We present results from laboratory experimental elections in which voter information is endogenously provided by candidates and voting is voluntary. We also compare advertisements that are costless to voters with those that reduce voter payoffs. We find that informative advertisements increase voter participation and thus informative campaign advertising turns out voters. However, the effect of information is less than that found in previous experimental studies where information is exogenously provided by the experimenter. Furthermore, we find that when advertising by winning candidates reduces voter payoffs, informed voters are less likely to participate, thus are turned off rather than turned out. Finally, we discover that candidates tend to overadvertise, and contrary to theoretical predictions, advertise significantly more when voting is voluntary than when it is compulsory.

1. Introduction

Two aspects of the American electoral process typically receive considerable attention from public commentators—the turnout rate of American voters and the quantity of campaign advertisement expenditures by candidates. When discussing turnout, a number of pundits conclude that turnout is lower than it “should be” compared to other countries.1 Similarly, many argue that through financing campaigns and campaign advertising, special interest groups exert a disproportionate influence on elected officials.2 Furthermore, often a link is suggested between these two issues; that is, some observers contend that turnout is low partly as a consequence of the influence of special interest groups who provide campaign contributions. When President George W. Bush signed into law the Shays–Meehan/McCain–Feingold campaign finance reform bill in 2002, advocates of the reform, such as U.S. Representative Charles Bass, Republican of New Hampshire, touted the bill as having the potential to reduce voter turnout.
apathy.\textsuperscript{3,4} Testing such an argument in an empirical study of aggregate turnout in US elections from 1960–1998, Cebula (2007) finds a negative relationship between PAC congressional election campaign contributions and voter participation, controlling for other influences on turnout during the period. Voters are believed to be “turned off” rather than “turned out” by campaign finance.

In contrast, recent formal theoretical analysis of the effect of information on turnout suggests the opposite relationship might exist if we assume that campaign advertising provides information to voters, which helps clarify their choices. Specifically, both decision theoretic models of turnout (Matsusaka, 1995) and game theoretic ones (Feddersen and Pesendorfer, 1999) predict that as a voter becomes more informed he or she is more likely to participate in elections. In the decision-theoretic model, information directly increases the expected utility from voting, and thus increases the likelihood of participation. In the game theoretic approach, which has been labeled the “Swing Voter’s Curse,” uninformed voters are less likely to participate because of the possibility that their uninformed vote might cancel out an informed voter with similar preferences. In both approaches, as overall information levels increase, overall turnout also increases. Thus, if campaign advertising increases the number of informed voters, then turnout should also increase with advertising.

The theoretically predicted relationship between turnout and information has received empirical support in both observational and experimental data. Palfrid and Poole (1987), Wattenberg et al. (2000), and Coupe and Noury (2004) show that turnout is positively correlated with voter information levels. However, since becoming informed about politics may be a consequence rather than a cause of political participation, these studies cannot establish a causal link. In a number of recent studies, researchers have exploited situations where political information can be viewed as exogenous in order to determine the impact on turnout of changes in political information. Other studies exploit situations where political information is arguably exogenously determined and find a positive effect on voting propensity (see Gentzkow, 2006; Klein and Baum, 2001; Lassen, 2005; and McDermott, 2005).

The relationship between turnout and information has also been subject to experimental study. Battaglini et al. (2008, 2010), hereafter BMP, present the first laboratory experimental analysis of Feddersen and Pesendorfer’s Swing Voter’s Curse Theory. In their experiments, a jar is randomly selected which either has three red balls and nine white balls (called the red jar) or three yellow balls and nine white balls (called the yellow jar). An odd number of subjects randomly select a ball within the jar, revealing its color. If a white ball is revealed, subjects are uninformed about the true jar, but if a red or yellow ball is revealed, subjects learn which jar is correct. Subjects then have a choice whether to abstain or guess which jar is correct. If a majority of the guesses are correct, then the subjects each receive an 80 cent payoff, if incorrect then the subjects each receive a 5 cent payoff. The swing voter’s curse theory predicts that in these experiments uninformed voters will abstain and informed voters will participate and BMP find significant evidence in support of the theory.

In summary, much evidence suggests that the information voters receive influences their participation decisions, which would suggest that campaign advertising that increases voter information also increases participation in the electoral process as a consequence. Yet, as noted above, a number of commentators contend that campaign advertising funded by special interest groups can cause voters to be apathetic and less likely to participate in the electoral process. Which view is correct? In this paper we provide evidence on this question using a laboratory experiment.

Our experiment design extends the design reported by Houser and Stratmann (2008) by adding voter participation decisions, but is otherwise identical. The advantage to using the Houser and Stratmann (2008) design is that it enables us to advance the literature on voter participation in three important ways. First, we endogenize voter information. In the experiment subjects are assigned to be candidates and are able to advertise to subjects who serve as uninformed swing voters, providing them with information about the choices before them.

Second, we use two variants of campaign advertisement finance schemes—one where advertising by the winning candidate does not reduce voters’ payoffs and one where voters’ payoffs are reduced when campaign advertising occurs which captures the situation where campaign advertising is financed by providing interest groups with special favors. The first variant of campaign

\textsuperscript{3} Bass stated: “Under the current political system, corporations, unions, and wealthy individuals channel huge contributions to political parties to influence federal elections. These unregulated, undisclosed, or soft money, contributions have given rise to widespread voter cynicism, mistrust, and apathy,” in a Press Release from his office on March 27, 2002. CNN in the Money Host Jack Cafferty expressed a similar view on his show on September 17, 2006 when he stated: “...it seems to me that part of voter apathy has to have something to do with this idea that the game is fixed going in, that the big corporations and the lobbyists...”

\textsuperscript{4} Such sentiments have been expressed not only concerning national elections but also state and local contests and widely across the country. In the summer of 2002, advocates of reform in North Carolina held a mock trial of the current system of campaign finance in which they pronounced the system “guilty” of alienating voters, see Scott Mooneyham, Associated Press State & Local Wire, June 26, 2002. The California Nurses Association supported a California campaign finance initiative in 2006 by arguing that clean money laws in states such as Maine and Arizona resulted in increased voter turnout, see Daniel B. Wood, The Christian Science Monitor, September 29, 2006. Numerous newspaper editorials often suggest such conclusions. For example, on February 13, 2008, New York’s Newsday argued that Obama’s greater reliance on small contributions rather than big donors would result in higher voter participation. See also Eric Frydenlund, “A Clean Campaign? It Will Be Next Time,” Madison, Wisconsin State Journal, June 25, 2006 and Norm Steenstra, “The Clean Elections idea would help public financing hurt fat cats, gives voters more choice,” Charleston, West Virginia Daily Mail, November 6, 2002.

The argument that reducing big money campaign contributions will increase voter turnout is pervasive enough in the popular media that opponents of such reform sometimes feel the need to dispute the claim. See for example the editorial by George F. Will in the Washington Post on September 28, 2006 where he noted that “Public Funding was supposed to increase voter turnout by decreasing the cynicism supposedly caused by privately financed politics.” Will then goes on to contend that there is no evidence to support this view held by reformers.

Note that this is a different issue from the debate over whether negative advertising does or does not mobilize voters. The argued link we are referring to is that the size of extensive campaign contributions reduces the desire for voters to participate in the electoral process regardless of whether the monies are used for positive or negative campaign advertising because the size of expenditures suggests to voters that candidates are making choices that benefit special interest groups (and not voters). In the experiments described in this paper, all advertising is positive.
financing can be seen as a baseline treatment that measures the possible “turned out” effect of endogenous campaign advertising. The second variant then adds in a cost to voters when winners advertise. So comparing behavior of voters between the first and second variants allows us to measure the “turned off” effect of campaign advertising that is seen as costly to voters.

A third important difference in our experiment is that we incorporate more “realistic” details of elections. In our experiments, not only do subjects vote for candidates who are also subjects in the experiment, but we also allow voters to have party allegiances. As in BMP, the subjects are all swing voters and all prefer the same candidate when advertisements are free to voters. However, the voters’ payoffs depend also on their assignment to a party and whether the winning candidate is in their same party. The voters in an elected candidate’s party benefit more from his or her election than the voters not in his or her party. This is especially true when advertising is free, and this advantage is less significant when advertising is costly to voters and candidates advertise.

We find that indeed endogenously provided informative campaign advertising increases voter participation, although the effect is much smaller than the information effect found by BMP. We find that many uninformed voters participate anyway, suggesting that the voters are influenced by their party assignment and the endogenous nature of the advertising. Furthermore, we find that when the advertising implies that candidates have given away favors to special interest groups, the effect of voter information on turnout is reduced, suggesting that voters are “turned off” by campaign advertising financed by special interest groups.

Our results also have implications for the efficiency of elections where participation is voluntary. A number of commentators contend that compulsory voting would enhance democracy while others contend that forcing uninformed and uninterested voters in participating can lead to less efficient outcomes. 5 In order to address this debate, we compare our results to the otherwise identical Houser and Stratmann (2008) experiments where participation was mandatory. We find that when subjects are allowed the option to abstain (which they are more likely to do when uninformed), the election does not result in more efficient outcomes and in fact, when advertising is costless to voters, candidates advertise excessively and there is no significant difference in the informational or economic efficiency. In the next two sections we discuss our theoretical model and experimental design. In Section 4 we present our empirical analysis and Section 5 concludes.

2. A model of endogenous campaign advertising with abstention

2.1. Voting model and information

We consider a game with a set of $n$ voters who choose by plurality rule. We assume that $n$ is even. Two of the voters are candidates A, B. All voters (including the candidates) may abstain, vote for candidate A, or vote for candidate B. There is no cost to voting. The candidate who receives the most votes cast is the winner and ties are determined by random draws. There are two states of the world. We assume that both states of the world are equally likely. For reasons that will become clearer later, without loss of generality, we label A the first state and B the second. Candidates know the true state of the world but voters can only learn about the true state of the world through campaign advertisements. Candidates can purchase campaign advertisements equal to $m_{ij} = \lambda_{ij}$, which reveal the true state of the world to a randomly selected voter with replacement (who may also be the candidate herself or her opponent). Let $m$ be the total number of ads aired by both candidates. There is no constraint on the number of campaign advertisements a candidate can purchase.

2.2. Preferences

2.2.1. Candidate preferences

Candidates’ utilities depend only on whether they win an upcoming election and how many campaign advertisements they purchase as given by the following function (where $C$ and $c$ are constants such that $C > c > 0$):

$$U_c = \begin{cases} C - cm_j & \text{if candidate } j \text{ wins} \\ -cm_j & \text{if candidate } j \text{ loses} \end{cases}$$

Thus, candidates are purely motivated by winning the election.

2.2.2. Voter preferences

2.2.2.1. Free information regime. Half of the noncandidate voters, $\frac{n-2}{2}$, are labeled A type and the other half are B type. We consider two campaign financing regimes. In the Free Information Regime, noncandidate voters’ utilities are independent of how many campaign advertisements are purchased. That is, each noncandidate voter’s utility depends on two factors, whether the candidate who shares their type is victorious and whether the candidate whose type matches the state of the world wins. A voter gets utility $\lambda$ (where $0.5 > \lambda > 0$) if the candidate from their party wins, they get $1 - \lambda$ if the candidate corresponding to the true

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5 For the argument that compulsory voting would be beneficial to democracy see Lijphart (1997) and for a recent theoretical study that discusses potential problems see Jakee (2006).
state of the world wins. If both things happen, the voter receives a utility of 1 and if neither thing happens, the voter gets zero. Formally, the noncandidate voters in this regime have preferences represented by a utility function \( u(t, w, \theta) \) that is a function of their type \( t \in \{A, B\} \), the winner \( w \in \{A, B\} \), and the state of the world \( \theta \in \{A, B\} \):

\[
\begin{align*}
  u(A, A, A) &= u(B, B, B) = 1 \\
  u(B, A, A) &= u(A, B, B) = 1 - \lambda \\
  u(A, A, B) &= u(B, B, A) = \lambda \\
  u(B, A, B) &= u(A, B, A) = 0
\end{align*}
\]

Notice that in this game all noncandidate voters’ utilities are highest if the candidate selected, either \( A \) or \( B \), matches the state of the world, either \( A \) or \( B \), regardless of their type. For example, if the true state of the world is \( A \), then type \( A \) noncandidate voters receive a payoff of 1 if \( A \) wins and 0 if \( B \) wins, so they obviously prefer \( A \). But type \( B \) noncandidate voters also prefer \( A \) as they receive a payoff of \( 1 - \lambda \) if \( A \) wins and \( \lambda \) if \( B \) wins. Although the noncandidate voters’ utilities depend on their type, under this regime, they are in a common value voting game.

There are two possible interpretations of these preferences. One interpretation is that noncandidate voters’ types represent their policy preferences between the candidates but that the state of the world represents a valence or nonpolicy dimension that noncandidate voters also care about such as honesty, capabilities in times of crises, integrity, etc. In state of the world \( A \), candidate \( A \) has an advantage in terms of the valence dimension and in state of the world \( B \), candidate \( B \) is has an advantage in terms of the valence dimension. The noncandidate voters are all “swing” voters who care more about the valence dimension than the policy differences. A second interpretation is that candidates are either moderates or extremists and that noncandidate voters prefer moderates (even in a different party) to extremists (even in their own party). This is another common interpretation of the term “swing voter.” In state of the world \( A \), candidate \( A \) is a moderate and candidate \( B \) is an extremist and in state of the world \( B \), candidate \( B \) is a moderate and candidate \( A \) is an extremist. Noncandidate voters care about policy in this interpretation, but are more willing to vote for a moderate candidate in a different party than have an extremist in their own party.

2.2.2.2. Costly information regime. In the Costly Information Regime voters’ utilities are reduced by the purchase of campaign advertisements by the winning candidate. The costly information regime corresponds then to the situation where the winning candidate makes promises of post election favors to contributors who finance his or her campaign advertisements. The voters in this regime have preferences represented by a utility function \( u(t, w, \theta) \) that is a function of their type \( t \in \{A, B\} \), the winner \( w \in \{A, B\} \), and the state of the world \( \theta \in \{A, B\} \):

\[
\begin{align*}
  u(A, A, A) &= u(B, B, B) = 1 - \lambda m_w \\
  u(B, A, A) &= u(A, B, B) = 1 - \lambda - \lambda m_w = 1 - \lambda (1 + m_w) \\
  u(A, A, B) &= u(B, B, A) = \lambda \\
  u(B, A, B) &= u(A, B, A) = 0
\end{align*}
\]

Notice that in the costly information regime for some numbers of campaign ads, voters are no longer in a common value game and do not always prefer a candidate whose identity (\( A \) or \( B \)) matches the state of the world. Suppose that only candidate \( A \) advertises in state of the world \( A \) and only candidate \( B \) advertises in state of the world \( B \) [later we will show that this is their optimal choice] and the true state of the world is \( A \). Then an \( A \) type voter prefers candidate \( A \) if \( m_A < \frac{1}{\lambda}; \) is indifferent between the candidates when \( m_A = \frac{1}{\lambda}; \) and prefers candidate \( B \) when \( m_A > \frac{1}{\lambda}. \) And a \( B \) type voter prefers \( A \) if \( m_A < \frac{1}{\lambda} - 2; \) is indifferent between the candidates when \( m_A = \frac{1}{\lambda} - 2; \) and prefers \( B \) when \( m_A > \frac{1}{\lambda} + 2.A \) ssume that when indifferent, all voters prefer the candidate whose identity matches their type. Then for \( m_A < \frac{1}{\lambda} - 2 \) all voters prefer \( A \), for values of \( \frac{1}{\lambda} - 2 \leq m_A \leq \frac{1}{\lambda} \) type \( A \) voters prefer \( A \) and type \( B \) voters prefer \( B \), and for values of \( m_A > \frac{1}{\lambda} \), all voters prefer \( B \).

In Fig. 1 we demonstrate an example of these payoffs where \( A \) is the true state of the world, \( m_B = 0 \), and \( \lambda = \frac{1}{7} \) (in our experiments we construct payoffs such that \( \lambda = \frac{1}{7} \)). In the figure the dark lines represent the utilities to \( A \) type voters as a function of the number of ads purchased by candidate \( A \) and the light lines represent the utility to \( B \) type voters. The dashed lines represent the utilities to voters if candidate \( A \) wins and solid lines represent the utilities to voters if candidate \( B \) wins. Notice that the cutpoint for \( B \) type voters is when \( m_A = 5 \) and for \( A \) type voters it is when \( m_A = 7. \) Thus, if \( m_A < 4, \) all voters prefer \( A \), if \( 5 \leq m_A \leq 7, \) type \( A \) voters prefer \( A \) and type \( B \) voters prefer \( B \), and if \( m_A > 7, \) all voters prefer \( B \).

2.3. Equilibrium behavior

2.3.1. Free information regime

2.3.1.1. Voter choices

2.3.1.1.1. Candidate voters and fully-informed noncandidate voters. As is standard in formal models of voting behavior we solve for Bayesian–Nash symmetric equilibria. We begin with an analysis of equilibrium voter choices in the free information
In the voting game we have three sorts of voters—candidate voters, noncandidate voters who have observed a campaign advertisement and thus are fully informed about the state of the world, and noncandidate voters who have not observed a campaign advertisement and thus are uninformed about the state of the world. Henceforth when we refer to informed voters we mean noncandidate informed voters and, since by definition uninformed voters are also noncandidates, we refer to them simply as uninformed voters. We assume all voters condition their vote on the likelihood that their vote is pivotal; that is, the case where their vote might lead to a change in the electoral outcome which is possible if the election is a tie or one vote short of a tie.

Given this, we can easily see that since candidates only receive payoffs from winning, they have a weakly dominant strategy of voting for themselves. Second, fully informed voters in this regime have a weakly dominant strategy to vote for the candidate whose identity matches the true state of the world since they prefer this candidate and, if their vote is pivotal, then their expected utility is highest if they vote for this candidate.

2.3.1.1.2. Should uninformed voters abstain?

In contrast, the equilibrium behavior of uninformed voters is more complicated. As in the swing voter's curse models uninformed voters have a possible incentive to abstain rather than voting for either candidate. This is because in the free information regime all voters prefer the candidate whose identity matches the state of the world. So uninformed voters have the same preferences as informed voters. Thus, if an uninformed voter votes for either candidate A or B, and his or her vote is pivotal, there is the possibility that his or her vote will cancel out the vote of an informed voter and lead to a less desirable outcome.

To see how abstaining can be an optimal strategy, consider the case of an uninformed voter of type A where the true state of the world is B and there is exactly one informed voter who is voting for B and all other noncandidate voters (who are uninformed) are abstaining. If our uninformed voter of type A votes his or her identity, then the election is a tie, and our uninformed voters' expected utility is 0.5. But if our uninformed voter of type A abstains, then B wins for sure and our uninformed voters' expected utility is $1 - \lambda > 0.5$. Note that if A is the true state of the world our uninformed voters' choice whether to vote for A or abstain does not change the outcome but our uninformed voter could change the outcome by voting for B, but with a similar loss in expected utility. Thus, given that all other uninformed voters are abstaining and there is at least one informed voter who is voting for the candidate who matches the state of the world, abstention is an optimal response.

2.3.1.1.3. Should uninformed voters participate?

However, uninformed voters may have other optimal responses because of the asymmetry in voter payoffs. That is, for large values of $\lambda$, a small number of voters, and a small number of advertisements purchased, abstaining is not always an optimal response by uninformed voters. This is because when the number of voters is small and there are a small number of advertisements, there is a higher probability that advertisements are seen by candidates rather than noncandidate voters and thus no noncandidate voter is informed. In this case, uninformed voters receive higher expected utility from voting for the candidate whose identity matches their type rather than abstaining.

To see how this can be true, consider the case of an uninformed voter of type A where all advertisements are seen by candidates and thus all other noncandidate voters are uninformed. Assume that all the other uninformed voters are voting their identity. If the A type voter abstains, then B wins for sure and his or her expected utility is $0.5(1 - \lambda)$. But if the A type voter votes his or her identity, then his or her expected utility is $0.5 > 0.5(1 - \lambda)$. Hence, in this situation, where there are no informed voters and all
other uninformed voters are voting their identity, our uninformed voter of type A is better off voting his or her identity as well. As the number of noncandidate voters increases and/or the number of campaign advertisements purchased increases, the probability that noncandidate voters are informed increases and the benefit from abstaining increases and the benefit from voting for the candidate whose identity matches the uninformed voter’s type decreases.

2.3.1.4. Voting behavior summary. In summary, for given values of \( \lambda, n, \) and \( m > 0, \) a voting equilibrium is possible where all uninformed voters abstain. However, it is also possible that an equilibrium exists where all uninformed voters vote for the candidate whose identity matches their type. Again, the possibility of this equilibrium depends on the values of \( \lambda, n, \) and \( m. \) Intuitively, when \( \lambda \) is high and \( m \) and \( n \) are low, then it is less likely there is an informed voter whose vote will be canceled out by an uninformed voter who votes. That is, when all uninformed voters are voting their type, then only half of the noncandidate voters will be affected by campaign ads (those voters who by seeing an ad would choose to vote for the candidate whose identity does not match their type), and thus there is a smaller probability of canceling out informed voters’ choices when uninformed voters participate. These results are stated formally in the following lemmas which are proved in the appendix:

**Lemma 1.** In the Free Information Regime, if at least one ad is purchased by candidates and noncandidate voters who see ads vote for the candidate whose identity matches the state of the world, there is a critical value of \( \lambda, \) \( X \leq 0.5, \) for a given number of voters \( n \geq 4 \) and ads, \( m, \) such that if \( 0 < \lambda < X, \) an optimal strategy for all uninformed voters is to abstain. Furthermore, the greater the number of voters and/or the number of ads, the larger \( X. \)

**Lemma 2.** In the Free Information Regime, there is a critical value of \( \lambda, \) \( X \leq 0.5, \) for a given number of voters \( n \geq 4 \) and ads, \( m, \) such that if \( 0 < \lambda < X, \) an optimal strategy for all uninformed voters is to vote their identity. Furthermore, the smaller the number of voters and/or the greater the number of ads, the larger \( X. \)

In our experiments we use \( \lambda = \frac{1}{2}. \) In the appendix we show that given the number of subjects in the experiment \( n = 22 \) and \( n = 24, \) for all values of \( m, \lambda, X. \) Moreover, for \( n = 22 \) if \( m \geq 3, \lambda > X \) and for \( n = 24 \) if \( m \geq 4, \lambda > X. \) Thus, if the number of ads are less than 3 (when \( n = 22 \)) or 4 (when \( n = 24 \)), both symmetric pure strategy voting equilibria are possible—the equilibrium where all uninformed voters vote their identity and the equilibrium where all uninformed voters abstain. But if the number of ads is equal to 3 or more (when \( n = 22 \)) or 4 or more (when \( n = 24 \)), the only symmetric voting equilibrium in pure strategies which is possible is where all uninformed voters abstain.

2.3.1.2. Candidate advertising choices. Obviously candidates whose identities do not match the state of the world have a dominant strategy of never advertising as, given voter strategies, advertising increases the probability that voters are informed and the likelihood of losing the election. In contrast, candidates whose identities match the state of the world have an incentive to advertise. However, this strategy depends on how voters are likely to respond.

2.3.1.2.1. When uninformed voters abstain. First we consider the case where all uninformed voters abstain as in the swing voter’s curse theory. For ease of exposition, assume that the true state of the world is \( A \) and candidate \( B \) does not advertise. In this situation, if candidate \( A \) could be sure that only noncandidate voters see campaign ads, then in equilibrium we would expect him or her to air one and only one ad since it would take only one informed voter for him or her to win for sure given the voter strategies above. However, candidate \( A \) cannot be sure that a noncandidate voter will see a given ad, but does know that the probability increases with the number of ads. The probability that a noncandidate voter will observe an ad when candidate \( A \) purchases only one ad is given by \( \left(1 - \frac{2}{n}\right)^2, \) while the probability that a noncandidate voter will observe an ad when the candidate purchases two ads is given by \( \left(1 - \frac{2}{n}\right)^2 \) and so on. Thus, financial gains for advertising are increasing at a sharply decreasing rate.

Assuming all uninformed voters abstain, informed voters vote the state of the world, and candidate \( B \) does not advertise, then candidate \( A \)’s expected payoff under voluntary voting, \( E(A) \) is given by the following function:

\[
E(A) = \left( \frac{1}{2} \right) \left( \frac{2}{n} \right)^{m_A} + \left(1 - \left( \frac{2}{n} \right)^{m_A} \right) C - cm_A
\]

In our experiments we set \( C = 15 \) and \( c = 0.1. \) It is straightforward to show that for these parameter values \( E(A) \) is maximized when \( m_A = 2 \) for both \( n = 22 \) and \( n = 24. \)

2.3.1.2.2. When uninformed voters vote their party. As discussed above, one possible pure strategy voting equilibrium is for all uninformed voters to vote their party identities. When all uninformed voters are voting for their party, this means that ads only change voting behavior and electoral outcomes when voters are both uninformed and not members of the party whose candidate matches the state of the world. As a result candidate optimal advertising choices are different. Assuming once again that the true state of the world is \( A \) and that candidate \( B \) does not advertise, candidate \( A \)’s expected financial payoff, \( E(A), \) is given by the following formula:

\[
E(A) = \left[ \left( \frac{2 + 0.5(n-2)}{n} \right)^{m_A} 0.5 + \left(1 - \left( \frac{2 + 0.5(n-2)}{n} \right)^{m_A} \right) \right] C - cm_A
\]
For the parameter values in the experiments and the number of subjects, candidate A should optimally purchase 7 advertisements to maximize his or her expected payoffs, which is significantly greater than the predicted 2 advertisements in this case when all uninformed voters are abstaining. Fig. 2 below graphs the two expected payoff curves for the cases of when all uninformed voters abstain (solid line) and when all uninformed voters vote their party identity (dashed line) for the case that \( n = 24 \).

However, as noted above, if ads are greater than 3 or 4 (depending on \( n \)), it is no longer optimal for uninformed voters to vote their party identity. So if candidate A purchases 7 ads, uninformed voters will optimally abstain and candidate A is no longer optimizing. So when voting is voluntary, an equilibrium where all uninformed voters vote their party and candidates advertise optimally given that behavior does not exist. Hence, under voluntary voting, theoretically we expect all uninformed voters to abstain.

2.3.2. Costly information regime

As discussed above, when campaign advertisements are costly to voters, noncandidate voters' payoffs are affected and the noncandidate voters are no longer in a common value game. We can still ignore voters who are also candidates as they will continue to trivially vote for themselves, canceling out. But informed and uninformed noncandidate voters appear to face a complicated choice. Both informed and uninformed noncandidate voters' choices now depend on their beliefs over the total number of ads purchased by the winning candidate.

However, recall that if noncandidate voters follow the strategy of uninformed voters abstaining and informed noncandidate voters voting for the candidate whose identity matches the state of the world, then the optimal campaign advertisement strategy is 2 ads in our experiment. Candidates whose identities match the state of the world have no incentive to advertise more than this optimal number even though uninformed subjects do not know the total number of ads purchased. If the candidate whose identity matches the state of the world is following this strategy, then all noncandidate voters receive a greater payoff from him or her, just as in the case when advertising is free.

2.3.3. Summary of equilibrium predictions

Somewhat counterintuitively, our theoretical analysis suggests that we do not expect any difference in behavior of voters or candidates between the two regimes—free information and costly information. In both regimes, we expect candidates whose identity matches the state of the world to purchase 2 ads, for informed voters to vote for the candidate whose identity matches the state of the world, and for uninformed voters to abstain. Theoretically we expect campaign advertising to have a “turn out” effect, but no “turned off” effect when advertising is costly to voters since candidates' advertisements are not expected to be large enough.

3. Experimental design

3.1. Basic procedures

The experiment was implemented entirely on computers using software created specifically for election experiments with campaign advertising. Subjects were recruited using an automated recruitment mechanism at George Mason University. Subjects
were seated at individual computer terminals and could not see or hear through computer clicking other subjects’ choices.6 We conducted three experimental sessions which we label Sessions 1, 2, and 3. In Sessions One and Two 24 subjects participated and in Session Three 22 subjects participated for a total of 70 subjects. Each session was divided into 16 periods for a total of 48 campaigns and elections and 1120 voting decisions. A period proceeded as follows —first two subjects were randomly chosen to be candidates. Then a one-minute campaign period began in which candidates were allowed to purchase campaign advertisements, which were shown to voters, as we will describe below. After the campaign period ended, all subjects (including the candidates) voted for one of the candidates or abstained. The candidate receiving the majority of votes (ties were broken by a computerized random draw) was declared the winner and the outcome was announced to voters. Then a new period began.

In each period, one candidate was designated as the candidate of the Circle party and the other as the candidate of the Triangle party, and voters were aware this was the case. Half of the remaining subjects were also randomly assigned to each party as non-candidate voters. Candidates were not only assigned a party but also a Pattern, Striped or Solid. In terms of the discussion above, a candidate is Striped if his or her party identity matches the state of the world and a candidate is Solid if his or her identity does not match the state of the world.

In the experiment candidates used tokens to purchase campaign advertisements. When a candidate used a token to purchase a campaign advertisement his or her true pattern or type would be revealed to exactly one randomly chosen voter (which could be the candidate him or herself or his or her opponent). All campaign advertising was truthful. Thus, if a non-candidate voter saw at least one ad from either candidate they became completely informed about candidate types, given that one candidate was always qualified. The restriction that advertisements be truthful has been made in a number of theoretical studies of campaign advertising such as Ashworth (2006) and Coate (2004). It is also supported by empirical evidence on the informational content of candidate advertisements as reported in Abrajano and Morton (2004) and Morton (2006). They find that incumbent members of Congress are more likely to provide verifiable information about their records when their records are closer to the policy choices that are preferred by median voters in their districts and that challengers to these incumbents engage in the opposite behavior when advertising about the incumbent’s record. These results suggest that candidates feel constrained to provide truthful information about their records to voters.

In Session One both qualified and unqualified candidates could advertise, but in Sessions Two and Three only qualified candidates could advertise. Furthermore, unless a candidate saw one of his or her own ads, the candidate did not know which voter saw his or her ads. Thus candidates could not engage in targeted advertising to particular party members.

3.2. Treatments

We used two campaign advertisement treatments—the Red Token treatment where campaign advertisements by the winner did not reduce noncandidate voters’ payoffs as in the Free Information Regime and the Blue Token treatment where campaign advertisements by the winner did reduce noncandidate voters’ payoffs as in the Costly Information Regime. The free ads treatment allows us to measure the baseline effect of informative campaign advertising on voter behavior, the “turned out” effect, while the costly ads treatment represents a situation where campaign advertisements are provided by special interest groups who then receive favors from the winner that are costly to voters and allows us to measure the “turned off” effect. We used a within subjects design; that is, campaign advertising treatments varied by period according to a predetermined pattern. All subjects were told which campaign advertising treatment applied before making choices in a given period and were given in-depth training in understanding the two types of campaign advertisement treatments. Table 1 presents a summary of the three sessions and the campaign advertising treatments by period.

By comparing the two campaign advertising treatments we can disentangle the informational effects of campaign spending on voter participation decisions from the effects of having these advertisements paid by special interests. Our within subjects design also allows us to make these comparisons controlling for unobservable subject differences that might confound a between subjects design.

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6 We used a “mouse-over” technology for subjects to make choices so that subjects could not identify when other subjects were making choices by hearing clicking, which was important to ensure that candidate identities were anonymous. Our experiment also featured computerized instructions which included an embedded quiz to ensure comprehension. Finally, subjects were given in depth training in 5 practice sessions (2 interactive) using the mouse-over technology before subjects participated in the paid portion of the experiment.

7 Ashworth justifies this assumption on page 56 with the argument that the opposing candidate can always uncover lies, and that some news organizations, like CNN, do fact-checking.
3.3. Subject payoffs

As noted above, in our experiments we used the parameters $C = 15$ and $c = 0.1$ for candidate payoffs. The payoffs of noncandidate voters depended on their party assignment and the party and pattern of the winning candidates as well as the number of campaign advertisements of the winning candidate in the costly ads treatment such that $\lambda = \frac{1}{7}$, as discussed above (this can be seen by subtracting four from each payoff (norming the lowest payoff to zero), and then noting that the payoff to electing an unqualified candidate of one's own party is 0.5, one seventh the payoff of 3.5 associated with electing a qualified candidate from one's own party). The specific amounts we used are described below in Table 2.

4. Experimental results

4.1. Election outcomes and overall efficiency

We report the results working backwards, in the reverse order in which they occurred in the experiments; first we discuss election outcomes, then voter behavior, and then candidate choices. So we begin with an examination of election outcomes. Theoretically we expect that there will be little difference in electoral outcomes between the free ads and costly ads treatments since we expect that candidate and voter behavior will be unaffected. This is not supported by the data. We find that in the free ad treatment qualified candidates win 88.24% of the time and unqualified candidates win 11.76% of the time, and there are no tie elections, while in the costly ad treatment qualified candidates win only 54.84% of the time, unqualified candidates win 29.03% of the time, and 16.13% of the elections end in ties.

In order to determine if these differences are statistically significant, we compare the informational efficiency of the treatments as to whether voters are choosing the candidate whose identity matches the state of the world. Furthermore, when costly ads are used, if the qualified candidate is advertising 6 or more ads than the unqualified candidate, then it is more informationally efficient for the unqualified candidate to win. We therefore assigned an informational efficiency rating to wins by the qualified candidate a value of 1, a tie a value of 0.5, and 0 to a win by an unqualified candidate in the free ad periods and the periods in which the qualified candidate ran 5 or less ads than the unqualified candidate. When the qualified candidate ran 7 or more ads than the unqualified candidate we assigned an informational efficiency rating to wins by the unqualified candidate a value of 1, a tie a value of 0.5, and 0 to a win by a qualified candidate. Cases where the qualified candidate advertised exactly 6 ads more than the unqualified candidate were assigned 0.5. Table 3 below presents these efficiency results. We find a significant decrease in informational efficiency when costly ads are used as compared to free ads. We find this decrease in efficiency occurs because of the greater number of wins by the unqualified candidate and tie elections.

We also compare the economic efficiency of the treatments. To compute economic efficiency we calculate the mean subject payoff per period including payoffs to candidates as well as voters. For tie elections we use the expected mean subject payoff rather than the actual payoff since random draws that favor the qualified candidate over the unqualified may suggest an efficiency difference that does not exist. Not surprisingly, as with informational efficiency, we find that the free ads treatment is significantly more economically efficient. These efficiency results, particularly the informational efficiency ones, suggest that candidates and/or voters choices are at variance with our theoretical predictions. We now turn to examining individual behavior to determine the sources of the efficiency results.

---

Table 2
Noncandidate voter payoffs.

<table>
<thead>
<tr>
<th>Where $m_w =$ Number of winner's ads</th>
<th>Qualified candidate wins</th>
<th>Unqualified candidate wins</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Free ads</td>
<td>Costly ads</td>
</tr>
<tr>
<td>Own party</td>
<td>7.5</td>
<td>$7.5 - 0.5m_w$</td>
</tr>
<tr>
<td>Other party</td>
<td>7.0</td>
<td>$7.0 - 0.5m_w$</td>
</tr>
</tbody>
</table>

Table 3
Efficiency of election outcomes.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Informational</th>
<th>Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free ads</td>
<td>0.88</td>
<td>7.49</td>
</tr>
<tr>
<td>Costly ads</td>
<td>0.63</td>
<td>4.50</td>
</tr>
</tbody>
</table>

8 The value of the t statistic is 2.23.
9 The t statistic is 5.05 for this comparison.
4.2. Voter behavior

4.2.1. Candidate vote choices

As we noted candidates are also voters and we theoretically predict that they should trivially vote for themselves in both the free ads and costly ads treatments. In 100 percent of the cases this is true for the qualified candidate in the free ads treatments. However, the unqualified candidates did not vote for themselves in 4 out of the 17 free ads elections, twice abstaining and twice voting for the qualified candidate. It is possible that these candidates perceived that their probability of winning was extremely small and abstained or voted for the other candidate as a protest or they may have falsely believed that candidates would receive payoffs as voters did. We also found that in compulsory voting unqualified candidates voted for the other candidate 8 out of 29 times in the free ads elections, while qualified candidates always voted for themselves.

We found a similar relationship in the costly ads treatment, unqualified candidates appeared more likely to make errors, which could be explained by the low probability that these candidates would win election. Only 1 of 31 qualified candidates in the costly ads periods did not vote for him or herself, choosing to abstain and only 4 out of 31 unqualified candidates did not vote for him or herself, one choosing to abstain and the other three to vote for the other candidate.

4.2.2. Participation decisions of non-candidate voters

As discussed in the Introduction, both the decision-theoretic and the game theoretic approaches suggest that uninformed voters will be more likely to abstain. We find that indeed this is the case in our data. Of the 152 voters who were not exposed to a campaign advertisement in the free ads treatment, 37 abstained (24.34%), while of the 212 non-candidate voters who were exposed to a campaign advertisement, only 2 abstained (0.94%). This difference is significant [t statistic = 6.58]. Similarly, of the 468 voters who were not exposed to a campaign advertisement in the costly ads treatment, 139 abstained (29.70%), while of 139 voters who were exposed to a campaign advertisement, only 26 abstained (13.54%), which is also significantly different [t statistic = 4.96].

Nevertheless, we find some inconsistencies between the general theoretical predictions and the observed participation decisions of non-candidate voters. First, we find that a large majority of uninformed voters participated in the election (75.66%) in the free ads treatment and 70.30% in the costly ads treatment, which is in sharp contrast to BMP’s previous experimental analysis of the effect of information on voting and our equilibrium prediction of 100% abstention. BMP (2008) find that uninformed voters participated only 15% of the time when there are zero computer voters and both jars are equally likely, the treatment equivalent to our treatment with free ads.10

As discussed above, our general theoretical equilibrium prediction endogenizing candidate behavior is that all uninformed voters will abstain. However, because of the payoff asymmetry in our experiment it is a best response for uninformed voters, when the qualified candidate is advertising a small number of ads, to vote their party identity. Of those uninformed voters who participated, the majority, 92.17% voted for candidates from their own party in the free ads treatment and 91.49% did so in the costly ads treatment. This suggests that the majority of uninformed voters assumed qualified candidates were advertising a small number of ads and thus best responded by voting their party identity.

Our second inconsistency with the theoretical predictions on abstention is strong evidence that informed non-candidate voters are “turning off” by campaign advertising purchased with costly tokens. That is, informed non-candidate voters were more likely to abstain in the costly ads treatment than in the free ads treatment (13.54% compared to 0.94%), which is statistically significant [t statistic = 4.91]. This is inconsistent with the theoretical prediction since informed non-candidate voters should vote for the qualified candidate in equilibrium. However, in order to determine better the causes of this higher abstention rate, we need to explore the overall behavior of informed noncandidate voters, which we do next.

4.2.3. Vote choice behavior of informed voters

We find that informed noncandidate voters are significantly influenced by the information they receive in the free ads treatment. When the qualified candidate is a member of their own party, they vote for that candidate 87.62% of the time, but when the qualified candidate is a member of the other party, they vote for the other party 82.24% of the time. Table 4 presents the voting choices of informed noncandidate voters in the voluntary free ads treatments broken down by the types of ads observed. Informed voters’ errors in the free ads voting treatment appear to be related to seeing ads from a candidate revealed as unqualified and no ads from the qualified candidate. When the informed noncandidate voters’ own party is qualified but the only campaign ads voters received are from the other party, informed voters vote incorrectly and 61.54% vote for the other party. Similarly, when the informed voters’ own party is unqualified and the only campaign ads voters received are from their own party candidate, informed voters vote incorrectly from their own party 71.43% of the time. In all other information environments, the majority of informed voters vote correctly.

As we noted above, voters in the costly ads treatment are much more likely to abstain than similar voters in the free ads treatment. Table 5 shows how these voters are less likely to vote for the qualified candidate in response to ads. Their behavior is

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10 BMP (2006) find even higher abstention rates of over 90%. The BMP (2008) results are more comparable since they involve voting groups of 17 and 21, whereas the BMP (2006) results are from voting groups of 7.
In order to consider more fully the combined effects of the different treatments on voter choices we estimate a multinomial logistic regression with non-candidate vote choice as the dependent variable. We clustered the standard errors by individual. The results of this estimation is presented in Table 6 below. We find that voting choices are significantly affected by whether a voter is informed and the type of information received, in particular information that one’s own party’s candidate is qualified reduces abstention. We also find that when voters observe more than one campaign ad from the qualified candidate in the costly ads treatment they are significantly less likely to vote for the qualified candidate and when voters observe more than one campaign ad from the qualified candidate in the free ads treatment they are significantly more likely to vote for the qualified candidate. Voters then appear to evaluate costly ads differently from free ads, however, these variables are not significant predictors of abstention decisions. We find little evidence of changes in voting behavior over time.

### 4.3. Candidate advertising behavior

We expect that unqualified candidates should not advertise. However, given that sometimes voters respond to unqualified candidate advertisements as discussed above, we might expect some unqualified candidates to advertise anyway. Nevertheless, unqualified candidates rarely advertise. In the free ads treatment, only one subject advertised when he or she was assigned to be the unqualified candidate. This subject did so in the first period of session 1 and in the 16th period of session 1, where he or she

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11 We also considered clustering by session. However, because the multinomial logit model is a non-linear estimator, we cannot estimate a multinomial logit model which clusters by a few sessions. We did explore clustering by session with simple linear probability models, with the probability of voting for the qualified candidate as the dependent variable in one and the probability of abstaining in the other. We found that in our data most of the correlation among unobservables stems from a correlation within individuals rather than within sessions. Therefore, we feel that presenting the multinomial logit model that clusters standard errors by individuals is the most appropriate way to proceed given our data.
purchased with free ads 26 and 22 advertisements respectively. In the costly ads treatment two subjects assigned as unqualified candidates purchased ads, both in the first 10 periods of the experiment, one purchased 27 ads and the other purchased 3 ads. In all other cases, subjects assigned as unqualified candidates chose not to purchase advertisements.

Second, we expect qualified candidates to purchase 2 ads. Interestingly, we find that qualified candidates advertised significantly more than predicted in both treatments as reported in Table 7 below. This was true regardless of the number of subjects. Qualified candidates in the free ads treatment with voluntary voting purchased on average 20.67 campaign ads in sessions 1 and 2 and in session 3 qualified candidates purchased on average 29 campaign ads. In the costly ads treatment qualified candidates purchased on average 8.15 ads in sessions 1 and 2 and in session 3 qualified candidates purchased on average 9.36 ads.

Although candidates advertised much more than theoretically predicted, we do observe that candidates advertise significantly less in the costly ads treatment compared to the free ads treatment. These results suggest that candidates anticipate campaign advertising under the costly ads treatment will have negative consequences, thus “turn off” voters. Given that advertising by candidates was excessively more than predicted, we considered whether subjects appeared to “learn” during the experiment to advertise less. Table 7 also reports advertisements broken down by whether they occurred in the first 8 periods versus the last 8 periods of a session. And Fig. 3 below shows the number of ads by period in a session by treatment. As the figure suggests and Table 7 shows, the mean number of ads purchased is less in the second half of a session than in the first half of a session. However, these differences are significant only at a 10% level for the costly ads treatment [t statistic = 1.42] and not significant in the free ads treatment [t statistic = 1.08]. This is not surprising, since our design discouraged such learning since subjects were typically only candidates once during a session, and at most twice.

Table 6
Multinomial logistic estimation of vote choices.
(Clustered by subject, null is voting unqualified, candidates excluded)

| Abstention equation | Coeff. | Robust std. er. | z    | P r>|z| |
|---------------------|--------|----------------|------|-------|
| Informed own qualified | −0.60 | 0.42 | −1.44 | 0.15 |
| Informed other qualified | −1.48 | 0.38 | −3.85 | 0.00 |
| Qualified ads = 1 and costly | 0.42 | 0.51 | 0.83 | 0.41 |
| Qualified ads > 1 and free | 0.76 | 0.84 | 0.90 | 0.37 |
| Costly ads treatment | 0.33 | 0.21 | 1.54 | 0.12 |
| Period | 0.01 | 0.02 | 0.30 | 0.77 |
| Constant | −0.60 | 0.29 | −2.06 | 0.04 |

| Vote for qualified candidate equation | Coeff. | Robust std. er. | z    | P r>|z| |
|--------------------------------------|--------|----------------|------|-------|
| Informed own qualified | 1.17 | 0.28 | 4.13 | 0.00 |
| Informed other qualified | 0.16 | 0.17 | 0.91 | 0.36 |
| Qualified ads = 1 & costly | −0.96 | 0.49 | −1.97 | 0.05 |
| Qualified ads > 1 & free | 1.93 | 0.43 | 4.48 | 0.00 |
| Costly ads treatment | −0.34 | 0.19 | −1.81 | 0.07 |
| Period | 0.01 | 0.01 | 0.77 | 0.44 |
| Constant | 0.24 | 0.19 | 1.24 | 0.21 |
| Number of observations | 1120 | | | |
| Psuedo R squared | 0.0847 | | | |

purchased with free ads 26 and 22 advertisements respectively. In the costly ads treatment two subjects assigned as unqualified candidates purchased ads, both in the first 10 periods of the experiment, one purchased 27 ads and the other purchased 3 ads. In all other cases, subjects assigned as unqualified candidates chose not to purchase advertisements.

Second, we expect qualified candidates to purchase 2 ads. Interestingly, we find that qualified candidates advertised significantly more than predicted in both treatments as reported in Table 7 below. This was true regardless of the number of subjects. Qualified candidates in the free ads treatment with voluntary voting purchased on average 20.67 campaign ads in sessions 1 and 2 and in session 3 qualified candidates purchased on average 29 campaign ads. In the costly ads treatment qualified candidates purchased on average 8.15 ads in sessions 1 and 2 and in session 3 qualified candidates purchased on average 9.36 ads.

Although candidates advertised much more than theoretically predicted, we do observe that candidates advertise significantly less in the costly ads treatment compared to the free ads treatment. These results suggest that candidates anticipate campaign advertising under the costly ads treatment will have negative consequences, thus “turn off” voters. Given that advertising by candidates was excessively more than predicted, we considered whether subjects appeared to “learn” during the experiment to advertise less. Table 7 also reports advertisements broken down by whether they occurred in the first 8 periods versus the last 8 periods of a session. And Fig. 3 below shows the number of ads by period in a session by treatment. As the figure suggests and Table 7 shows, the mean number of ads purchased is less in the second half of a session than in the first half of a session. However, these differences are significant only at a 10% level for the costly ads treatment [t statistic = 1.42] and not significant in the free ads treatment [t statistic = 1.08]. This is not surprising, since our design discouraged such learning since subjects were typically only candidates once during a session, and at most twice.

Table 7
Qualified candidate ads.

<table>
<thead>
<tr>
<th></th>
<th>Free ads</th>
<th>Costly ads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entire session</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>23.12</td>
<td>8.58</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>20.51</td>
<td>9.73</td>
</tr>
<tr>
<td>No. of obs.</td>
<td>17</td>
<td>31</td>
</tr>
<tr>
<td><strong>First 8 periods in session</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>28</td>
<td>11.13</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>8.44</td>
<td>3.04</td>
</tr>
<tr>
<td>No. of obs.</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td><strong>Last 8 periods in session</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>17.63</td>
<td>6.19</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>4.53</td>
<td>1.73</td>
</tr>
<tr>
<td>No. of obs.</td>
<td>8</td>
<td>16</td>
</tr>
</tbody>
</table>
Given the excessive advertising, an important question is whether candidate advertising behavior is rational given voter responses. In order to evaluate this question we compared the plurality of votes for qualified candidates with qualified candidate ads by token treatment, which is shown in Fig. 4 below. We also compared the probability of the qualified candidate winning with qualified candidates ads by token treatment in Fig. 5 below. We find that in the costly ad treatment increasing the number of ads has little effect on the plurality of votes for the qualified candidate and decreases the probability that the qualified candidate wins. However, these relationships are not statistically significant. Although we find a positive relationship between the number of ads and the plurality of votes for the qualified candidate and increases the probability that the qualified candidates win, these relationships are also insignificant. Thus we clearly find that the qualified candidates are behaving irrationally given voter behavior, advertising too much as the number of ads have no significant effect on the plurality of votes or the probability of winning.

Fig. 3. Qualified candidate ads by treatment and period.

Fig. 4. Plurality of qualified candidate votes by number of ads purchased.

12 We estimated both simple OLS and probit equations for the probability of winning.
4.4. Compulsory versus voluntary voting

Houser and Stratmann (2008) report similar experiments in which voting is compulsory, so abstention is not an option. How do our results in terms of election outcomes and candidate advertising strategies compare? Their results in terms of efficiency and candidate advertising are summarized in Table 8 below:

We find only minor differences in informational efficiency between compulsory and voluntary voting in both the free ads and costly ads treatments as the only significant difference is between voluntary and compulsory voting in the costly ads treatment at the 10% significance level.\(^\text{13}\) Thus, we find little evidence that voluntary voting affects informational efficiency. We also find no significant difference in economic efficiency between compulsory and voluntary voting.\(^\text{14}\)

How does qualified candidate advertising compare in voluntary voting to compulsory voting? We find that qualified candidates advertise significantly more when abstention is allowed than under compulsory voting in the free ads treatment. Under compulsory voting, qualified candidates in free ads treatments purchase on average 11 campaign ads which is significantly fewer than the purchases of qualified candidates in voluntary voting at a 5% confidence level. However, in the costly ads treatments, we find no significant difference between the number of ads purchased under voluntary voting as compared to compulsory voting.

5. Concluding remarks

Much debate exists over whether campaign advertising and the implicit assumption that such advertising is paid by special interest groups causes voters to participate less (turns them off) or provides voters with information that then increases their probability of participation (turns them out). In this paper we address this question using laboratory experiments where campaign advertising is endogenous and may or may not be costly to voters. We also compare our results to elections with compulsory voting. We find a number of important results that previously have not been explored in the literature. First, with respect to the efficiency of elections, we find that advertising that has no payoff consequences to voters is significantly more informationally and economically efficient than advertising with payoff consequences. However, we find that there is no informational or economic advantage of voluntary over compulsory voting.

Second, with respect to information and voting behavior, we find that indeed when advertising is informative and not costly to voters it increases their probability of participation, as has been found in previous studies. However, we find that the effect is not nearly as strong as that found in other similar common value voting games. We suggest that the reason for this difference is that voters’ payoffs in the common value game are slightly asymmetric and thus voters are induced with a preference over which party should win, even though all voters are paid more when the group chooses the qualified candidate regardless of party. Finally, we find that when advertising is costly to voters, voters are “turned off” by advertising, more likely to abstain, even when informed.

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\(^{13}\) The t statistic for the comparison between voluntary and compulsory voting under free ads is 0.25 and under costly ads is 1.31.

\(^{14}\) The t statistic for this comparison with free ads is 0.82 and for costly ads is 0.74.
We noted that increased abstention by informed voters is inconsistent with our theoretical predictions. Indeed, despite conventional wisdom regarding the “turned off” effect, we are aware of no model that predicts this outcome; developing a new theory in this direction would be a valuable advance. Those interested in doing so might consider not only models of the sort we developed, but also extensions that consider the role of altruism and reciprocity. For example, candidates may send fewer ads when it is costly to voters not only because (as we speculate) they anticipate a “turned off” effect, but also because of an “altruistic” concern for voters’ payoffs or, perhaps, in order to encourage future candidates to reciprocate by constraining their own advertising behavior.15

Finally, with respect to candidate advertising strategies, we find that qualified candidates advertise much more than theoretically predicted, although significantly less so when advertisements are costly to voters, as predicted. However, we also find that when advertising is free to voters and voting is voluntary, candidates actually advertise significantly more than when voting is compulsory. Candidates appear to believe that advertising is more necessary when voting is voluntary.

What are the implications for naturally occurring elections and the role of campaign advertising? Our analysis provides some support for the “turned off” versus “turned out” trade-off in costly campaign advertising. Although advertising that is informative to voters increases participation, when the advertising is known to have a cost to voters in terms of payoffs, informed voters are less likely to participate. It also suggests that the effect of information on turnout may not be as strong as hypothesized when voters have party preferences even if the voting game is a common value one. Finally, our analysis finds that candidates appear to believe that advertising is more necessary when voting is voluntary than compulsory.

Acknowledgments

The authors are grateful to the International Foundation for Research in Experimental Economics for funding that supported this research. We thank John Duffy, Jens Grosser, and Arthur Lupia for their comments and suggestions on earlier versions. Thanks also to the editor and two anonymous referees for comments that improved this paper. We are grateful to Will Christie and Jason Arentz for assistance with programming, and to Jared Barton for assistance with the data.

Appendix A. Experiment instructions

Welcome to today’s experiment! You will be taking part in a decision making study. We are interested in your decisions that you make on your own. That means, now that the experiment has started, you may not talk to anyone except the experimenter. Please turn off all phones, beepers, and any other electronic devices. If you talk or otherwise communicate with another participant during the experiment, or if an electronic device of yours disturbs the experiment, you will be asked to leave and will collect only your show-up bonus. If you have any questions at any time during the experiment, please raise your hand, and we will come to you to answer your question.

VERY IMPORTANT: If you should experience any software problems at all (a program freeze, a system error message, etc.), do not touch the computer. Do not click to close any system error screens. Instead, please raise your hand, and we will assist you.

When you are finished reading a screen, click the Next button to continue.

For your participation, you will be paid a show-up bonus. You may earn more money during the course of the experiment, as explained in detail below. The experiment will take about two hours. Please remain quiet after the experiment has concluded. Each of you will be called to the experimenter, one-by-one, to be paid your earnings privately. After you have been paid you should exit the lab.

As you proceed through these instructions, there will be a quiz question at the bottom of each page. You must answer the question correctly before going to the next page. When you finish the instructions, you will play a simulated version of the experiment so that you can thoroughly familiarize yourself with the interface.

15 We thank a reviewer for suggesting this interpretation.

Table 8: Compulsory voting results.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Free ads</th>
<th>Costly ads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficiency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informational</td>
<td>0.86</td>
<td>0.49</td>
</tr>
<tr>
<td>Economic</td>
<td>7.67</td>
<td>3.83</td>
</tr>
<tr>
<td><strong>Qualified ads</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>11</td>
<td>8.78</td>
</tr>
<tr>
<td>Std. dev.</td>
<td>9.77</td>
<td>9.54</td>
</tr>
<tr>
<td>No. of obs.</td>
<td>27</td>
<td>36</td>
</tr>
</tbody>
</table>
In this experiment you will be assigned randomly to the role of either candidate or voter. Two participants will be candidates, and the rest will be voters. Candidates campaign, and at the end of the campaign voters vote. There will be several campaigns during the experiment, so there is a chance that you will be both a candidate and a voter (there is also a chance that you will be only a voter). Therefore, during these instructions, you will familiarize yourself with both the candidate and the voter interfaces and rules.

Question: How many participants will be candidates during any given campaign?

A: 1  
B: 2  
C: 3  
D: varies from campaign to campaign

Whether you are a candidate or a voter, you will be randomly assigned to a political party. This experiment is a two-party experiment. The two parties are the Circle Party and the Triangle Party. One candidate will be a Circle candidate, and the other candidate will be a Triangle candidate. There is an even number of voters, so in each campaign half the voters will be Circle party and half will be Triangle party.

You will be randomly reassigned to a party at the beginning of each of the campaigns. Party assignment will not affect your ability to earn payoffs during the experiment.

Question: If you are a Circle candidate in campaign 1, how many times is it possible for you to be assigned to the Circle party in subsequent campaigns?

A: None  
B: No limit  
C: 1  
D: 2

A candidate always prefers to have a person from their party elected. For example, a Circle candidate will always prefer to elect a Circle candidate, and a Triangle candidate will always prefer to elect a Triangle candidate.

If you are a voter, there might be circumstances in which you could be better off if the candidate from the other party is elected. For example, if you are assigned to the role of a Triangle voter, then there may arise a situation where you would be better off if the Circle candidate won the election.

In addition to the candidates being assigned to a party, they will also be randomly assigned to either Solid or Striped.

The amount you earn in this experiment will depend partly on which candidate wins the election. Your earnings depend on whether the winning candidate belongs to your party, and whether they are a Solid or Striped candidate. Your earnings also depend on the campaign decisions of the winning candidate, as described in detail below.

The campaign proceeds as follows. For 1 minute (marked by a countdown timer in the upper corner of your screen), candidates will campaign. After this, all campaigning will stop, and all participants will vote for their preferred candidate. The voting phase will last for 30 seconds. Both voters and candidates must vote.

During the campaign phase, voters observe candidates’ activity on their computer screens. Candidates campaign by advertising. Each advertisement will reach exactly one voter. The voter who receives an advertisement is chosen randomly, with each voter equally likely to see any advertisement. As a candidate, you might have purchased eight advertisements, but this does not necessarily mean you have reached eight unique voters: the same voter can be reached multiple times while other voters are reached no times. You will not be told the party affiliation of the voters you reached.

Question: If you are a voter, what is the minimum number of advertisements you will see during the campaign?

A: 1  
B: 3  
C: 0  
D: 2

A candidate can advertise only true information. For example, an advertisement from a Triangle-Striped candidate reads as follows:

“You have observed an advertisement from the Triangle candidate who is revealed to be Striped.”

An advertisement from a Triangle-Solid candidate will read as follows:

“You have received an advertisement from the Triangle candidate who is revealed to be Solid.”

Candidates pay for advertising with tokens. One token pays for one advertisement. There are four colors of tokens: Yellow, Blue, Red and Purple. Tokens are given to candidates at the beginning of the experiment, and candidates may purchase advertisements using any color of token available to them. Only the individual candidate knows how the advertising was purchased. For example, you are a Triangle candidate, and you purchase one advertisement using one Purple token. Your advertisement will reach one voter, but that voter will not be told that you made the purchase with a Purple token.

16 These instructions are written for a more general experiment than we conducted where candidates may be able to purchase ads from different types of tokens simultaneously. However, in our experiment candidates either would be able to purchase from red or blue tokens only. Voters always knew which token was being used to purchase the ad because the information screen at the beginning of the session informed them as is clear from later in these instructions.
Question: You are a voter. In the current campaign, candidates are given Yellow and Blue tokens to use to buy advertisements. You receive an advertisement from a candidate. What color token was used to purchase the advertisement you saw?

A: Blue  C: Yellow
B: Red or Blue  D: Yellow or Blue

Advertising is always costly to candidates. Each advertisement reduces a candidate’s total experimental earnings by 10 cents. If you are a candidate, and during the campaign you have used 3 Red tokens and 4 Blue tokens, by how much will your earnings be reduced?

A: $0.70  C: $2.70
B: $2.00  D: $2.30

Advertisements are costly to voters only if a candidate uses Blue tokens to pay for advertising. If a candidate is elected, and that candidate has used Blue tokens to pay for advertising, then each voter’s earnings are reduced by 50 cents for each Blue token that has been used by the elected candidate.

You are a voter. If an elected candidate advertised 5 times, and three of those advertisements were purchased with Blue tokens, by what amount is each voter’s payoff reduced?

A: $1.00  C: $1.50
B: $0.50  D: $3.00

A voter’s screen will show the history of all advertisements that have been seen. You will have information only on messages you have received. You will not know how much either candidate has advertised or which other voters have seen advertisements.

At the end of the campaign phase, there will be a 30-second voting period. All participants must vote, as discussed previously. Whether you are a candidate or a voter, you will see a voting window which allows you to press a button corresponding to the candidate you wish to vote for. When you press the button, a message box will appear asking you to confirm your vote. You will not be able to change your vote once it has been confirmed, nor can you vote a second time. The election results will be shown to all participants. You will see the results along with your personal earnings for the campaign.

On the voting screen, the middle window is titled “Abstain.” Abstain means simply that you wish to vote for neither candidate. If you mouse over the “Abstain” button and confirm, your decision will be entered as a “No vote,” meaning you voted for neither candidate.

There is no monetary penalty for abstaining. Given the outcome of the election, your earnings are the same whether you voted for Circle, Triangle, or you chose Abstain.

Candidates’ earnings are calculated as follows. Because each candidate wants only their party to win, the first two steps are not used to calculate candidates’ earnings.

The first step in calculating candidates’ earnings is as follows.
First, a candidate will earn a bonus of $15 if he/she is elected.
Also, a candidate’s earnings are reduced by $0.10 for every advertisement that he/she has purchased.
Candidates do not earn any money from tokens that are not used.

Here is an example: You are a Circle-Striped candidate. You win the election in a Blue token campaign. During the campaign you use 11 Blue tokens to buy 11 advertisements. Your earnings are calculated by adding together the following: $15 because you
won the election, and \(-$1.10\) ($0.10 11) due to the 11 advertisements. Your earnings for the campaign, therefore, are $15—$1.10 = $13.90.

Here is a second example: You are a Circle-Solid candidate. You lose the election in a Red token campaign. During the campaign you purchased 1 advertisement. Your earnings are as follows: $0 because you did not win the election, and \(-$0.10\) due to the 1 advertisement. Your earnings for the campaign, therefore, are $0 — $0.10 = $—0.10.

While it is possible for you as a candidate to lose money during an individual campaign, your earnings for the experiment will be positive.

You have now learned how the entire campaign process works for both voters and for candidates. There will be multiple campaigns in the experiment. Before each campaign begins, an information screen will be displayed for you. This screen will tell you what tokens are available for the upcoming campaign, whether you are a voter or a candidate, your party affiliation, and, if you are a candidate, whether you are stripes or solids. These characteristics will be randomly reassigned each campaign. At the conclusion of the final campaign, a summary screen will display your total earnings including your show-up fee.

Please sit quietly after the experiment has concluded and wait to be called to receive your earnings.

You will now go through three practice screens: first the Candidate screen, second the Voter screen, and third the Voting screen. Screens will display for 1 minute each. Practice clicking the different buttons in the window to see how the interface works.

Click the <Finished> button to begin the practice screens.

Appendix B. Solution of uninformed voters’ equilibrium choices

Proof of Lemma 1. Uninformed voters condition their votes on the case when they are pivotal. An uninformed voter is pivotal when one of the candidates is losing by one vote and they can force a tie election or when there is a tie election. Let \(P_0\) be the event when there is a tie among the other voters between \(A\) and \(B\); and \(P_\emptyset\) for \(\emptyset = A, B\), which is the event in which policy \(\emptyset\) is losing by one vote among the other voters. To demonstrate that uninformed voters find it optimal to abstain when informed voters choose the candidate whose identity matches the state of the world and candidates purchase at least one ad, we calculate the expected utility of an \(A\) type voter given that all uninformed voters are abstaining and demonstrate that abstention is also this voter’s optimal choice for any amount of campaign advertising. To calculate these expected utilities, we first calculate the pivot probabilities.

With an even number of voters and two voters as candidates who always vote for themselves, that informed voters vote for the informed voter will choose the option that gives him or her the highest expected utility. It is clear that for all values of \(\lambda, n,\) and \(m, u_A(\lambda) > u_B(\lambda)\). Hence the relevant issue is which is greater, \(u_A(\lambda)\) or \(u_B(\lambda)\). The difference between these two expected utilities is given by:

\[
\begin{align*}
u_A(\lambda) - u_B(\lambda) &= \begin{cases} 
0.5 \lambda \left( 1 - \frac{n-3}{n-1} \right)^m & \text{if } m = 0 \\
0.5 (0.5 - \lambda) \sum_{i=1}^{m} \left( \frac{m!}{i!(m-i)!} \right) \left( \frac{n-3}{n-1} \right)^i \left( 1 - \frac{n-3}{n-1} \right)^{m-i} & \text{if } m > 0
\end{cases}
\end{align*}
\]
Obviously, when \( m = 0 \), uninformed voters gain most by voting for the candidate who matches their type. But if \( m > 0 \), the optimal response depends on the values of \( \lambda, n, \) and \( m \). It is straightforward to show that for a given value of \( m > 0 \), critical values of \( \lambda \) exist such that for \( \lambda < \lambda_c, u_A(A) < u_B(A) \) and abstaining is the optimal response. Fig. A.1 below shows the relationship between \( \lambda \) and \( n \) for given values of \( m = 1, 2, 3 \), with the lowest curve for \( m = 1 \) and the highest curve for \( m = 3 \). Note that as \( m \) and/or \( n \) increases, \( \lambda \) increases.

Similarly, we can show that for an uninformed type \( B \) voter the same relationship holds. Note also that for the value of \( \lambda \) used in our experiments, \( \lambda = 0.14 \), and the number of voters used in the experiments, \( n = 22 \) and \( n = 24 \), for all values of \( m > 0 \), abstaining is an optimal response.

**Proof of Lemma 2.** Consider an uninformed \( A \) type voter in the \( A \) party. Assume that all informed voters are voting for the candidate whose identity matches the state of the world and all other uninformed voters are voting for the candidate whose identity matches their type. Uninformed voters condition their vote on the relative pivot probabilities as in Lemma 1.

\[
\Pr(P_A|A) = \binom{m}{0} \left( \frac{0.5(n-2)}{n-1} \right)^0 \left( 1 - \frac{0.5(n-2)}{n-1} \right)^m = \left( 1 - \frac{0.5(n-2)}{n-1} \right)^m.
\]

\[
\Pr(P_A|B) = \binom{m}{0} \left( \frac{0.5(n-2)-1}{n-1} \right)^0 \left( 1 - \frac{0.5(n-2)-1}{n-1} \right)^m = \left( 1 - \frac{0.5(n-2)-1}{n-1} \right)^m
\]

\[
\Pr(P_B|A) = \begin{cases} 0 & \text{for } m = 0 \\ \sum_{i=1}^{m} \binom{m}{i} \left( \frac{0.5(n-2)}{n-1} \right)^i \left( 1 - \frac{0.5(n-2)}{n-1} \right)^{m-i} & \text{for } m > 0 \end{cases}
\]

**Fig. A.1.** Critical lambda values.
As above, we can solve for the critical value of \( \lambda \) such that \( u_A(A) = u_B(A) \). If \( \lambda < \lambda \), \( u_A(A) < u_B(A) \) and if \( \lambda > \lambda \), \( u_A(A) > u_B(A) \). As above, \( \lambda \) is increasing in \( m \), however, unlike the situation in Lemma 1, \( \lambda \) is decreasing in \( n \). Fig. A.2 illustrates how \( \lambda \) changes with values of \( m = 1 - 5 \) and \( n \). The lowest curve represents the values when \( m = 1 \) and the highest curve represents the values when \( m = 5 \). The dotted line in the figure shows the value of \( \lambda \), 0.14, which was used in our experiments. Notice that for the number of voters used in our experiments, the number of ads must be less than 3 or 4 for an uninformed voter to optimally best response by voting his or her type. That is, for \( n = 22 \) when \( m = 3 \), voting identity is optimal, but for \( m \geq 3 \), abstaining is an optimal choice and for \( n = 24 \) when \( m < 4 \), voting identity is optimal, but for \( m \geq 4 \), abstaining is an optimal choice.

References


