Politician Effort and Voter Inference[*]

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Abstract

This paper explores a psychologically motivated model of belief formation in a political context. Using a retrospective voting framework, we specifically examine the implications of a common inference bias in which voters overweight the effect of an incumbent's unobserved effort on realized outcomes. This bias is motivated by and consistent with the fundamental attribution error in social psychology, whereby people over-attribute the cause of observed outcomes to personal and dispositional causes and underweigh

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situational causes. We provide experimental evidence of this bias and show that it leads to reduced incentives for the politician to exert effort on the voters' behalf.

1 Introduction

The way in which voters' form attitudes towards elected officials is an important concern for political research. There is currently a great deal of debate on how exactly voters determine their preferences between candidates. A large part of this debate has to do with the extent to which voters behave rationally when forming attitudes and casting votes. For instance, one view of voter attitude formation (retrospective voting) holds that voters behave irrationally and naively reward positive prior performance without taking into account expectations of future performance (Kramer, 1971; Norpoth, 1996). The opposite view (prospective voting) holds that voters are more sophisticated and take into account information on past outcomes only to the extent that it has predictive value for future performance (Chappell, Jr. and Keech, 1985; MacKuen, Erikson and Stimson, 1992; Suzuki and Chappell, Jr., 1996). Related work has examined the extent to which voters vote myopically out of concern for personal economic outcomes (Fiorina, 1978) or whether they care about the economy as a whole (Kinder and Kiewiet, 1979) and how voters use information to form attitudes (Gant and Davis, 1984; Lodge, Steenbergen and Brau, 1995).

This paper adds to the literature on voter attitudes by considering a model of political effort in which voters' inferences are subject to a bias. The bias, consis-

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tent with social psychological research on the "fundamental attribution error" and "correspondence bias," involves voters over-estimating the effect that a politician had on observed outcomes.[1] In our model, an outcome of importance to voters is determined both by a random process and by the effort exerted by a politician. We consider the implications of a specific instance of voter error – in particular when voters over-attribute the cause of the observed outcomes to the politician. We show that this bias leads to reduced incentives for the politician to exert effort.

Since our theoretical results rest on the key assumption that voters commit the error of over-emphasizing the effect the politician has on outcomes, we test this assumption using experiments. Specifically, we set up a laboratory situation, similar to our model, in which "voters" receive a payoff based on a random, unobserved component and on the costly effort of a politician who can observe the outcome of the random process. After observing the total payoff the voters must determine, for an additional reward, whether or not the politician exerted effort. The results of the experiments support the assumption in our model.

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[1]The fundamental attribution error refers to the common result that observers tend to over-attribute the causes of observed behavior (and outcomes) to personal rather than situational causes (see Ross and Nisbett, 1991; Ross, Amabile, and Steinmetz, 1977). The correspondence bias refers to the tendency to make assumptions about a person's disposition based only on cues that are entirely environmentally determined (see Gilbert and Malone, 1995; Voonk, 1999).

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1.1 The voter bias

We start with the assumption (which we later test) that voters commit a simple bias in evaluating the effort of elected officials. In situations (such as the economy, crime prevention, education, etc.) where the outcome of interest to voters depends on one component that is controlled by political leaders and one that is not, we assume that voters will over-emphasize the effect of the politician. This bias is consistent with a considerable amount of social psychological research.

Two such areas of research are work on the "fundamental attribution error," which refers to the tendency to over-attribute observed behavior and outcomes to personal rather than situational causes, and work on the "correspondence bias," which refers to the tendency to assume stable, personal qualities about individuals based on observed outcomes or behaviors that are entirely situation driven. One classic study demonstrating this type of result was conducted by Ross, Amabile, and Steinmetz (1977). In their study, subjects watched while two people played a simple trivia quiz game in one of two randomly assigned roles: questioners and responders. The questioners had been instructed to come up with challenging, but not impossible, questions to ask the respondent. After observing questioners generate some questions that the responders were unable to answer correctly, subjects were asked to rate the general knowledge of the people in both roles. Even

though the role presents questioners with a large situational advantage in revealing knowledge, subjects rated questioners as significantly more knowledgeable than respondents. Subjects ignored the situational advantage and instead attributed the fact that questioners had knowledge that responders did not to a personal difference.

More closely related to the topic of this paper, several experimental studies have found that the fundamental attribution error affects perceptions of leadership quality (Weber, et al., 2000; Mitchell, Larson and Green, 1977; Lord, et al., 1978; Staw and Ross, 1980) in organizational settings. Across these studies, leaders associated with good outcomes are perceived as effective leaders, even when they have little or no effect on outcomes. Leaders associated with poor outcomes, however, are typically blamed for being responsible even when they similarly had no effect on determining the outcomes. In most of these experiments, subjects briefly observe a leader in action, and then observe the outcomes that result. Typically, the situations and processes generating the outcomes are very simple.

For instance, in the Weber, et al., study, leaders were subjects in an experiment randomly selected to give a short speech urging other subjects to coordinate in a game in which coordiantion was either very easy or very hard. The treatment variable ("leadability" of the situation) was uncorrelated with initial leadership

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perceptions elicited immediately after the leader spoke. After the groups played the game for several periods and groups in one treatment succeeded and groups in the other treatment failed, however, there was a significant difference in leadership ratings. That observers make strong attribution errors concerning the effects of even limited leadership in simple situations, suggests the possibility that these errors might become greater when leadership is more visible and observers have even less knowledge of the process by which outcomes are generated. An example of such a situation is the evaluation of political officeholders on complex issues by voters.

The application of biases such as these to voter evaluations is not new. There is some research in political psychology on voter attributions resulting from processes similar to the fundamental attribution error and correspondence bias. For instance, Rapoport, Metcalf and Hartman (1989) report experiments in which voters made attributions about candidate's personal traits from stated issue positions.

In addition, a few empirical studies have acknowledged and dealt with the possibility that voters may differentially credit or blame elected officials depending on the voters' perceptions of the extent to which that official has control over outcomes. For instance, Hibbing and Alford (1981) find that the prevalence of economic voting is affected by the ability of candidates to have affected economic

outcomes. Powell, Jr. and Whitten (1993) conducted a country level study of economic voting, measuring the extent to which incumbent parties' votes are affected by economic conditions. They recognize that voters need to also take into account the extent to which the party in power is responsible for those outcomes. Using several measures of clarity of responsibility of the ruling party, they find an interaction between economic voting and responsibility: voters reward incumbent parties for good economic performance and punish them for poor economic performance only in countries with high degrees of clarity of responsibility. However, none of these studies directly addresses the possibility that voters commit the error of over-emphasizing the effect officials have on outcomes.

While the above studies indicate that voters consider the extent to which elected officials are responsible for outcomes, there exists a strong possibility that voters over-attribute the cause of outcomes to officeholders than to other factors. The presence of this bias in voter inference, which is the key contribution in our model, is supported by three pieces of evidence. First, the fundamental attribution error and correspondence bias are robust phenomena in decision making that hold across a wide variety of contexts. As mentioned above, several simple studies have shown that perceptions of a person's leadership quality are strongly affected by outcomes even when the leader has little or no control over them. Therefore,

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in any situation where evaluators are observing outcomes that may be affected by the actions of another individual, we should expect to see a bias in the direction of over-attributing the effect to the person at the expense of situational variables. Second, it is quite possible that the actual effect of elected officials on outcomes of interest to voters (such as the state of the economy) is limited. Stigler (1973) makes this point, arguing that economic results are often beyond the control of elected officials. In addition, Salancik and Pfeffer (1977) find that the identity of city mayors has almost no effect on city budgets. Third, the experiments in this paper show that "voters" in a simple laboratory experiment commit this type of error.

1.2 Overview of the paper

This paper examines the effect of biased voters' attributions of outcomes on the actions of elected officials. We combine formal methods, political social psychology, and experimental methods to explore both the implications and characteristics of biased voter inferences in delegation situations. We restrict our attention to the classic principal-agent problem in which a politician must make a decision regarding whether or not to exert costly effort and increase a representative voter's well-being. The voter is able to observe only her own well-being and then must

infer whether or not the politician exerted this effort. The voter's inferences are assumed to be characterized by the bias described above. After developing the model, we report experimental results testing the assumption that voters make this kind of mistake. We find that even in a simple situation where the effect of the politician is clearly stated to voters, they still over-attribute the outcomes to effort on the part of leaders.

This paper represents a behavioral approach towards an understanding of representative democracy. There are at least two reasons a formal behavioral approach is fruitful in this area of political science. First, by introducing an inference bias that is robust (in the sense that it has been replicated in numerous studies) we are able to predict a systematic bias in politicians' incentives. Our theory predicts that politicians have an increased incentive to shirk their responsibilities when times are good than they would if voters formed correct (i.e., Bayesian) beliefs about the relative role of personal/dispositional versus situational factors. In addition, politicians may have an incentive to always shirk when the situational factors are strong relative to the personal/dispositional factors.

Second, the application of social psychology findings to a stylized model of political agency illustrates the importance of incorporating findings that, on their face, may appear unrelated to the study of political institutions and decision-

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making. We would argue that social psychology is inextricably linked to the successful development of positive models of political decision-making. In elections, for example, the individual incentives are generally very weak due to the incredibly small probability of being pivotal. Therefore, any cognitive bias may rationally persist in such domains given any significant individual cost need be incurred by voters to eliminate it. In addition, it is often apparently overlooked that Nash equilibria are strategically defined. If even one agent can credibly commit to not keeping up his or her "end of the bargain" (i.e., he or she can commit to not playing the strategy prescribed by the equilibrium), then there is no *a priori* reason to expect that the other agents have any reason to play their equilibrium strategies. People are, almost by definition, credibly committed to their respective cognitive biases. Thus, incorporating these biases into the strategic calculus of all agents is perhaps a more appropriate means of formulating positive theories of strategic interaction.

Our paper proceeds as follows. In the next section, we define a simple model of electoral delegation. Section 3 contains a discussion of the fundamental attribution error and its effect on the politician's incentive to exert effort. We then describe and report experimental results in Section 4. Section 5 contains a discussion of the implications of our model and experimental data for the study of

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electoral behavior. Finally, Section 6 concludes.

2   The Model

We study a principal-agent situation between a single voter (the principal) and a single politician (the agent). The politician is the first to observe the level of income, x. The voter will receive x if the politician does nothing. Alternatively, the politician may exert a costly level of effort to increase the income of the agent by a fixed amount. We denote the individual cost of effort, which is completely borne by the politician, by c, and the benefit of effort to the voter by b. Restricting attention to the most interesting case, we assume that $b > c > 0$, so that while effort by the politician is socially efficient, it is not a weakly dominant strategy for the politician. We denote the amount received by the voter by y. After deciding whether or not to exert effort, the voter receives $y = x$ if the politician decided to not exert any effort or $y = x + b$ if the politician decided to exert effort. After receiving y, the voter infers whether or not effort was exerted. This inference is based on a prior belief concerning the initial distribution of income, x, the amount of benefit yielded by effort, b, the cost of effort to the politician, c, and the voter's beliefs about the politician's behavior as a function of x. The politician is assumed

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to maximize the probability that the voter believes effort was exerted. We assume that the voter seeks to maximize the probability that his or her inference is correct.

We denote the commonly known distribution of x by F, with probability density function f. Let $p(y) \in \{0, 1\}$ denote the voter's posterior beliefs regarding the probability that the politician exerted effort, conditional on observing y, and $p^*(y) \in \{0, 1\}$ denote the true posterior probability. We restrict our attention to degenerate beliefs and pure strategies for simplicity. The game tree is presented in Figure 2.[2]

For the moment, let us take the voter's beliefs as given. We are interested in the politician's incentives as a function of these beliefs, $p(y)$. In order to understand these incentives, we examine the problem faced by the politician *in the case where the beliefs are known*. That is, what is the best possible strategy for the politician (i.e., when should she work and when should she not work as a function of x) given what the voter will infer? Given a stochastic realization x, the politician should exert effort if and only if, conditional on $y = x$, the voter will infer that the politician did not exert effort but, conditional on $y = x + b$, the voter will infer that effort was exerted. That is, for any belief $p(y)$ chosen by the voter and for

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[2]Depending on one's assumptions about F, there can be an uncountably infinite number of perfect Bayesian equilibria of this game. Briefly, perfect Bayesian equilibrium is a notion of equilibrium in which players' beliefs are "almost always" correct and, given his or her beliefs, no player has a unilateral deviation which strictly increases his or her own payoff.

Voter's payoff, Politician's Payoff

Voter Thinks Politician Worked — x+b, 1-c

Politician
works

Voter Thinks Politician Shirked — x+b, -c

Nature chooses x

Politician
shirks

Voter Thinks Politician Worked — x, 1

Voter Thinks Politician Shirked — x, 0
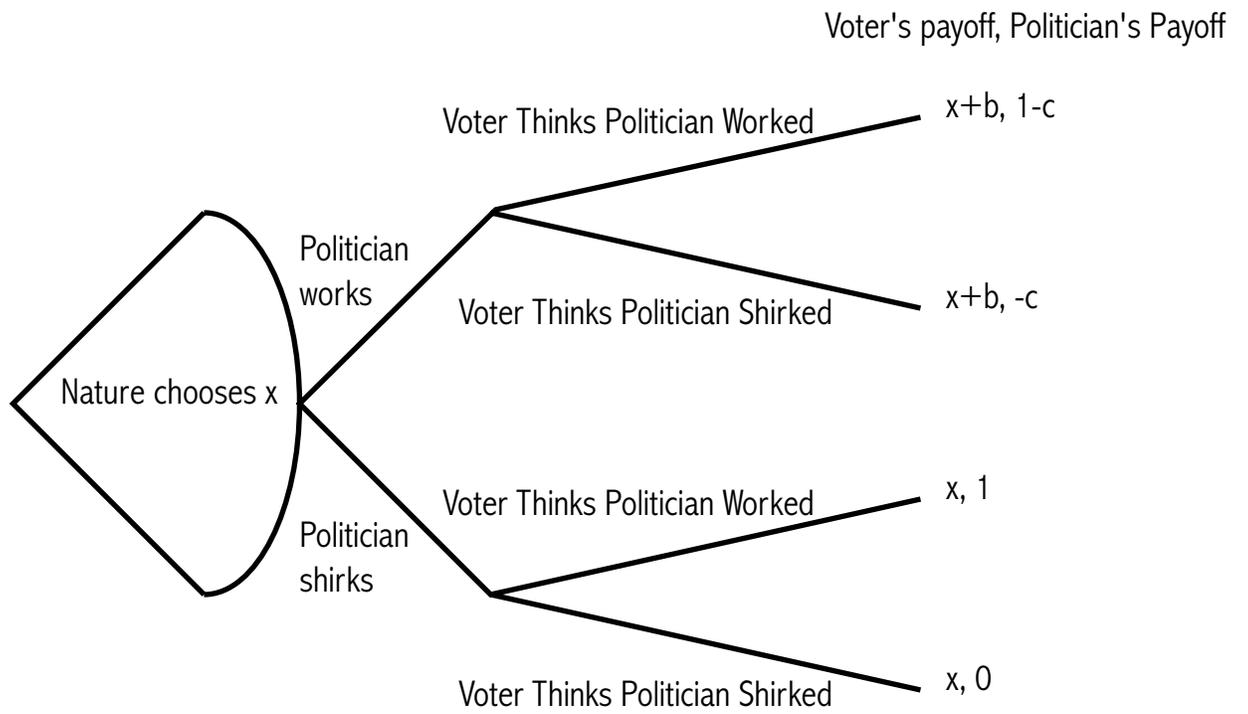
Figure 1: A Simple Principal-Agent Game

any $x \in \mathbb{R}$, the politician should work if and only if $p(x) = 0$ and $p(x + b) = 1$.

Realizing the politician's incentives and knowing b, the voter can choose her beliefs, p, so as to maximize the level of effort exerted by the politician. The voter's most preferred outcome is to have the politician always exert effort, regardless of the realization of x. Given that $c < b$, this is the "first best" outcome in terms of the voter's payoffs. It is simple to see that whenever the support of F is wider than b the first best outcome is impossible to implement as a Nash equilibrium. To deal with such cases, the value of a "second best" outcome is the highest level of effort achieved in a Nash equilibrium. Restricting attention to degenerate beliefs for the voter and pure effort strategies for the politician, such an equilibrium is defined as

$$\max_{p} \int_{\mathbf{R}} y g_p(y) dy,$$

where

$$g_p(y) = \begin{cases} 0 & \text{if } p(y + b) - p(y) = 1 \\ f(y) + f(y - b) & \text{if } p(y) - p(y - b) = 1 \\ f(y) & \text{otherwise.} \end{cases}$$

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The definition of g_p reflects the best responding behavior of the politician, conditional on the beliefs of the voter, p. An equivalent way to formulate the problem is to normalize it and maximize the difference between the payoffs offered by a program p and the "null" program, $p(y) = 0$ (i.e., never believing that the politician exerted effort). This problem is

$$\max_p \int_{\mathbf{R}} y(g_p(y) - f(y))dy,$$

or, equivalently,

$$\max_p E(p),$$

where

$$E(p) = \frac{1}{2} \int_{\mathbf{R}} |g_p(y) - f(y)| \, dy$$

denotes the probability of effort, given the politician's best response to p, the voter's beliefs. We now discuss how the voter's beliefs are formed.

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3 A Behavioral Model of Belief Formation

In this section, we provide a model of how voters form posterior beliefs about politician effort. As discussed in the introduction, one robust empirical feature of inference is the fundamental attribution error; this error is the overemphasis of human factors in the determination of observed outcomes. We now formally build this bias into our model of voter belief formation. By restricting our model to beliefs that are consistent with a specific inference bias (similar to the fundamental attribution error and correspondence bias), our analysis is positive, rather than normative as in many game theoretic models of politics, in nature. We now discuss what this bias implies about a voter's beliefs, p, in this model.

3.1 The voter bias

Our model represents an attempt to merge a robust finding from social psychology with a model of strategic interaction in a political context. It is desirable that the analysis assume that the agents are aware of the strategic situation. That is, we want to suppose that the voter and the politician are aware of how their individual choices jointly determine their individual payoffs. The most common means of including this awareness is by examining strategies (in this case, a prescription for

when the politician works and when the voter infers that the politician worked) that satisfy some notion of equilibrium. However, most game theoretic notions of equilibrium require that players' beliefs be correct (at least almost always). Our goal in this paper stands in opposition to such requirements, unfortunately. Specifically, we are faced with two alternatives. Either the voter's beliefs are not generally correct (due to the inference bias) *or* her inference maximizes her objective payoffs but is inconsistent with her internal (or, subjective) beliefs. In the latter case, any bias in the voter's judgment is not translated into her behavior. We choose the first alternative and impose a requirement called consistency (discussed in more detail below) on the voter's beliefs.[3]

In this paper we allow for the voter to believe that effort by the politician increases the voter's income by an amount, β, which is greater than the true amount, b. This relaxation represents only one possible parameterization of biases such as the fundamental attribution error and correspondence bias: the direct effect of an individuals' effort is believed to be larger than it truly is. In general, however, the proper description of the role of these biases in the formation of voters' beliefs is that the correlation between dispositional and personal characteristics of political institutions and voters' payoffs is believed to be higher than it truly is.

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[3]We also show below (using our experimental results) that this bias can indeed be detected in observed behavior, providing empirical support for our choice.

Our operationalization of the voter bias is very straight-forward. We suppose that E is a dummy variable equalling 1 if the politician exerts effort and that x is distributed according to a commonly known distribution F. Then, while the voter's payoff is given by

$$Y = bE + x,$$

the voter believes that her payoff is generated by

$$Y = \beta E + x,$$

where $\beta > b$ and E is unobserved by the voters.

We define the voter's beliefs to be *consistent* if, for any outcome x, $p(x) = 1$ implies $p(x - \beta) = p(x + \beta) = 0$. Beliefs not satisfying this condition for some outcome x are labeled *inconsistent*. Consistency of beliefs implies that the voter has no *a priori* reason to believe that her beliefs are wrong given that the politician is best responding to them. Inconsistent beliefs can be seen to be irrational by introspection on the part of the voter. Inconsistent beliefs lead the voter to draw incorrect inferences about the politician's effort level; the politician does not have incentive to incur the cost of effort in as many cases as he would if the

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voter's beliefs were consistent. Nevertheless, consistency of the voter's beliefs is not sufficient to ensure that the politician has an incentive to always exert costly effort on the voter's behalf. The maximum effort level (i.e., effort for all values of x) is not feasible due to the asymmetry of information assumed in this framework. Moreover, the second best (i.e., the maximum level of effort achievable in a perfect Bayesian equilibrium of voter beliefs and politician effort) is not possible with consistent beliefs whenever the voter's prior beliefs are characterized by the inference bias (i.e., $\beta \neq b$). In other words, if the voter's beliefs are consistent then the bias reduces the incentive of the politician to exert effort.[4] This is due to the tension between perception and introspection in this framework: obviously, a rational voter would prefer to have a correct understanding of the effect of the politician's effort on outcomes. Taking the flawed perception as given, however, achieving the highest level of politician effort that can be achieved without the bias requires an internally inconsistent inference by the voter because, if the voter's inference is characterized by the bias, then the voter derives a solution to Equation 2 with respect to some parameter $\beta > b$ (i.e., the definition of g_p is in terms of β instead of b, the true effect of work). In this case, it follows immediately that,

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[4]By adopting inconsistent beliefs, it is always possible for the voter to extract the second best level of effort from the politician. The duality of the problem implies, however, that adopting such beliefs would lead to an observational equivalence between a voter with inconsistent beliefs and incorrect perception and a voter with correct perception and consistent beliefs.

since the politician's true effect is b, the voter's beliefs will not induce greater levels of work than would be induced by the optimal beliefs with respect to the true parameter. That is, *the voter bias can never increase the voter's payoffs so long as the politician is optimally responding to the true environment*.

4 Experiments

A key assumption in the above analysis is that the voters are subject to a specific bias. In our model, voters over-attribute the cause of observed outcomes to elected officials, relative to the actual influence these officials have in determining outcomes. This assumption is based on a large body of research, discussed earlier, that shows that individuals are likely to over-attribute outcomes to individuals rather than to situational causes. However, in order to provide further support for this assumption, we conducted experiments to test whether this bias is present even in a simple laboratory situation where the effect of the elected official is known to be small relative to the situational cause.

The experiments consisted of several rounds of a simple game between a "leader" and several "voters." In each round, a random process determined an outcome of value to the voters. The leader observed this random outcome (but the

voters did not) and then decided whether to add to the value of voters at a cost to herself. The voters then observed the final outcome, which included both the random component and the leader's action, and attempted to determine whether or not the leader had added to their value. These experiments recreate the political economy environment in our model and also real-world situations in which voters, who do not fully observe the actions of elected officials, care only about whether these leader exerted costly effort on their behalf.

4.1 Experimental design

We conducted two types of sessions. In one kind, there was one leader and seven voters. There were three of these sessions. The other session was collected in a large undergraduate classroom and consisted of one leader and 45 voters. In the classroom session, 7 of the 45 voters were selected at random after the experiment to be the 7 voters who would receive actual earnings and whose actions would influence the payoffs of the leader. In this way, the payoffs and basic structure of the game remained constant between the two different types of sessions (in all four sessions, the leader's payoffs were based on the actions of seven voters). In the first type of session, subjects were paid their earnings in cash at the end of the experiment. In the other session, subjects were told that seven of the voters would

be randomly selected by the experimenter and these seven voters, plus the leader, would be paid at the beginning of the following class.

The random process in our model consisted of a roll of two twenty-sided dice. The outcome of interest to voters was the sum of the two dice (a number between 2 and 40), which represented the amount (in cents) that both voters and the leader received in that period. The distribution of this outcome is a "tent" distribution with mode at 21 (probability = 0.05) and least mass on the endpoints (2 and 40, probability = 0.0025). The leader rolled the die and was able to observe the outcome. The voters were not able to directly observe the outcome. This outcome can be thought of as part of some unidimensional measure of societal well-being – such as an index of the economy, crime, etc. – where the value represents the outcome in the absence of any effects of policy actions by the elected official.

After rolling the die and recording the outcome, the leader decided whether or not to add to the total received by voters. If the leader added to this total, then every voter received 5 additional cents and the leader incurred a cost of 20 cents. If the leader did not add to the total, then she did not incur any cost.

The voters did not observe whether or not the leader added to the roll of the dice. Following the leader's decision, the experimenter announced the total outcome (the roll, plus 5 if the leader added). Voters recorded this outcome, which

corresponded to the amount in cents that they received for that round. Voters then attempted to determine whether or not the leader added to the total. Voters guessed either "Yes" or "No" and received 50 additional cents if they correctly identified whether or not the leader had added to the total. Voters did not find out whether they had guessed correctly in any round until the end of the experiment.[5]

At the end of each round, the leader was informed of how many voters had voted "Yes," but not of their identities. The leader received 20 cents for every voter that voted "Yes." The incentives for the voters are such that voters want the leader to add to the total and want to be able to determine when the leader has added to this total. The incentives for leaders are such that they prefer every voter to believe that the leader worked without actually having to work. The payoff for leaders and voters are given by:

$$\pi_L = r - 20a + 20 \sum_i g_i$$

[5]The first session we conducted, as well as a pilot session not reported in this paper, included a second "opposition" leader who rolled the dice in each round and then announced whatever number he wanted to claim was the role of the dice. At the end of each round, voters voted whether to keep the leader from the previous round or replace this leader with the opposition leader. Voting to replace was costly in that, if the leader was replaced, then every voter who voted to replace was charged 5 cents. This was intended as a second, behavioral, measure of voter beliefs. However, while some voters voted to replace the leader and using this variable instead of voter guesses yields similar results, the leader was never actually replaced. Therefore, this was dropped from the remaining sessions.

$$\pi_{V_i} = r + 5a + 50|g_i - a|,$$

where r is equal to the outcome of the roll of the two dice, a is a binary variable equal to 1 if the leader adds to the total and 0 otherwise, and g_i is a binary variable equal to 1 if the voter guesses "Yes" and 0 if the voter guesses "No."

Each session consisted of 23 rounds of the above game, plus two practice rounds for which players were not paid. In the practice rounds, the experimenter instructed the leader whether or not to add and voters were informed of whether or not they had guessed correctly at the end of each of the rounds. The experiments were conducted using undergraduates at Carnegie Mellon University.

4.2   Results

Table 1 presents a summary of the results for each session.[6] The third column of the table contains the frequency with which the leader added in a particular session, while the fourth column contains the frequency with which voters guessed "Yes." The next column contains the correlation between total number of voters guessing "Yes" in a round and the actual action of the leader. The final two columns contain the correlations between the roll of the dice and the number of

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[6]The entire dataset is available at www.andrew.cmu.edu/user/rweber/data.htm.

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voters guessing "Yes" (column 6) and the actual behavior of the leader (column 7). The fifth column indicates that voters are not doing a particularly good job of guessing whether or not the leaders actually added – two out of four sessions have negative correlations between voters' guesses and what the leader actually did. Moreover, voters are relying too much on the role of the dice in predicting whether the leader added (column 6) relative to whether the leader actually did (column 7). For all sessions, the correlation in column 6 is greater than the one in column 7, indicating that voters treat the value of the roll as more diagnostic of whether the leader worked than it actually is.

This provides the first piece of support for our hypothesis that voters over-emphasize the role of outcomes relative to the actual ability of the leader to influence outcomes. Recall that the leader can only add 5 to the final outcome, meaning that the effect on the number that voters observe is not likely to be large. Since leaders are not more likely to add when the roll of the die is higher, then the outcome observed by voters is due mostly to this random process and much less so to the actions of the leader. However, voters behave as if the value of this outcome is more diagnostic of whether the leader actually worked than it is.

Session	n	mean a	mean g_i	corr($\sum_i g_i, a$)	corr($\sum_i g_i, r$)	corr(a, r)
1	8	0.65	0.57	0.52	0.79	0.35
2	8	0.61	0.73	-0.13	0.63	-0.59
3	8	0.57	0.66	-0.44	0.86	-0.69
4	46	0.48	0.53	0.31	0.85	-0.04

Table 1. Summary of results by session

Figure 1 provides additional support. Figure 1 presents the frequency with which leaders added to the total (Freq. Add) and with which voters guessed that they did (Freq. Yes), for each outcome observed by voters (r, plus 5 if the leader added). That is, conditional on a particular outcome (total) observed by voters, Figure 1 gives the frequency with which voters guessed "Yes" and the frequency with which leaders actually added to the total. The graph also presents the lines that minimize the sum of squared deviations from the actual data.[7] As Figure 1 indicates, voters are more likely to guess that a leader added when the total is higher, even though leaders were actually less likely to have added when the total

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[7]These lines are determined by the OLS estimates obtained from regressing Freq. Yes or Freq. Add on Total. The estimates include only the outcomes where total is between 7 and 40, since outside of this range voters can perfectly identify what action the leader took.

is higher. This is consistent with the hypothesis that voters treat higher outcomes as more indicative of leader "effort" than they actually are.

Table 2 also reveals further evidence of this bias in voter behavior. The summary statistics (averages of leader behavior and voter guesses) are divided for each session into rounds with low rolls (21 or below) and high rolls (above 21). As the results in the table indicate, leaders are less likely to add to the total (43% vs. 72%) when the roll is higher. Voters, however, are more likely to guess that the leader added to the total (77% vs. 47%) when the initial roll is higher.

Session	Roll	Number of rounds	mean a	mean g_i
1	Low	13	0.54	0.43
	High	10	0.80	0.76
2	Low	10	1.00	0.66
	High	13	0.31	0.78
3	Low	11	0.91	0.39
	High	12	0.25	0.90
4	Low	12	0.50	0.42
	High	11	0.45	0.63
Aggregate	Low	46	0.72	0.47
	High	46	0.43	0.77

Fig. 1. Frequencies of voter inferences and leader behavior by outcome

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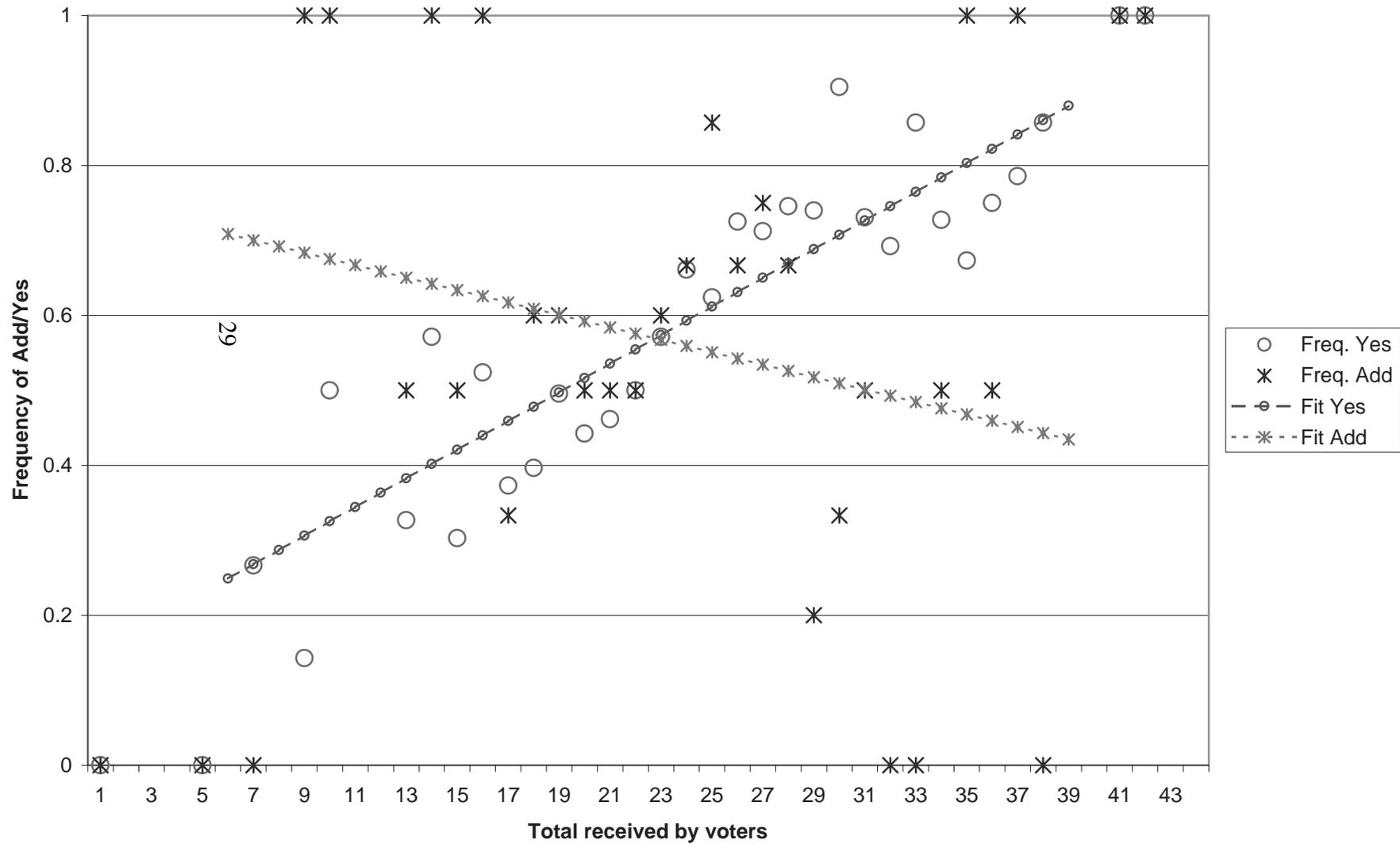
Table 2. Summary of leader and voter behavior by roll

Finally, evidence of the bias in voter behavior can also be seen in the results of several logistic regressions, shown in Table 3. The first regression indicates that leaders add to the total less when the initial roll is higher. The second regression indicates that voter guesses about whether or not the leader added to the total are predicted both by whether or not the leader actually added to the total and by the roll of the dice. In the final two regressions, the variables *Wrong Yes* and Wrong No are dummy variables equal to 1 if the voter incorrectly guessed Yes or incorrectly guessed No, respectively, and 0 otherwise. These two regressions indicate that voters are more likely to incorrectly believe that the leader added to the total when the total they observe is high and they are more likely to incorrectly believe that the leader did not add to the total when the total is low. All three regressions are consistent with the result that voters are overattributing high numbers to the leader having added and low numbers to the leader not having added.

Dependent variable:	Add[a]	Guess[ab]	Wrong Yes	Wrong No
Roll	−0.074***	0.115***		
	(0.284)	(0.010)		
Add		0.486***		
		(0.131)		
Total			0.041***	−0.024***
			(0.009)	(0.009)
Constant	1.839**	−4.620***	−4.107***	0.734
	(0.765)	(0.654)	(1.056)	(0.504)
N	92	1310	1445	1311
Log likelihood	-58.172	-737.513	-774.08	-668.43
Pseudo R^2	0.072	0.186	0.078	0.080

[a] - Regression includes fixed effects for session.

[b] - Regression omits observations where total < 7 or total > 40

* - p < 0.1; ** - p < 0.05; *** - p < 0.01

Table 3. Logistic regression results

5 Implications of the Voter Bias

While we argue that the experimental results presented above are consistent with the fundamental attribution error, we think that the bias we find can be characterized specifically. Voters are increasingly likely to believe that the politician exerted effort as the observed outcome increases. This bias reduces the overall incentive for the politician to work. Furthermore, if the voter's beliefs are not sufficiently sensitive to small changes in the observed outcome, then the politician may never possess an incentive to exert any effort at all. That is, voters simply giving more credit to the politician when outcomes are good than when they are bad does not necessarily imply that the politician has any incentive to improve the outcome.

Also, while not identical, the bias we observe in the experimental data is evocative of "pocketbook" voting: voters are more likely to give credit to the politician when times are good than when they are bad.[8] However, the credit or blame for the outcome more properly lies with the random process than with the effort exerted by the politician. Even in our experiments, this tendency was noted

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[8]There are, of course, several dimensions to pocketbook, or economic, voting. One key dimension which our experiments do not examine is the distinction between voting based on aggregate and personal economic outcomes, since all voters receive identical payoffs. An interesting extension of our experiments would be to subject individual payoffs to unobserved idiosyncratic perturbations in addition to the systematic shock, inform voters of their own payoffs and the average payoff received, and observe how voters' inferences.

by at least one of the leaders. Leaders did not work very often when outcomes were very good (with a few exceptions) and did not work when outcomes were very bad (again, with a few exceptions). Effort was most likely to be exerted when initial outcomes were slightly above average, implying that the politicians were somewhat sophisticated in expending effort.

The results reported in Table 3 directly speak to the question of electoral accountability as a means to screen out shirking politicians. When times are good, shirkers are less likely to be forced out of office while, conversely, even dedicated politicians are more likely to suffer the electorate's wrath in bad times. While not the most surprising finding, it brings up an important normative and positive question: is representative democracy inefficient? For example, the incentives are less present for more capable individuals to enter politics when times are bad– i.e., precisely when such individuals are most needed. Similarly, when times are good, the incentive to enter politics is high for all comers – individual ability and/or effort may not matter as much as it should. This pattern of incentives may very well result in only bad times representing a stable outcome.

Along the same lines, since politicians' electoral fates may be essentially beyond their control – being determined only by exogenous shocks – why would anyone seek a career in politics? Aside from the material advantages that success-

ful politicians may derive from their offices – which may not be large compared to the material rewards offered by management positions in the private sector of most modern democracies – what would drive an individual to surrender the success of his or her career to the vagaries of exogenous shocks? An interesting possibility is that politicians themselves – including policy-driven ones – fall victim to a self-referential form of the fundamental attribution error, known as the "illusion of control."[9] The illusion of control is characterized by people believing that they have more control over somewhat exogenously determined outcomes than they actually possess. Obviously, individuals with an illusion of control with respect to public policy should be more likely to consider careers in politics than other individuals, *ceteris paribus*.[10]

6 Conclusions

This paper represents three contributions to the positive theory of voting. First and most importantly, the findings of social psychology regarding evaluations of

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[9]Indeed, an argument could be made that policy-motivated individuals are predisposed towards possessing the illusion of control.

[10]Since the voter bias examined in this paper is similar to the fundamental attribution error – which has been demonstrated in economic settings such as the evaluation of management effectiveness in firms – perhaps the voter bias is simply a fact of life that must be faced anytime an individual is in a principal-agent situation.

individual performance and ability in noisy environments – principally the fundamental attribution error and correspondence bias – are discussed and introduced to the examination of voter behavior. Second, it is shown that the incentives for politicians to exert costly effort may be reduced when voters' belief formation is consistent with these judgment errors. Finally, experimental results are presented that are characterized by a bias consistent with both previous experimental findings and the model developed in this paper. The implications of this research are multifaceted: the robust cognitive biases discussed in this paper pose serious normative and positive questions for the study of representative democracy. Normatively, do representative institutions serve the public interest? For example, is the economic performance of representative democracy robust to voters' cognitive biases? An important positive question posed by this research is with regard to the selection effects such biases might induce in the candidates for public office, are the candidates for office during good times generally of a different quality from those during bad times? Similarly, can such selection effects lead to vicious cycles in representative democracies?

Finally, in addition to the substantive and theoretical findings presented here, this paper has attempted to make a point with respect to methodology. Specifically, the combination of social psychology, experimental methods, and formal

modeling represents a potent triad of approaches to the study of electoral behavior. It is our hope that this and other similar combinations are more extensively applied in the future.

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