, $s_1(X)$ as s_1, and $s_2(X)$ as s_2. I also denote $s_2 = SQ$, when $s_1 = 0$ (i.e., the setter chooses to accept SQ). It follows that when an election is held it is of the form: SQ versus s_2.

After the setter moves, the voters choose a strategy. All actions taken by, and all information obtained by, voters are assumed to be costless to them. A voter's strategy is a binary decision, $v_i = \{-1, 1\}$, where $v_1 = -1$ represents a vote for SQ and $v_i = 1$ represents a vote for s_2. Voters can condition their choice of strategy on information provided to them about the setter's strategy. In all game types, the voters directly observe the setter's entry decision, $s_1 \in \{0,1\}$. In the CI (Complete Information) game type, voters observe s_2. For any T_i the particular strategy chosen by voter i in the NI and CE game types is $v_i(T_i, s_1)$, while in the CI game type it is $v_i(T_i, s)$. For notational simplicity, I denote voter i's strategy as v_i.

When the setter contests the election, the winning outcome is determined by simple majority rule. The outcome function is, for any $s \in \{1\} \times [0,999]$ and $v_i \in \{-1, 1\}$

$$o(s, v_1, \ldots, v_n) = s_2 \text{ if: } \sum_{i=1}^{n} v_i > 0, \text{ and } o(s, v_1, \ldots, v_n) = SQ \text{ if: } \sum_{i=1}^{n} v_i \leq 0.$$

The outcome determines the payoffs to all players. I have assumed that SQ wins ties as this is the tie-breaking rule used most often in direct legislaton.

The setter and the voters have symmetric and single peaked utility functions. Each player's utility is a function of the distance between their own ideal point and the location of the electoral outcome. In addition, the cost of contesting the election is a component of the definition of setter utility. I define the *voter utility function* for player $i \in N$ to be $\forall$ policies $\alpha \in [0,999]$, and $T_i \in [0,999]$: $U_i(\alpha, T_i) = -|\alpha - T_i|$, and the *setter utility function* to be $U_0(\alpha,X) = -|\alpha - X| - (K \times s_1)$.

To characterize strategies and outcomes in direct legislaton, I have derived an equilibrium concept that combined the Bayes-Nash equilibrium concept with this model's assumptions. The formal statement and derivation of the equilibrium concept, as well as proofs of stated lemmas, are included in Lupia (1992).[1] In short, players in this model choose strategies to maximize expected utility. These strategies are chosen with respect to the information and strategies of the other players. In equilibrium, each player's strategy is the best response possible to the chosen strategies of others, given his or her information.

2.1. *Identifying the power of information*

I begin with a description of two lemmas whose implications are general. Lemma 1 is an incentive compatibility condition that establishes that the setter contests an election if and only if the benefit from contesting the election is greater than the cost. Lemma 2 establishes that if voters are uncertain about the location of s_2 (the alternative to the SQ) when it is time for them to vote, then a dominant strategy for the setter is to choose her ideal point. In fact, the setter can, in equilibrium, choose any point for which $f > 0$, however, her ideal point provides her with the highest utility when s_2 is the electoral outcome.

Lemma 1: The setter contests an election if and only if the benefit from contesting the election is greater than the cost.

Lemma 2: A weakly dominant location strategy for the setter is $s_2 = X$.

For notational convenience in describing equilibria in the incomplete information game types, I will, henceforth, refer to the cumulative distribution function of alternatives as F(X), and the corresponding density function as f(X). Also, from Lemmas 1 and 2, we can say that when $K = 0$, the setter should always enter. That is, the worst outcome a utility maximizing setter can obtain from costlessly contesting the election is the utility from SQ, which is the best she can do if she does not contest the election.

To identify the effect of information, I first introduce a direct legislation environment where the transmission of information is not a factor and the actual "interaction" between the setter and the voters is negligible. Later game types differ from the "No Information Transmitted"
game type only in that specific types of communicaton are introduced.

Our "control case" is the NI (No Information) game type. In the NI game type, the setter does not have to pay in order to contest the election. In the NI equilibrium, the setter enters (Lemma 1) and chooses her ideal point as s_2 (Lemma 2), voters must condition their strategy exclusively on their prior information (expected utility maximization), and the outcome is determined by which of SQ and s_2 provide a greater expected payoff to the median voter.

It is often the case in direct legislation that a significant effort is needed to place a particular alternative on a ballot. Only those individuals and groups most affected by a particular issue should expect to receive a positive return from expending the resources necessary to propose and support an alternative to the status quo. In the CE (Costly Entry) game type, the setter must decide whether or not to spend K (> 0 and common knowledge) in order to contest the election. The fact that the setter decides to contest the election sends a signal to the voters. In the direct legislation environment, the content of this signal is that the setter believes she can recover (at least) the cost of contesting the election. For $K > 0$, the fact that the setter contests the election, along with the voters' knowledge of the shape of the setter's utility function, implies that s_2 is not within a well specified neighborhood of SQ, since electoral outcomes near SQ will not provide enough extra utility to the setter to make contesting the election a profitable endeavor. The fact that the voters know K, and can observe the setter's entry decision, allows voters to update their prior beliefs. The introduction of "costly entry" provides a way to demonstrate the effect of certain types of information on voting behavior and electoral outcomes in direct legislation.

Let $\epsilon(K)$ (henceforth referred to as ϵ) be a distance on the continuum which is an increasing function of K. ϵ determines the range (symmetric around SQ) of alternatives within which it will never be profitable for the setter to contest an election. Since K and the shape of the setter's utility function is known, the correspondence between K and ϵ is common knowledge. Lemma 3 tells us that for setters whose ideal points are located within the range $(SQ-\epsilon, SQ+\epsilon)$, there exist no policies which, given the cost of contesting the election K, will provide the setter with a higher payoff than costlessly accepting SQ.

Lemma 3: If the setter's ideal point is located in the range of unprofitable alternatives, it is a dominated strategy for the setter to contest the election.

When $K > 0$ and $s_1 = 1$, voters know that $X \notin [SQ - \epsilon, SQ + \epsilon]$. When the setter enters, voters use Bayes' Rule to incorporate this information into their beliefs about the location of s_2. This updating leads to a revised distribution of setter types $F(X|1)$, which is related to $F(X)$ in the following way:

$$
\begin{array}{ll}
f(X|1) = 0 & [SQ - \epsilon, SQ + \epsilon] \\
f(X|1) = f(X) \times \dfrac{1}{1-F(SQ+\epsilon)+F(SQ-\epsilon)} & [0, SQ - \epsilon), (SQ + \epsilon, 999]
\end{array}
$$

The size and location of the "range of unprofitable alternatives" will determine the number of voters that are members of one of two partitions of the electorate. The members of the first partition are called *centrist voters* $\{i|T_i \in (SQ - \frac{\epsilon}{2}, SQ + \frac{\epsilon}{2})\}$ and the members of the second partition are called *non-centrist voters* $\{i|T_i \notin (SQ - \frac{\epsilon}{2}, SQ + \frac{\epsilon}{2})\}$. Because the setter is completely informed, she knows the exact number of voters in each partition. Lemma 4 tells us that *centrist voters* can infer from the setter's entry, and the common knowledge, that s_2 will provide them with a lower payoff than will SQ.

Lemma 4: "Vote for the SQ" is a dominant strategy for all centrist voters.

It follows that non-centrist voters base their voting decision on beliefs $f(X|1)$.

In the CE equilibrium, the setter enters and chooses $s_2 = X$ if and only if her ideal point is not located within the range of unprofitable alternatives *and* voter beliefs will lead a majority of voters to vote for s_2. Otherwise, she does not contest the election. Centrist voters vote for SQ (and always cast the same vote they would have if they were completely informed). Non-centrist voters maximize expected utility, where the expectation is conditional on their type and their beliefs about s_2, which themselves are conditioned on the setter's entry decision. The number of non-centrist voters who expect to receive higher utility from s_2 than SQ must make up a *majority of all voters* in order to render s_2 the CE outcome.[2]

We can form several testable hypotheses about the effect of information asymmetries and signaling on the relationship between voter preferences and electoral outcomes by comparing the CE and NI equilibria. Since the only difference between the NI and CE game types is a positive cost of entry in the CE game any difference in behavior or electoral outcomes across these equilibria can be linked to the introduction of "costly entry." The difference in equilibrium behavior across the two game types is that both centrist and non-centrist voters can use their observation of the agenda setter's entry decision to obtain informaton about the location of s_2. This information should make both types of voters more likely (relative to the NI game type) to cast the same votes they would have cast had they been completely informed when they cast their vote. Notice also that as the cost of contesting the election increases, the "range of unprofitable alternatives" widens and $f(X|1)$ provides increasingly accurate information about the location of s_2.

To fully capture the effects of informaton in this institutional context, I employ a surrogate benchmark called the *Complete Information Majority Preferred Alternative* (CIMPA). The CIMPA is the outcome, among the (one or two) alternatives offered to voters in the direct legislation environment, that provides a higher payoff to the median voter. When the setter contests an election and voters are uncertain about s_2 then the CIMPA is either X or SQ. When the election is not contested, SQ is the only alternative and is, by definiton, the CIMPA. The introduction of "costly entry" leads to an increase (relative to the NI equilibrium) in the likelihood that the CIMPA is the outcome chosen by incompletely informed voters. To the extent that we are able to project the concept of "costly entry" on to a broader concept of "voter observations and beliefs about agenda setter effort", we can use the model to better understand how voters can use commonly available, low cost cues to make decisions that lead to (*ex post*) better voter decisions and electoral outcomes that are more representative of complete information majority preferences.

In my description of the equilibrium of the NI and CE game types, I have referred to strategies and outcomes that would result if the electorate were completely informed. To demonstrate that complete information behavior is distinct from incomplete information behavior, I complete the description of the theory with a description of a complete information direct legislation environment. In the CI (Complete Information) game type, voters observe s_2. The CI game type is equivalent the model in Romer and Rosenthal (1978, 1979), where in addition to the setter, voters also have complete information. In equilibrium, the setter makes an offer that maximizes her payoff subject to the constraint that the median voter prefer the offer to the pre-existing SQ. Notice that the CIMPA is always the electoral outcome and is either SQ or the point that both maximizes the setter's utility and is preferred by the median voter to SQ.

3. Experimental design

The experiments were conducted at the California Institute of Technology's Economics and Political Science Experimental Laboratory in March and April, 1990. All of the subjects were undergraduates at the California Institute of Technology. Subjects were paid cash for their participation in the experiment. Four experiments were conducted, each consisting of four sessions. Each session consisted of 10 elections, where each election within a session was of the same type. Thus, each experiment consisted of 40 elections. The order of the four sessions (chosen to minimize subject confusion) was:

1. Complete Information (CI);
2. No Informaton (NI);
3. Costly Entry, K = 10 (CE10);
4. Costly Entry, K = 20 (CE20).

3.1. Sequence of events

When subjects reported to the laboratory, we began an "Instruction Session." The instructions given to the students are reprinted in the appendix. Subject roles were determined by a random process. Each subject, who participated in only one series of experiments, was told to choose a non-transparent envelope from a group of similar looking envelopes. Each envelope contained an index card with either the word "Voter" or the word "Setter" on it. Only one card had the word "Setter" on it and the subject receiving that card was assigned the role of setter for the remainder of the experiment. Temporary walls were placed between all subjects to prevent any unplanned communication between subjects.

At the end of the instruction session, subjects were told the exchange rate for the experiment (1 "experiment" £ = \$ .008) and the first experimental session began. I told all subjects the location of SQ, the cost to the setter of contesting the election and the distribution from which voter and setter ideal points were drawn for the following session. If the game type involved a positive cost of contesting the election, K > 0 (CE10, CE20), then subjects were told that for s_2 located within a well-defined neighborhood of SQ (100 units, 200 units), the setter would earn a lower payoff by contesting the election regardless of the election result. The exact text of this explanation is included in the Appendix. The setter was then given her private information (her ideal point for the next election).

The computer prompted the setter to choose whether or not to contest the election. If the setter decided not to contest the election, SQ was declared the outcome by the computer, the network did not give voters the opportunity to vote and the election period ended. If the setter contested the election, she had to pay the entry cost, which was either 0, 10 or 20 pounds. The setter then selected an alternative in [0,999], and entered this choice into the computer. In CI games, voters observed the location of s_2; otherwise they did not. Voters voted, the outcome was determined, and the next period began.

In Experiments 1–3, voters were told their payoffs and the aggregate election result after each period. In experiment 4, voters were told their payoff at the end of each session and the aggregated election results were made available to them at the end of the experiment. At the end of the fourth session, voters were asked to fill out the post-experiment questionnaire, which was designed to elicit subject educational characteristics, and to have the subjects describe how they made decisions, how they thought other players made decisions, and how their decision making changed during the experiment. Materials were collected, subjects were paid and the experiment ended.

3.2. Linking design and theory

For each election, voter and setter ideal points were determined using a uniform distribution and a random number generator. The setter received a new ideal point each election and the voters received a new ideal point each session. We also selected a new value for SQ for each session.

In order to isolate the effect of information and generate a sufficient variance in the information parameters, the three steps were taken. *First*, only one configuration of voter ideal points was used for every session of every experiment. The ideal points within a configuration were shuffled so that no voter received the same ideal point in any two sessions. The use of one configuration was revealed only to the setter. The voters knew the distribution from which the setter ideal points were drawn and knew that voters would receive a different ideal point each session. *Second*, we used only one set of 40 setter ideal points for each experiment. The ideal points were divided into four sets of 10 ideal points. The sets of ideal points were shuffled before each experiment. We ran four experiments and each set of 10 ideal points was used exactly once for each of the four game types. No subjects knew that the same 40 setter ideal points were re-used across experiments. *Third*, a single SQ was used with each set of 10 setter ideal points.

Table 1. Effect of setter extremism on his choice of s_2

Experiment 1–3

Complete information		Incomplete information	
Constant	−41.50	Constant	−3.90
SE	(46.32)	*SE*	(35.17)
Distance	0.82	Distance	0.60
SE	(0.16)	*SE*	(0.13)
r^2	.45	r^2	.22
N	30	N	68

Experiment 4

Complete information		Incomplete information	
Constant	−43.47	Constant	−10.83
SE	(37.48)	*SE*	(13.12)
Distance	0.79	Distance	0.07
SE	(0.21)	*SE*	(0.05)
r^2	.70	r^2	.18
N	8	N	14

There exist important differences between the first three experiments (i.e., the first 30 elections of each of the four game types) and the fourth experiment (i.e., the last 10 elections of each game type). The remainder of this section describes the differences and their relevance.

The model defines direct legislation as a non-repeated, one period, multi-stage game. The experiment has been designed to test for the effects of information in the direct legislation model. Unfortunately the cost, both logistically and financially, of obtaining a different set of subjects for each election forced me to create a "single shot game" environment in a repeated game experimental setting.

In a repeated game setting, subjects can learn from past actions. Therefore, I wanted to create a non-repeated environment and attempted to minimize the amount that subjects could learn from past setter actions for each selection. In order to allow the setter's preferences to be a source of uncertainty throughout the experiment, the setter's ideal point for each period was drawn, with replacement, from the common knowledge (uniform) distribution of setter types using a random number generator. This method of determining the setter's ideal point was announced during the instruction session. The use of this method assured that past setter preferences could not serve as a signal of present of future setter preferences.

I originally believed that this procedure was sufficient to eliminate repeated play effects, but this belief turned out to be mistaken. In Experiments 1–3, subject-voters observed their own utility and past election results after every election. This information provided subjects with information that voters in the model were not assumed to possess. This information allowed subject-voters to punish the setter for past actions. The fact that voters could employ a punishment strategy affected setter strategies – setters became reluctant to choose alternatives that were near the endpoints of the continuum. This reluctance is documented in the responses to the "Setter Questionnaire" and Table 1.

Table 1 reports two OLS regressions – one for the complete information (CI) game type and one for the (II) incomplete information game types. In each case, the dependent variable is $|s_2 - X_0|$, the absolute value of the distance between the setter's ideal point and her choice of s_2, and the independent variable is $|500 - X_0|$, the absolute value of the distance between the setter's ideal point and the median of the (uniform) distribution from which voter types were drawn (500). A positive and significant coefficient indicates that the farther the distance between the setter's ideal point and the center of the distribution, the farther the setter's ideal point is from s_2.

Table 1 shows that the farther away the setter's ideal point is from 500, the greater the distance between X_0 and s_2 The model predicts that the coefficient of DISTANCE will be positive and significant in the CI elections, as this is reflective of the influence that voter preferences have on the setter's strategy. In contrast, the model predicts that the coefficient of DISTANCE will be zero in the II elections.

The coefficient of DISTANCE in the II regression (.60) is smaller than the DISTANCE coefficient in the CI elections (.82) but it is significantly larger than its predicted magnitude, zero. This result is consistent with the supposition that relatively extreme setter types refrained from choosing extreme values for s_2 in order to avoid future electoral punishment. To make the experiment more consistent with the model, and to further minimize repeated play effects, one 4-session (40 election) incomplete information experiment was conducted in which election outcome and individual payoff information was withheld from voters until the end of the experiment.

The coefficients displayed in the lower part of Table 1 are of the from the same type of regression as the coefficients displayed in upper part of Table 1. Notice that the coefficient of *Distance* in the II election regression is .07, which is close to and not significantly different from zero – the value that our model predicts. The value of the distance coefficient for the CI elections is nearly the same for Experiment 4 (.79) as it was for Experiments 1–3 (.82) and is also positive, and statistically significant.

A comparison of the upper and lower parts of Table 1 shows that the changes in the experimental design prevented voters from punishing the setter for past actions, and setters from misinterpreting past election results. Notice, in particular, that the coefficient of "Distance" in the II regression is very close to zero. These changes, which made the experiment more representative of the electoral environment of the underlying model, improved the magnitudes of the predicted relationships to levels that the model would predict.[3] Where differences in setter risk aversion, caused by the difference in voter information across experiments, impacted the forthcoming analysis I provide separate analyses for those experiments held before the changes and those experiments held after.

One other design change was made between the third and fourth experiments, to make the experiment more consistent with the theory in Lupia (1992). To simulate the fact that direct legislation elections generally take place in large electorates, in Experiment 4 the setter was told the actual distribution of voter types. In Experiments 1–3, the setter only knew the underlying distribution (uniform over [0,999]) from which voter types were drawn. This change in setter information should have a marginal impact on the setter's location strategy, s_2, in the CI game type. That partial strategy is the only strategy in the direct legislation environment that is a function of setter knowledge of the location of the median voter's ideal point. In all of the experiments, voters knew only the underlying distribution from which their types were drawn.

4. Analysis of experimental results

I begin the analysis with an examination of setter behavior. Table 2 provides a statistical summary of setter behavior in the four experiment game types. We held 40 elections of each type, but not all were contested. Row B shows the number of times that the setter chose to contest the election. Overall, the model correctly predicted whether or not the setter would contest the election 89% (142 of 160) of the time.

Lemma 1 tells us that the setter should contest the election when the expected benefit is greater than the cost. In the CI and NI game types, the cost of entry is zero. Therefore, the model predicts that the setter should not do worse by contesting an election. In fact, the setter contested the election in 76 of 80 (95%) CI and NI elections. On the two occasions where the setter did not contest the election in the CI game, the setter's optimal strategy, conditional on contesting the election, would have been to choose s_2 = SQ – so the setter was actually indifferent between entering and not entering. On the other hand, the two occasions where setters chose not to contest the election in NI elections

Table 2. Setter strategies

	Entry	CI	NI	CE10	CE20
A	Observations	40	40	40	40
B	Number of contested elections	38	38	27	17
C	Contested when $X_0 \notin [SQ - \epsilon, SQ + \epsilon]$	38/40	38/40	25/30	16/21
D	Contested when $X_0 \in [SQ - \epsilon, SQ + \epsilon]$	0/0	0/0	2/10	1/19
E	Statistic C, if win expected	38/40	38/40	25/26	11/16

	Location	CI	II = (NI, CE10, CE20)
F	Number of times that $X_0 = s_2$, *Exp 1–3*	5/30	19/68
	%	17	28
G	Number of times that $X_0 = s_2$, *Exp 4*	3/8	13/14
	%	37.5	93

appear to be mistakes. In each case, the setter, by not entering, selected a dominated strategy.[4]

The model predicts (Lemma 3) that if the setter's ideal point is within the "range of unprofitable alternatives," she should not enter. Row D shows that in 26 of 29 (90%) CE elections, the setter did not contest the election when the her ideal point was located inside the "range of unprofitable alternatives." Lemma 1 and Lemma 3 together imply that, when K > 0, the setter should contest the election if and only if her ideal point is outside of the "range of unprofitable alternatives" and her information about voter preferences lead to the expectation that she will win the election. The last two entries in Row E show that the setter contested the election in 36 of 42 (86%) CE elections where the setter's ideal point was not located within the "range of unprofitable alternatives" and the setter should have expected that a majority of voters would get higher expected utility from s_2 than from SQ. (I measure the model's ability to predict setter entry, in this circumstance, by assuming equilibrium behavior on the part of all other participants.) The setter chose not to contest the election in only 4 of 9 (45%) CE elections where the setter's ideal point was not located within "the range of unprofitable alternatives" and the setter should have expected that a majority of voters would get higher expected utility from SQ than from s_2.

Table 2 also provides information about where the setter decided to locate s_2. Since the model (Lemma 2) generates different predictions about setter locaton strategies for complete and incomplete information game types and the same predictions for all incomplete information game types, Table 2 makes the same distinction. Also, recall from Section 3, that we altered several aspects of the experimental structure. Specifically, in the first thirty elections (Experiments 1–3) of each type of incomplete information game voters learned past electoral outcomes and their own past payoffs. In the last 10 elections (Experiment 4) of each II game type, voters were not provided with payoff and election result information until the end of the experiment. Notice that Table 2 provides separate statistics for before and after the change.

In incomplete information game types, the model predicts (Lemma 2) that when the setter chooses to contest the election, she will choose her ideal point as the location of the alternative ($X_0 = s_2$). Row F of Table 2 shows that in Experiments 1–3 of each type of II game, the setter chose $X_0 = s_2$ in 19 out of the 68 (28%) cases where she chose to contest the election. This behavior is not consistent with the model's prediction (100%), but is closer to this prediction than is the case for the corresponding Complete Information game type ($X_0 = s_2$: in 5 of 30 cases, 17%). On the other hand, the alterations in the experiment's design, implemented in Experiment 4, increased the model's predictive success. Row G of Table 2 shows that in 13 of the 14 (93%) times that the setter contested an incomplete information election after the change, she chose $X_0 = s_2$. This is very close to the 100% that the model predicts.

Consider, for a moment, that the voters' ability to punish setters for past actions gave them a credible electoral threat (even though implementing the threat is a dominated strategy when an election is considered as an isolated event). Reducing voter information in Experiment 4 removed voters' ability to "punish" and resulted in setters choosing to locate s_2 at their ideal points more often in the II game types. This finding reinforces the finding of Collier, McKelvey, Ordeshook and Williams (1987) that historical information about electoral alternatives allows incompletely informed voters to increase the likelihood that they cast the same votes they would have cast if they were completely informed.

I now turn to an examination of voter behavior. The purpose of this examination is to demonstrate the effect on voting behavior of the relatively simple piece of information provided by the voter observation of costly setter entry. Table 3 summarizes voter behavior in the experiment. Recall that two types of voter behavior were discussed in the model. Voters whose ideal points were within the distance $\frac{\epsilon}{2}$ of SQ were called "centrist voters" and all other voters were called "non-centrist voters,"

The model predicts (Lemma 4) that Centrist Voters will always vote for SQ. Row H of Table 3 shows that centrist voters chose SQ on 39 of 58 (67.2%) occasions. While the predictive power of the model, in this case, is not overwhelming, it should be noted that 17 of the 19 "mistakes" are due to two subjects who voted for SQ only 2 of the 19 times (10.5%).[5] The remaining centrist voters chose SQ 37 out of 39 (95%) times.

Table 3. Voter strategies and electoral outcomes

	Voters	CI	NI	CE10	CE20
H	Correct Centrist votes (ex post)	n/a	n/a	14/20	25/38
I	Correct Overall Votes (ex post)	233/246	164/246	117/177	95/112
	% Correct Votes	95	67	66	85

	Outcomes				
J	Number of times CIMPA = CI winner	37/40	22/40	30/40	39/40
K	Statistic J, when election contested	35/38	20/38	17/27	16/17
	% CIMPA = Direct Legislation Outcome	92	53	63	94

A comparison of the three equilibria presented in Section 2 reveals that, all other factors held constant, as the cost of entry to the setter increases and the "range of unprofitable alternatives" widens, the likelihood that non-centrist voters cast the same vote they would have cast, if they were completely informed, should increase. In Table 3, a "correct" vote is defined as a vote for the electoral alternative that was actually closer (*ex post*) to the voter's ideal point. (This definition implies that a vote for SQ is always a "correct" vote for a centrist voter.) Row I of Table 3 shows the number and percentage of "correct" votes cast in each type of election. In CI elections, the model predicts that voters will cast "correct" votes 100% of the time. In fact, 233 of 246 (95%) of the CI votes are correct.

When voters have less information, the probability that a voter casts a "correct" vote should decrease. In the NI elections, where voters had the least information, 164 of 246 (66.7%) of the votes were "correct." When the cost of entry was increased from 0 to 10 pounds, the act of setter entry should have provided better information to the voters about the location of s_2. Correspondingly, the model predicts that the probability that "correct" votes are cast will increase. Contrary to this theoretical expectation, the percentage of "correct" votes cast in the CE10 game (66%, 117 of 177) was nearly equal to the percentage of correct votes cast in the NI game (66.7%). This lack of effect was as evident in Experiment 4 as in the other experiments. When the cost of entry was increased from 10 pounds to 20 pounds, the effect on voting behavior was statistically significant in that we can reject the hypothesis that the set of observations from the CE20 experiments were produced by the same data generating function as either the CE10 or NI experiments at the .05 level of significance. In the CE20 game 95 of 112 (85%) votes were cast "correctly."

Having examined the effect of information on setter and voter strategies, we can now evaluate the model's predictive power on the subject of electoral outcomes. Table 3 shows the relationship between the electoral outcomes obtained in the experimental environment and the Complete Information Majority Preferred Alternatives. Recall that the CIMPA (defined in Section 2) is used as the benchmark by which the correspondence between majority preferences and electoral outcomes is "measured" and is defined as is the outcome, among the (one or two) alternatives offered to voter that provides a higher payoff to the median voter.

The model predicts that as K increases, so should the likelihood that the direct legislation outcome is the CIMPA. Row K of Table 3 shows the number and percentage of times that the direct legislation outcome was the CIMPA when the election was contested. In the NI experiments, where voters possessed the least information, the CIMPA won the election 20 out of 38 (53%) times. In the CE10 experiments, voters possessed more information than they had in the NI experiments. In the CE10 experiments, the CIMPA won the election 17 out of 27 (63%) times. In the CE20 experiments, the voters possessed even more information, and the CIMPA won 16 out of 17 (94%) times that the election was contested. This result is not significantly different than the predicted (100%) or actual (92%, 35 out of 38) number of times that the CIMPA won in CI elections. *Thus, in our experimental environment, the knowledge that the setter must pay 20 pounds in order to contest the election was an effective substitute for complete information.*

5. Conclusion

This paper reports on the use of laboratory experiments to identify the effect of information on voting behavior and electoral outcomes in the direct legislation environment. I showed that when incompletely informed voters know that the setter has paid a certain amount to contest an election, they can use this information to increase the likelihood that they cast the same votes they would have cast had they possessed complete information. As a consequence of the way voter strategies were affected by information, the likelihood that the "incomplete information" electoral outcome was the same as the electoral outcome that would have been chosen by a completely informed electorate increases, as does the responsiveness of direct legislation outcomes to "complete information" voter preferences.

While this research does not resolve long standing questions about the responsiveness of democratic institutions, it does add to what we understand about responsiveness by demonstrating conditions under which incompletely informed voters can generate the electoral outcomes that they would have if better informed. This research also informs the debate about the use of the referendum and initiative to determine policy. My answer to the question: "Is direct legislation is a useful mechanism for obtaining policy outcomes that correspond to the "will of the majority" or is it a way for small, wealthy interest groups to subvert the "popular will," " is that direct legislation can be both. When voters are badly informed (or the electoral alternatives are reasonably complex), and there are no effective information cues available, small groups who have enough resources to obtain agenda control can use direct legislation to obtain preferred outcomes. When meaningful cues are available (or the effect of electoral alternatives are easy to understand), then direct legislation can be useful tool for the implementation of majority-preferred policies.

Notes

1. I first incorporated the assumption that voters always vote as if they are the pivotal voter, an assumption common to most spatial election models. This strategy is weakly dominant with respect to the strategies of other voters. The incorporation of this assumption transforms the equilibrium concept into a variant of the Sequential Equilibrium concept of Kreps and Wilson (1982). I also incorporated the assumption, which is essentially the same made by Kreps and Wilson, that voter beliefs are consistent.
2. This result also implies that the higher the cost of contesting the election, the fewer setter types who will find it profitable to contest the election and the better protected SQ will be. Herzberg and Wilson (1990) have produced this relationship in a direct legislation type experimental environment.
3. Except in specific circumstances, which are noted, the changes in the experiment seemed to have an impact on only the setter's location decision. There were no significant differences in any other behaviors before and after the changes.
4. These mistakes cannot be linked to the repeated play-induced setter risk aversion pointed out in Section 3, as these mistakes occurred in the fourth experiment where past utilities were not revealed.
5. One centrist voter obviously drew the wrong implication from the information provided her. She voted against the alternative (SQ) that maximized her *ex ante* and *ex post* utility 12 of 13 (92.3%) times that she was a centrist. This same voter chose the correct *ex ante* vote 10 of 20 (5 of 10 in CI, 5 of 10 in NI) times in the elections in which she was not a centrist voter. The other voter was evidently thrown off by "out of equilibrium" behavior by the setter. Notice, in Row D of Table 3, that the setter enters twice when her ideal point is in the "range of unprofitable alternatives." These two mistakes occurred in the same experimental session. This experimental session took place before the information changes were made. Thus the voter knew that the setter had earlier chosen a strategy that she should not have chosen. That the voter observed the setter's mistake obviously confused him. Before the setter made these mistakes, the voter voted for the SQ (1 of 1). After the setter made the mistakes, the voter voted for the s_2 (5 of 5).

References

Collier, K.E., McKelvey, R.D., Ordeshook, P.C. and Williams, K.C. (1987). Retrospective voting: An experimental study. *Public Choice* 53: 101–130.

Herzberg, R. and Wilson, R. (1990, March). Voting as a public bad: Theoretical and experimental results on voting costs. Mimeo, presented at the Western Political Science Association Meetings.

Kreps, D.M. and Wilson, R. (1982). Sequential equilibria. *Econometrica* 50: 863–894.

Lupia, A, (1994). Short cuts versus endorsements: Information and voting behavior in California insurance reform elections. *American Political Science Review*, Forthcoming.

Lupia, A. (1992). Busy voters, agenda control and the power of information. *American Political Science Review* 86: 390–403.

McKelvey, R.D. and Ordeshook, P.C. (1984). Rational expectations in electons: Some experimental results based on a multidimensional model. *Public Choice* 44: 61–102.

McKelvey, R.D. and Ordeshook, P.C. (1985). Sequential elections with limited information. *American Journal of Political Science* 29: 480–512.

Romer, T. and Rosenthal, H. (1978). Political resource allocation, controlled agendas, and the status quo. *Public Choice* 33: 27–44.

Romer, T. and Rosenthal, H. (1979). The elusive median voter. *Journal of Public Economics* 7: 143–170.

Appendix: Instructions used in the experiment

This experiment is part of a study of elections. You will each be paid in cash for your participation in the experiment. The amount that you earn today will depend upon your decisions, the decisions of others, and chance. The payoffs in the experiment will not necessarily be fair, and we cannot guarantee that you will earn any specified amount. However, if you are careful, and make good decisions, you can generally expect to make a substantial amount of money.

This experiment consists of a series of elections. As you may be aware, some elections are contests between candidates for a legislative office, like mayor, senator or president. Other elections are, instead of contests among candidates, contests among different policy alternatives. In democratic countries, this type of election is used to make local, state and national policy decisions. It is this type of election that we intend to study with this experiment.

In the experiment, each of you will play one of two roles. Most of you will be voters. Each voter will be asked to vote for one of two policy alternatives, called the "Status Quo" and the "Alternative." [Point to board.] One among you will not be a voter and will, instead, be chosen, at random, to be a "policy setter." The "policy setter" will select the "Alternative." In this experiment, the policy receiving the most votes will determine everyone's payoff.

The experiment will take place through a network connecting the computer terminals. All interaction between you will take place through these terminals, and you are not allowed to communicate in any other way. If any difficulty arises, raise your hand, and one of us will come to assist you.

Before beginning the experiment, we will have an instruction session so that you can familiarize yourself with the terminals, the information they display, and with the sequence of events. After this session there will be a brief quiz. It is important that you pay close attention to the instructions, since you must pass the quiz in order to participate in the experiment. Any questions you have about the experiment should be addressed to me, and I will repeat the answer for everyone to hear.

We will now give each of you an envelope. A card inside the envelope will tell you your role in the experiment. [ENVELOPES PASSED TO SUBJECTS]

Now that you all know your roles, we are ready to proceed with the instruction session. Will the "policy setter" please sit at the terminal to my left, and will the voters please sit at the terminals in the center of the room.

The setter will have an assistant who is not a participant in the election. The assistant's job is to record all of the setter's actions and payoffs. The computer records all voter actions.

You may turn your terminal on now by pressing the key labeled "master", which is located directly beneath the screen. When the terminal asks for your name, please type in your name, then hit "Enter." [SUBJECTS ENTER THEIR NAMES and WAIT FOR GAME SCREEN TO APPEAR]

Voter and setter screens are different, but have some similarities. The top part of all screens keeps a record of what has happened previously, while the bottom part tells you what is happening now. The first column on all of the screens is labeled ELECT and tells you which election in the experiment you are in. It is currently election Number 1, thus, it is time to hold our first practice election.

Each experiment consists of a series of elections. The purpose of each election is to choose a certain policy. The policy that wins the election directly determines all of your payoffs. How the winning policy determines your payoffs will be explained shortly.

Voters will be asked to vote for one of two policy alternatives. One of these policies will be selected by the setter. By making two decisions, the setter determines the choices that voters will have in each election. The setter's first decision is whether or not to contest the election.

Later, in the actual experiment, the setter will make this decision on his own. For now, the setter should enter the response "Yes" to the question, "Do you wish to contest the election?" To make this response, type in "Yes," then press "Enter."

Since the setter has chosen to contest the election he must now select a policy that voters can vote for. The policy, which the setter selects, is called the "alternative". The ALT is represented by a point on the line which begins at 0 and ends at 999. Later in the experiment, the setter will choose the location of the alternative on his/her own. For now, the setter should choose the ALT to be the point 650 on the line that begins at 0 and ends at 999.

Setter, to take this action, type in 650, then press "Enter." The setter will be asked to confirm his/her decision and can do so by typing "Y," and then "enter." If the setter makes a mistake in typing in their decision, they can correct it by typing "N" and starting over. [Setter chooses the ALT].

Now appearing on the bottom of player screens is the location of the ALT, which is listed as "ALT's position." Verify that the ALT is located at the point 650. [Verification.] Also appearing on the bottom of your screen is the position of the other policy that you can vote for, the SQ. The SQ, like the ALT, is represented by a point on the line which begins at 0 and ends at 999. Appearing on the bottom of player screens is the location of the SQ, that is listed as "SQ's position." Verify that the SQ is located at the point 400. [Verification.]

The SQ for each election has been determined by the experimenters before the beginning of the experiment and all actions on behalf of the SQ are performed automatically by the computer. The SQ will remain the same for each of the upcoming experimental sessions. The location of the SQ will be announced at the beginning of each experimental session and will always be posted on the board, in addition to appearing on your screens.

Voters can now move the two policy positions from the bottom of their screens to the top of their screens by pressing "Enter." As you can see, the SQ is now located in the column labelled "SQ's position," while the ALT is in its appropriate column.

Voters, when I instruct you, please vote in Election 1. To vote for the SQ, type "capital S," then hit "Enter." To vote for the alternative, type "capital A," then hit enter. Please vote for the ALT in Election 1 now by entering a "capital A" at your terminal. Please wait for further instructions before doing anything else.

As you can see, the ALT has won the election, because a majority of you voted for that policy. To see the election result, look in the last column, which is labeled "Vote". This column shows the vote for SQ, followed by the vote for A. You can see that the SQ received no votes and the ALT received seven votes.

Note that the setter and the voters both receive the same information about the election result. This is important to realize since it implies that no participant in the experiment can ever learn how any other participant voted. All that any participant ever learns about the election is the aggregated result.

Setter, you can check your payoff from the last election by looking at the column labelled "Income" on the your setter information sheet, which has been filled out by the assistant. Since the ALT won the election, the setter will see that he has earned 98 pounds.

Voters can verify that they have earned 85 pounds each by looking under the column labelled "Income" on their screens. Voter income is recorded by the computer, and a voter's cumulative income in the experiment is displayed in the bottom right hand corner of their computer screen in blue. All players should be aware that 100 pounds is the maximum payoff, and 0 the minimum payoff, that any player can receive in one election period. These pounds can be exchanged for dollars at the end of the experiment at a fixed exchange rate.

At this point you are undoubtedly curious about how your income was determined. Let me start this explanation by telling you that each of you has an "ideal point" on the line that begins at 0 and ends at 999. Voters, your ideal points are located in the bottom left-hand corner of your screens and are in white. The setter's ideal point is located in the column labelled "Ideal Point" on your Setter Information Sheet. Please take a moment to look at your ideal point. [Players look at their ideal points.]

If your ideal point is the same as the winning policy, your receive the highest possible payoff for that period, which is 100 pounds. The further your ideal point is from the winning policy the lower your payoff will be. In this practice session, all voters have the same ideal point, which is 500. In the real experiment, each voter will have a different ideal point.

If the winning policy of the first practice election had been located at 500, the voter ideal point, voters would have received the maximum payoff of 100 pounds. However, the winning policy, the ALT, was located at the point 650. This point is 150 units away from the voter ideal point. As a consequence, each voter received 15 pounds less than 100, or 85 pounds. If the winning policy was 200 units away from your ideal point in either direction (either 300 or 700), you would receive a payoff of 80 pounds. Consequently, since the SQ is 100 units away from your ideal points, then if SQ had won the election, your payoff would have been 90 pounds. [Show the following example on the board.]

The setter's income for this period was 98 pounds. The setter's payoff is not on his screen but is tabulated for him by the assistant. The setter's payoff is computed in exactly the same way as the voter payoffs. The setter's income was 98 pounds because the setter's ideal point was 20 units away from his ideal point. That is, the location of the winnning policy 650, was 20 units away from the setter's ideal point, which was 630. Had the SQ won the election, the setter's payoff would have been 77 pounds since the SQ is 230 units from the setter's ideal point.

In the real experiment each participant will have his/her own unique ideal point, and only you will know what your own ideal point is. Throughout the experiment, your payoffs will be computed in the manner that I have just demonstrated. Are there any questions about how your payoffs are determined? [Questions.] Good, now let's proceed to practice election number 2.

Recall that in each period the setter's decisions determine the choices that voters will have in the upcoming election. In the first election period, voters were given a choice between the SQ located at the point 400, and the ALT, which was chosen by the setter and located at the point 650. By making different decisions, the setter can change the choices that the voters will have in Election number 2.

First, the setter decides whether or not to contest the election. Later, in the actual experiment, the setter will make this decision on his own. For now, the setter should enter the response "NO" to the question, "Do you wish to contest the election?" To make this response, type in "N" then press "Enter." [Setter Chooses not to Contest the Election.]

Since the setter has chosen not to contest the election, he does not get to choose the "alternative". When the setter decides not to contest the election, voters do not have an opportunity to vote, and, the SQ wins the election by default. Note that the setter always has the option not to contest the election.

The setter can again check his/her payoff in the last election by looking at the column labelled "Income" on the setter information sheet. Since the SQ won the election, the setter will see that he has earned 77 pounds. Voters will see that they have earned 90 pounds each. [SUBJECTS LOOK AT SCREEN]

Now, we will proceed to practice election number 3. There will be two differences between the next three practice elections and the last two. The first difference is that the setter and voters will be allowed to make their own decisions. The second difference has to do with the setter's ideal point.

From now until the end of the experiment, the setter will receive a new ideal point each period. This is different than the voters, who will always keep their same ideal point for an entire experimental session. The assistant will show the setter a new ideal point each period and only the setter and his/her assistant will know the exact location of his ideal point in any particular period. While this implies that voters will not know the exact location of the setter's ideal point, voters will know something about it. Voters will know that the setter's ideal point is drawn each period from a discrete uniform distribution.

In less technical terms, the setter's ideal point is equally likely to be any point between and including 0 and 999. So in each period there is a 1 in 1000 chance that the setter's ideal point is 174, (repeat) 372, 819. The setter's ideal points for the remainder of the experiment were obtained through the use of a random number generator. So it is very unlikely that the setter's ideal points will follow any particular pattern and it is not the case that a setter's past ideal points in any way determine his/her future ideal points.

In other words, just remember that at any time during the experiment, the setter's ideal point is equally likely to be any number between and including 0 and 999 and that the setter's payoff depends on the difference between his ideal point and the winning policy. Note that the setter neither gains an increased payoff from winning the election nor receives a lower payoff for losing the election, the setter receives utility only from the distance between the winning policy and his ideal point, just like the voters. Are there any questions about ideal points? [Questions]

Remember that the voters keep their same ideal points and the SQ remains the same. Let us now proceed with the third practice experiment. Please do not enter your choice into the computer until you are told by me to do so. The setter should be aware of the fact that the computer will only accept your first response to this question. Will the setter now decide whether or not to contest the election. [Setter makes entry decision.]

If NO. The setter has chosen not to contest the election. Therefore, the SQ wins by default. Voters each receive a payoff of 90 units, as the SQ is 100 units from their ideal points. The setter receives a payoff of 51.4 pounds, as the SQ is 486 units from his new ideal point, 886. Will all players please press enter to move the election result to the top part of their screens. Let us now proceed with the fourth practice election.

If YES. The setter has chosen to contest the election. As a result, he must now choose the value of the ALT. Will the setter please enter a value for the ALT. [Setter chooses ALT] Will voters now vote for either the SQ or the ALT. [Voters vote.]

As you can see by looking in the column labelled "Vote" on your screen, the policy (Winner) has won the election. Since the winning policy was (D) units away from your ideal points, you payoff for this election period should be 100 − D.

If SQ wins. The setter receives a payoff of 51.4 pounds, as the SQ is 486 units from his new ideal point, 886. Will all players please press enter to move the election result to the top part of their screens. Let us now proceed with the fourth practice election.

If ALT wins. The setter receives a payoff of ZZZ pounds, as the SQ is ZZZ units from his new ideal point, 886.

In the fourth and fifth elections, voter ideal points and the SQ will remain as they were. The setter's ideal point will change each period. Will the setter and the voters please proceed with the fourth and fifth practice elections. At the end of the fifth election, please do not touch your keyboard until you are instructed to do so [Fourth and Fifth practice periods.]

[SQ, ALT] is the policy that has won the fifth practice election. This completes the instruction session. [EXPERIMENTS RUN, additional instructions available from the author.]

End

The experiment is now complete. In order to compute your payoffs, you will need the outcome sheet that we are passing around. To compute your earnings from the experiment, total your payoffs from each of the four experimental sessions and multiply by the exchange rate that is on the bottom of your screen. While we are recording the experimental data, we would like you to fill out a post-experimental questionnaire. Please respond to each of the questions carefully. In a few moments, we will call each of you individually to collect your payoff sheets and questionnaires. At that time we will pay you and you are free to go. Thanks again for your participation in this experiment.