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ALTRUISM AND THE DECISION TO VOTE

EXPLAINING AND TESTING HIGH VOTER TURNOUT

Richard Jankowski

ABSTRACT

A core problem at the foundation of rational-actor models for politics is the seeming irrationality of voting, i.e. that it is irrational for voters to vote and to be informed about politics. Myerson has shown that only low turnouts are feasible if we just assume citizens vote on the basis of self interest, and there is uncertainty as to the number of voters. I modify the standard analysis by arguing that individuals are motivated by weak altruistic considerations when deciding whether to vote. First, I present a formal analysis of voting that has a unique, symmetric Bayes–Nash equilibrium for the voting game. It is a mixed-strategy equilibrium which also specifies the conditions under which high turnouts (in excess of 50% of the potential voters) will result. Second, I present an empirical test of the hypothesis using a unique data set (the National Election Survey Pilot Study in 1995) which includes various measures of ‘humanitarianism.’ I am able to integrate that survey with the 1994 NES election survey to provide evidence that weak altruism is the single most important determinant of the decision to vote.

KEY WORDS • altruism • Bayes–Nash equilibrium • self interest • voter turnout

1. Introduction

A rational-actor analysis of politics should start with the individual citizen’s decision to participate in the political process. However, it is commonly argued under a rational choice theory going back to Downs (1957) that it is irrational for a citizen to vote and to acquire political information. Nevertheless, many rational-choice analyses of elections, parties, and interest groups start by assuming political participation is

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unproblematic. Green and Shapiro (1994) go so far as to argue that this conundrum is a fatal flaw in rational-choice analysis because the fact of large scale turnout contradicts the theory. This article attempts to resolve this apparent anomaly.

A standard remedy to the problem of participation and information is to posit a sense of civic duty on the part of the citizen (Riker and Ordershook 1968; Palfrey and Rosenthal 1985). This remedy is inadequate for a number of reasons. First, we need a more extensive elaboration of what is meant by duty. The current debate over altruism indicates that duty and altruism are complex phenomena, with different behavioral implications depending upon the definition used. Second, the problem with the civic duty (and related consumption theory) explanations is that they cannot explain a number of empirical facts of voting behavior.

There are three empirical facts that any theory of voting turnout should explain. One, voters frequently vote strategically. When their most-preferred candidate has little chance of winning, they vote for their second-most preferred candidate (Cain 1978; Abramson et al. 1992). Two, in the USA we observe that approximately 50% of eligible voters vote during presidential election years, approximately 30–35% vote in off-year elections, and 20–25% vote during state and local elections (Teixeira 1987). Three, we observe that the better educated and informed citizens have a higher propensity to vote. Wolfinger and Rosenstone (1980) argue that formal education is the most important variable in explaining differences in turnout in the USA. Jankowski (2002) argues that the inclusion of civic duty or a consumption benefit cannot explain all these phenomena.¹ Rather, any ‘successful’ analysis of voting must be instrumentalist.

Jankowski (2002) argues that the inclusion of altruistic benefits in the decision calculus solves the problem of voting in rational-choice theory. However, he does not show that either voting is an equilibrium strategy or that a high turnout results when altruism is included. I show both that a voting equilibrium exists and that it can be at a high-turnout level. Following Myerson (1998), I assume that population uncertainty characterizes the decision to vote. Then, a unique, symmetric Bayes–Nash equilibrium exists. And I demonstrate the conditions under which this equilibrium can generate the high rates of turnout we observe.

Lastly, I present an empirical test of the hypothesis which uses the 1995 NES Pilot Study, because it includes several measures of ‘humanitarianism.’ By integrating this survey with the 1994 NES election survey, I am able to present evidence that altruism does in fact play a key role in the decision to vote.

2. The Standard Calculus of Voting: Decision and Game-theoretic Analyses

To show that it is irrational to vote and to become informed about politics is fairly straightforward based upon expected utility analysis.² (A game-theoretic analysis results in somewhat different conclusions as I will presently discuss.) Assume that there are two candidates for office – C_A and C_B . B_1 is defined as the difference in personal benefit that a voter receives if candidate C_A is elected as opposed to C_B . The citizen can either vote in the election or abstain.³ There is some positive cost ($C > 0$) associated with the act of voting. Hence, the expected utility of the two actions is compared, and voting is preferred when equation (1) holds:

$$u(\text{vote } C_A) > u(\text{abstain}) \quad (1)$$

Thus, one votes when:

$$[p(C_A \text{ wins} | \text{vote } C_A) - p(C_A \text{ wins} | \text{abstain})] B_1 > C$$

A voter can influence the outcome of an election in two ways. First, their vote can overcome a tie between the candidates and produce a winner. Second, their vote can create a tie when the opposing candidate has a plurality of one vote. Hence, a random tie-breaking procedure gives the voter's preferred candidate a 50/50 chance of winning. If we define p_1 as the probability that citizen i 's vote for candidate C_A is decisive, then, the pivot probability, the expected utility of voting for citizen i is:

$$EU_i = \frac{p_1 B_1}{2} - C \quad (2)$$

And the citizen votes only when:

$$\frac{p_1 B_1}{2} > C$$

Given that p_1 is vanishingly small, it is irrational for citizens to vote even if B_1 is very large. The probability that a vote will be decisive is a function of two factors: the closeness of the election, and the number of voters. In a very close election with 100,000,000 voters, the probability that one's vote will be decisive is about 0.00008. But if the election is not very close, the probability that one's vote will be decisive becomes infinitesimally small (Owen and Grofman 1984).

The standard remedy for this irrationality of voting is to impute a sense of civic duty, D , to voters. Hence, the expected utility of voting becomes:

$$EU_i = \frac{p_1 B_1}{2} - C + D \quad (3)$$

Thus, anyone for whom $D > C$ votes, and anyone for whom $D < C$ does not vote.

However, it cannot be the case for everyone that it is irrational to vote. If no one else were voting, it would be rational for an individual citizen to vote because their single vote is decisive, and their benefit exceeds the costs in the example given. This case assumes complete information, i.e. everyone knows everyone else's costs, preferences and decisions as to whether to vote or abstain. Elections however are characterized by incomplete information. Ledyard (1984) and Palfrey and Rosenthal (1985) start with this basic insight by assuming that individuals have incomplete information as to each other's cost of voting. Moreover, they analyze the electoral competition as a game between two groups of voters. They then undertake a game-theoretic analysis and derive Bayes–Nash equilibria with positive rates of turnout.

Palfrey and Rosenthal's analysis (1985) produces three equilibria. Their two high turnout equilibria require complete information on the part of voters with regard to the number of leftist and rightist voters. A third equilibrium assumes incomplete information; it however produces only a low voter turnout.

Myerson (1998) argues that population uncertainty is the only realistic approach because there are hundreds of millions of potential voters. The adult population in the USA cannot possess complete information as to the number of leftist and rightist voters. Myerson shows that only a low-turnout equilibrium holds in cases of population uncertainty. In his example, with 2,000,000 potential left-wing voters, and 1,000,000 potential right-wing voters, a total of 32 individuals vote in equilibrium. Thus, the only logically consistent equilibrium is contradicted by the empirical fact of high turnouts that we observe in elections.

Ultimately, Palfrey and Rosenthal (1985: 64) return to the view of Riker and Ordeshook that in large elections the only individuals who vote are those who are motivated by civic duty. For those individuals for whom $D > C$, their dominant pure strategy is to always vote. They will vote irrespective of whether others vote or if their votes are pivotal. Hence, if 50% of Americans have a strong enough sense of civic duty, it can explain the 50% average turnout in US presidential elections. This high turnout based upon civic duty is not one of the three equilibria analyzed by Palfrey and Rosenthal; but it is logically consistent with their analysis.

However, Jankowski (2002) demonstrates that the civic duty or consumption voting explanations of high turnout are inconsistent with other facts of turnout, such as strategic voting, in the USA. I show that to obtain the observed high voter turnout levels, an instrumental analysis of voting is required, and this necessitates altruistic voting.

3. Altruism as Sympathy

Riker and Ordeshook's (1968) and Palfrey and Rosenthal's (1985) use of civic duty to analyze the decision to vote explicitly modifies the fundamental self-interest axiom of much rational-choice theory.⁴ The standard assumption that individuals act only out of self interest is not substantiated by observation, and hence, needs to be modified. US citizens give approximately 3% of their income annually to charity (Tullock 1983). Individuals regularly give blood to the American Red Cross on a voluntary basis. The outpouring of giving in the wake of 9/11 was substantial. Hence, more than civic duty motivates individuals. At least a weak form of altruism is evident in the behavior of individuals.

Sen (1977) notes that there are two alternative views of altruism. The one view is that altruism is based upon ethical norms (Sen calls this commitment); the other view is that it stems from a feeling of sympathy we experience when observing the state of others. This latter view does not require our personal assistance to the needy.⁵ The more common approach is to analyze human behavior using a sympathy-based notion of altruism, e.g. Becker (1976), Andreoni (1990), Stark (1995) and others. The conceptualization of altruism as sympathy goes back to Hume (1977) and Smith (2000). My analysis adopts the concept of altruism-as-sympathy because it provides the most parsimonious explanation consistent with the facts of voting.⁶

Altruism-as-sympathy entails that the donor's utility from her helping others or observing others' increased happiness is some function of the recipient's increased happiness. As noted by Sugden (1984) sympathy is a public good because we do not have to actually contribute to the well-being of others to experience the sympathy. Hence, the greater the happiness of the recipient, the greater the utility to other altruists.⁷ Altruism entails deriving utility when other people's well-being is increased. Hence, we can write an individual's utility function as:

$$U_i = U(x + \sum_{j \neq i} \alpha(x_i - x_j)x_j) \quad (4)$$

where x is individual i 's consumption of private goods, and x_j is the consumption of private goods by those other than individual i .⁸ Individuals derive happiness when the less fortunate are made better off. This is captured by the term $(x_i - x_j)$.⁹ Alpha is the weight we attach to the happiness of others, where $0 < \alpha < 1$. Clearly, there cannot be a dollar-for-dollar substitution between private consumption and the consumption of others in an individual's utility function. Otherwise, individuals would give most of their wealth to charity. The implicit weight for our own consumption is 1, and α captures the relative utility to oneself of others' consumption. An α less than zero would indicate that the individual is spiteful, i.e. one that derives happiness from the misery of others.

Lastly, equation (4) is net utility because the costs of various programs to help others are paid for by taxes imposed on citizens. Crucially, the declining marginal utility of income is assumed. Thus, policies that redistribute from the rich to the poor increase total utility for altruistic individuals.

Altruism enters the voting calculus in that candidates espouse programs that differentially help others. For example, a voter might believe that candidate A's platform will provide one billion dollars for the needy, relative to candidate B. Hence, I define B_2 as the benefit to voter i from seeing others' increased happiness through the adoption of candidate A's platform relative to that of candidate B. Thus, $B_2 = \sum_{j \neq i} \alpha(x_i - x_j)x_j$. Direct observation of the recipients' increased happiness is not necessary. For example, donors who give to tsunami relief, or who give blood, do not directly observe the increased happiness of the recipients. The donors have expectations as to the impact of their donations. Thus, the modified voting equation is:

$$EU_i = \frac{p_1[B_1 + B_2]}{2} - C + D \quad (5)$$

Now with sympathetic altruism, expected benefits can exceed costs, $p(B_2)/2 > C$. B_2 can be sufficiently large so as to counterbalance the small probability that one's vote will be decisive. For example, if the net benefit to others from candidate A's program is one billion dollars in extra welfare expenditure, then even if $p = 1/100,000,000$, the expected benefit (\$5) will exceed the costs of voting. Since the altruistic benefit from government policies can run into the billions of dollars, voting even with very low probabilities of being decisive is very robust.

It is important to note that fiscal conservatives can also be viewed as altruists. If they believe a candidate's program to eliminate wasteful welfare programs will save billions of tax dollars for fellow citizens, then their interest in reducing welfare payments for everyone can also be considered

as pure altruism. Moreover, not everyone is altruistic, nor has the same degree of altruism, even if they are altruistic. Some individuals, such as Mother Teresa, are willing to give their entire lives to helping others. At the other extreme, there are those, such as Scrooge, who experience unhappiness when others are happy. Most human beings fall in between Mother Teresa and Scrooge. But, for purposes of mathematical tractability, I assume that all individuals have the same level of altruism.

It is important to note that I am assuming that individuals are characterized by 'weak' altruism. In this, I am following Hume in that he argued that individuals are motivated by both self interest and 'limited generosity.' This assumption is buttressed by the finding that individuals give only about 3% of their income to charity. Most of us are not Mother Teresa. Formally, weak altruism is expressed as a small α in equation (4).

We can now see that the expansion of the rational-actor model to include pure altruism can be the foundation to the solution of the problem of voting, and in particular, showing how a high turnout can result. It is still necessary to show that a high turnout equilibrium exists. This task entails two parts: (1) showing that an equilibrium exists; and (2) characterizing the equilibrium by showing the conditions under which a high turnout is feasible. But before turning to these questions, I want to first evaluate some alternative analyses that, in principle, could generate high turnout elections.

4. Alternative Views of Altruism and Non-self-interested Voting

Besides altruism as sympathy, other types of non-self-interested motives can affect voter turnout. Fiorina (1976), Brennan and Lomasky (1994) and Aldrich (1997) have analyzed the decision to vote from the perspective of expressive voting. Expressive voting is when one votes simply as a means of expressing a preference in and of itself. It is analogous to cheering at a baseball game. Conversely, Palfrey and Rosenthal (1985) have continued in the vein of Riker and Ordeshook (1968) and Downs (1957) by emphasizing the importance of civic duty to voters.

Analytically, civic duty and expressive voting can be thought of as identical because they are non-instrumentalist motives for voting. They differ in terms of what is the underlying motivation: either a sense of duty or expressing oneself. They both are consumption theories of voting. Any citizen for whom civic duty or the expressive benefit from voting is greater than the cost of voting will vote, irrespective of their chances of affecting the outcome of an election.

There has been some attempt to put more content into expressive voting. Aldrich (1997: 385–6) argues expressive voting is more likely when candidates differ markedly. But, his analysis cannot explain strategic voting. The definition of one's most preferred candidate is that candidate whose election produces the greatest utility for oneself. Hence, under Aldrich's formulation, one should vote for one's most preferred candidate irrespective of the probability that they will get elected.

There are two primary limitations of the non-instrumental analyses of voting. First, in the case of civic duty, empirical tests of voter motivation indicate that civic duty can only explain about 5% of the turnout (Rosenstone and Hansen, 1993). Second, Jankowski (2002) shows that non-instrumental motives cannot explain a number of empirical facts of voting. For example, voters regularly engage in strategic voting. When their most-preferred candidate has little or no chance of winning an election, voters vote for a less-preferred candidate. For these reasons, an alternative to non-instrumental motives is necessary.¹⁰

This leaves the last alternative to sympathetic altruism as voting because of moral obligation, what Sen calls commitment. Fehr and Schmidt (1999) and Bolton and Ochelfelt (2000) have presented formal theories of ethical giving. In addition, there are a wide variety of philosophical theories, e.g. Kantian, Rawlsian, utilitarian etc., which might have implications for voting. But, to my knowledge, there is no published theory of voting based on ethical imperatives.¹¹ Feddersen (2004) argues for such a theory since it might solve the turnout problem. It would be helpful if theories along this line were developed. As noted, Sen (1977) differentiates between sympathy and commitment, the latter of which entails an ethical component. Because I reject simple self-interest, I argue that a theory of commitment or ethical voting which generates testable predications is needed. It would allow us to empirically differentiate between sympathy or commitment, if the two analyses have different predictions. But, until such a theory is developed, from the wide variety of ethical theories, we can only test the altruistic theory, which I present within. Thus, the absence of any ethical theories of voting is an important lacuna in the literature.

5. A Game-theoretic Model of Altruistic Voting

Before undertaking the game-theoretic analysis, an additional modification of the basic voting calculus model is required. Following Myerson (1998, 2000), I assume that the game is characterized by incomplete information,

and in particular, by population uncertainty. That is the number of voters that support the alternative candidates is unknown. Thus, my analysis differs from Palfrey and Rosenthal (1985) and Ledyard (1984) who define two teams of voters (leftists and rightists) and assume everyone knows how many leftist and rightist voters there are.¹²

The reasons for the incomplete information can be many. Players do not know: (1) the outcome function of the game; (2) other players' utility functions; and (3) their own or some other players' strategy spaces. Any private information possessed by one or some actors, but not common information to all players, creates the problem of incomplete information. Hence, we must be careful in specifying what is (are) the source(s) of incomplete information. In the case of voting, there are several possible reasons for incomplete information. Players might demonstrate different degrees of altruism, warm-glow benefit, contribution levels, or the total number of players in each group can all be unknown to the players. To simplify the analysis, I follow Myerson (1998) in making population uncertainty the sole source of incomplete information, and I assume that the population uncertainty takes a Poisson distribution.

Following Harsanyi, we can transform the game of incomplete information into one of imperfect information by positing that nature creates different types of individuals, i.e. leftist and rightist voters. Thus, there is a set of types (T), with $t = 1, 2$. The total number of voters is unknown, and the number of individuals of each of the types is unknown. All that is known is that the distribution of the number of individuals of each type is Poisson. Thus, we can define Q as the probability distribution for the set of types of voters. It specifies the number of voters of each t in the game. For a Poisson random variable with mean λ , the random variable equals any nonnegative integer k with probability:

$$p(k|\lambda) = e^{-\lambda}\lambda^k/k!$$

Furthermore, to have a game of imperfect information, we assume that the number of each type (the two types are leftist or rightist voters) is independently and identically distributed. It is clear that the set of types (T) is non-empty, and we can quite sensibly assume that it is finite.

The independent assumption also means that the aggregation property of a Poisson distributions holds. Thus, the sum of independent random variables, here for each type, is also a Poisson random variable. This property will be very useful in establishing equilibrium and other characteristics.

Having argued that we must modify previous analyses by including a modicum of altruism in the voting decision calculus, the question

becomes does an equilibrium exist for this modified voting game, and what are its characteristics? To show that an equilibrium to the voting game must exist, we must specify the action set available to the players, the utility functions of the players, and then link them to the population uncertainty. First, I define an action set (A) for the members of the groups. I assume further that this action set is the same for all groups. Moreover, this set is finite and has at least two elements, to vote and to abstain.

Second, the utility payoff for each player is a function of three elements: the player's t ; the player's action, a ; and the number of other players choosing the various options, x . Thus the utility function $U(t, a, x)$ is defined and we have a game with population in (Q, T, A, U) . Thus, we can prove the following theorem.

Theorem 1 Any game with population uncertainty (Q, T, A, U) as defined above, and where T and A are finite (as above) and U is bounded, must have at least one equilibrium.

The existence of a fixed point or equilibrium to this game requires (following Kakutani's theorem): (1) that the strategy set, a , for every player is convex, closed and bounded; and (2) that each player's utility function is both continuous in a , and concave in the i th player's strategy, a_i , holding the other players' strategies, a_j as fixed. Since both of these conditions hold, a fixed-point exists. Note that one of the strategies may be a mixed Bayesian strategy.

5.1 Characterizing the Equilibrium

Showing that an equilibrium exists is only a first step in the analysis of the contribution game. We want to characterize this equilibrium. To characterize the equilibrium (a) of this game, we return to the cost-benefit analysis of voting as represented by equation (5). The equilibrium, besides existing, has three characteristics: it is symmetric, it is a mixed-strategy equilibrium, and it is unique. A game is symmetric if all players of the same type adopt the same strategy. Palfrey and Rosenthal's (1985) analysis generates both high and low turnout equilibria. They allow for asymmetric, pure-strategy equilibria. Hence, different voters of the same type will either vote or abstain as a pure strategy. They start with an electorate of 1,000,000 rightists and 2,000,000 leftists. One equilibrium entails all rightist voting, and the leftists being divided into two subgroups of equal size. One subgroup of leftists votes, and one subgroup abstains. Each individual member of the group must know if they

are to vote or abstain, and the number of voters in each group. Clearly, such an equilibrium requires extensive coordination which is unrealistic in an election with a voting base in the millions. Myerson (1998) shows that with population uncertainty, only the low-turnout equilibrium holds, and it requires symmetric strategies.

In addition, the equilibrium from the population uncertainty game must be a mixed-strategy equilibrium. This is clear from the given condition that this equilibrium is symmetric. The only pure strategies available to all members of either group are to vote or to abstain. Clearly, not voting is not an equilibrium. Likewise, everyone voting is not a symmetric equilibrium when there is population uncertainty, i.e. when members of each group do not know the exact number of individuals voting, and when the two groups are of different size. Therefore, only mixed-strategy equilibria are feasible.

Lastly, the equilibrium of this game is unique. The proof of uniqueness is fairly straightforward. Myerson (1998: 391, 2000) provides the proof for uniqueness in large Poisson games.

5.2 A High-turnout Equilibrium

Since the equilibrium is symmetric, mixed and unique, I turn to the central question: can altruism explain the high turnouts we observe in elections? Assume that there is an election with two candidates, one a leftist and the other a rightist. The two types of voters cast ballots for the candidates they prefer. In case of a tie, there is a coin toss to determine the winner.

A leftist voter is pivotal in two cases. One, without the leftist type's vote, there is a tie, and the rightist candidate wins in a coin toss. Two, without leftist voters voting, the rightist candidate wins, although the leftist candidate would have won in a coin toss. The population uncertainty assumption entails that we do not know the number of each type of voter, but rather, that the numbers of leftist and rightist voters are independent Poisson random variables.¹³ Hence, each potential leftist voter's pivot probability is given by:

$$\sum_{k=0}^{\infty} \left(\frac{e^{-100000000\rho} (100000000 \rho)^k}{k!} \right) \left(\frac{e^{-100000000\lambda} (100000000 \lambda)^k}{k!} \right) \left(1 + \frac{100000000 \lambda}{(k + 1)} \right) (1/2) \tag{6}$$

A comparable pivot probability is given for rightist voters:

$$\sum_{k=0}^{\infty} \left(\frac{e^{-100000000\rho} (100000000 \rho)^k}{k!} \right) \left(\frac{e^{-100000000\lambda} (100000000 \lambda)^k}{k!} \right) \left(1 + \frac{100000000 \rho}{(k+1)} \right) (1/2) \tag{7}$$

The leftist voters vote with probability λ and the rightist voters vote with probability ρ . In a mixed-strategy equilibrium these probabilities are the randomization probabilities adopted by the members of the two types of voters that produce a Bayes–Nash equilibrium. These randomization strategies result in the individuals of each type being exactly indifferent between voting and abstaining. There are no pure-strategy equilibria when we have population uncertainty.

Next, we define the benefit from voting solely in terms of self interest as in equation #1, and rewrite it as the pivot probability equal to the cost–benefit ratio:

$$p = C/B_1 \tag{8}$$

This pivot probability is then set equal to 0.05 (the cost–benefit ratio) to represent a realistic measure of costs relative to private benefit. This value is the same as adopted by Palfrey and Rosenthal (1985) and Myerson (1998) to capture the cost–benefit ratio when only self-interest motivates the voters.

To determine the equilibrium turnout levels by the two types of voters (λ and ρ) we solve for them simultaneously or set both pivot probabilities equal to 0.05. To solve for the Poisson pivot probabilities, I use an approximation developed by Myerson (2000).¹⁴ This approximation is given by:

$$\sum_{k=0}^{\infty} \left(\frac{e^{-\alpha} \alpha^k}{k!} \right) \left(\frac{e^{-\beta} \beta^k}{k!} \right) \left(1 + \frac{\beta}{(k+1)} \right) (1/2) \approx \frac{e^{-(\alpha+\beta-2\sqrt{\alpha\beta})}}{4\sqrt{\pi\sqrt{\alpha\beta}}} \left(\frac{\sqrt{\alpha} + \sqrt{\beta}}{\sqrt{\alpha}} \right) \tag{9}$$

The α and β parameters are the means of the Poisson distributions for the two groups. They are equal to $N_1\lambda$ and $N_2\rho$, respectively. I solve equation (9) for the equilibrium randomization strategies of the group

members. If $N_1\lambda = N_2\rho$, then the approximation for the pivot probability reduces to:

$$\frac{1}{2\sqrt{\pi N_1\lambda}} \quad (10)$$

Setting this equal to $C/B = 0.05$, I obtain:

$$\frac{1}{2\sqrt{\pi N_1\lambda}} = 0.05 \quad (11)$$

Thus, $N_1\lambda = 31.83$. Hence, if there are one hundred million members in each group, approximately 32 individuals from each group will vote. Thus, the turnout rate is not even remotely close to those observed turnout rates, which are approximately 50% in US presidential election years.

To obtain a high turnout rate, we must include altruistic benefits in the cost–benefit analysis of voters. Hence, I return to the pure altruistic formulation as found in equation (5). To obtain a turnout of approximately 49.7%, I calculated that a ratio of costs to benefits of approximately 0.00004 is required. Thus, if the cost of voting is approximately five dollars, the benefit per voter must be approximately US\$125,000. This condition to produce a high-turnout level of voting can only be supported by altruistic benefits.

It might be argued that a US\$125,000 benefit per voter is within the realm of self-interest, and hence, no appeal to altruism is necessary. However, the US\$125,000 is just a lower bound on the required benefit. The implicit assumption of the analysis, until now, has been that there is a single policymaker. In democracies there are multiple policymakers, i.e. the legislators, the executive, the bureaucrats and even the courts. The probability that one's vote is decisive in determining policy must be multiplied by the probability that the elected official, for whom one is voting, is decisive in the policymaking arena. For example, if the elected representative has a 1 in 1000 chance of being decisive in the policymaking arena, i.e., obtaining one's desired policy outcomes, then the benefit required is US\$125,000,000 as opposed to US\$125,000 in the single policymaker case.

The probability that one's vote is decisive from a policy perspective is substantially less than the probability that one's vote is decisive in the vote for a single representative. Hence, the required benefit to make it rational to vote in the multiple policymaker case is higher than in the single policymaker case, when the policy benefits are the same. Thus, the US\$125,000 benefit required is just an extreme lower bound. The

actual benefit may even entail tens of millions or billions of dollars of value. Government policies to help the poor run into the hundreds of billions of dollars a year. Thus, even with an infinitesimally small probability of affecting government policy, the expected benefit of voting would exceed the costs of voting. Only an altruistic motivation can support such an extensive expected benefit from voting.¹⁵

The exact probability that one's vote is decisive and that the elected representative is decisive in the policymaking process varies from election to election as the number of offices up for election varies. Thus, I do not attempt an exact calculation of this probability in this paper as it will vary with elections.¹⁶

The intuition behind this finding is that as the altruistic benefit increases from voting, the equilibrium probability for voting increases. This probability is the randomization strategy between voting and abstaining. Thus, even though the probability of being pivotal declines, the probability of voting increases as the benefit ($B_1 + B_2$) increases, holding C constant. Thus, the inclusion of altruistic benefits does enable us to explain high turnouts in elections.

Figure 1 plots the cost–benefit ratio required (on the vertical axis) to produce a voting equilibrium, as the number of voters per group, N , varies from one million to one hundred million, and the probability of voting, L , varies from 0.00 to 0.70. The product of N and the probability of contributing gives us the total number of contributors from each type or group. As can be seen, as the benefits increase (i.e. the cost–benefit ratio decreases) the probability of voting increases.

The analysis above assumes that the two groups have the same number of potential members. I now turn to the case where the two groups are of different membership size, i.e., $N_1 \neq N_2$. Changing the size of the two groups does not affect the equilibrium number of voters. The intuition behind this is fairly straightforward to see. Since both groups use mixed-strategies in determining whether to vote, they randomize so that the other group's members are indifferent between voting and abstaining. Hence, both groups are indifferent in equilibrium only when the expected number of voters from either group is the same. For this to occur, the smaller group must assign a higher probability of voting than the larger group to offset the larger group's size.¹⁷

This adjustment is evident from equation (9). The means (α and β) of the Poisson distributions for the two groups are equal to $N_1\lambda$ and $N_2\rho$, respectively. The means must be equal in equilibrium. Hence, if one group is larger than the other, the randomization strategy of the members of the groups (α and β , respectively) must adjust to compensate for the

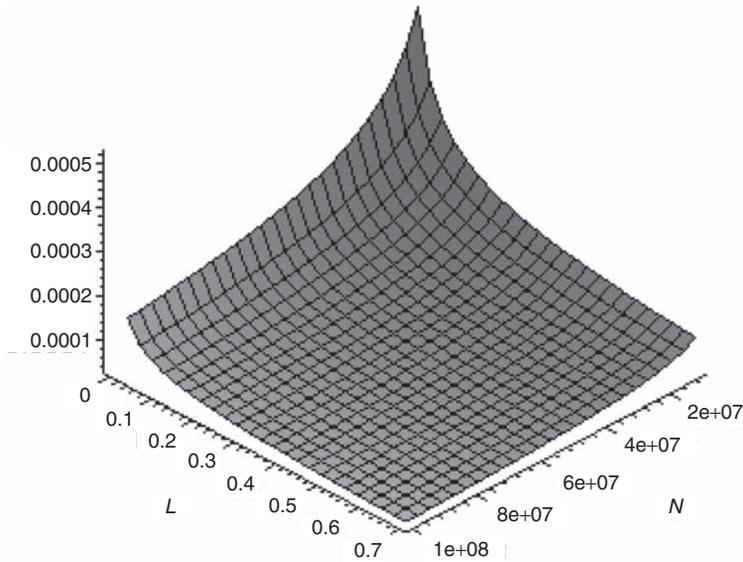


Figure 1. Mixed-strategy voting probability as a function of the number of voters and cost-benefit ratio

group size. Thus, if group one is larger, group two must randomize with a higher probability of voting. Thus, relative group size differences do not affect the prior analysis derived from the case of groups of equal size.

Thus, I have shown that voting has a mixed-strategy equilibrium, and that high turnouts in elections are feasible if we assume an altruistic benefit from voting. Empirical testing of any theory is necessary in any scientific analysis. Hence, I now turn to the testing stage of my analysis.

6. An Empirical Test

A number of researchers have been testing the role of altruism in various settings. For example, Putnam (1998) notes that there has been a decline in altruism, starting in the early 1960s, that coincides with the decline in civic engagement and voting turnout. Feldman and Steenberger (2001), Fong (2001) and Russell et al. (2003) analyze support for welfare programs by differentiating between self-interested and altruistic motivations.

To my knowledge, there have been no empirical tests linking voter turnout and altruism. One of the reasons for this lacuna is that measures of altruism are lacking in voting surveys, which are the basic tool used in analyzing voter turnout. However, the 1995 Pilot Study for the American National Election Study incorporates 11 questions specifically designed to measure 'humanitarianism.' These measures are only ordinal preference relations, but they allow me to test for a link between altruism and turnout.

The statistical test herein is at core a logistic regression relating the decision to vote and the degree to which the individuals espouse altruistic sentiments. The dependent variable is a measure of whether the respondent voted or abstained in the 1994 elections.¹⁸ The coding of the responses is: 0 = voted; 1 = abstained. I use the original NES coding which might make for confusion later on. I will call attention to the coding when this possibility arises.

The primary independent variable is a measure of the altruism expressed by the respondents. The eleven questions of the 1995 Pilot Study fall into two categories. There are questions which elicit a simple dichotomous response (agree/disagree) to humanitarian concerns, and questions which elicit a five-point ordinal response to humanitarian concerns. The five potential responses to these questions are: agree strongly; agree somewhat; neither agree nor disagree; disagree somewhat; and disagree strongly. The five-point scale responses are preferable because they elicit the intensity of one's altruism. The NES coding of responses is: 1 = strongly agree; 2 = somewhat agree; 3 = neither agree nor disagree; 4 = somewhat disagree; and 5 = strongly disagree.

The actual questions also vary from what I characterize as eliciting strong versus weak altruism. Thus, the wording of the three questions is: (Q1) 'One should always find ways to help others less fortunate than oneself'; (Q2) 'The dignity and well-being of all should be the most important concerns in any society'; and (Q4) 'All people who are unable to provide for their own needs should be helped by others.'

These three questions I consider as eliciting a sense of strong altruism because they include the phrases 'one should always' and 'the most important.'¹⁹ By contrast, Q3 is stated as: 'One of the problems of today's society is that people are often not kind enough to others.' This question is more akin to what I consider weak altruism because it does not make the helping of others the most important consideration. Hence, as I noted above, weak altruism is hypothesized to be the best predictor of voting turnout. And weak altruism is captured by Q3.

My interpretation of which questions reflect weak versus strong altruism is supported by the percentages of individuals espousing strong agreement

with the question. One would expect that the weakest form of altruism would have the broadest base of support. Question 4 elicits the weakest support as only 40.2% of the respondents strongly agree with its sentiment. Question 1 elicits support by 50% of the respondents; and Q2 elicits a 51.6% support level. By contrast, Q3 is strongly supported by 67.6% of the respondents.

For altruism to be a factor affecting turnout, it must be the case that both groups of voters in the formal analysis, Democratic and Republican voters, be altruistic. But it is sometimes argued that Democrats are ‘bleeding heart liberals’; while Republicans are ‘cold hearted conservatives.’ Table 1 presents the percentage support of strong and weak, Democrats and Republicans, who strongly agree with humanitarianism Q1–4. The NES asks individuals if they identify themselves as Democrats, Republicans or Independents. It then asks those who identified themselves with either party whether they are strong or weak supporters of that party. Two patterns are evident in the data.

The first pattern is that strong party identifiers exhibit a stronger sense of altruism than weak party identifiers for all the measures of altruism. Party attachments seem to be mediated by one’s sense of altruism. It is conjectured that altruistic motives promote allegiance to a political party. Most forms of political participation are, from a cost–benefit analysis, irrational if one’s only motivation is self interest.

The second pattern is that there is little difference between Democrats and Republicans in terms of weak altruism (Q3); 75.7% of strong Democrats strongly support it and 71.2% of strong Republicans. However, there is a difference between Democrats and Republicans with regard to strong altruism. The most extreme case being Q2, which has 75.7% of strong Democrats agreeing, but only 35.3% of strong Republicans. There are ‘compassionate conservatives,’ which is necessary for the formal model to hold, although they are only weak altruists.

One additional modification of the altruism measure is needed to test the basic hypothesis. Being an altruistic individual, it is still not rational

Table 1. Democratic versus Republican support for altruism

	<i>Strong Democrats (%)</i>	<i>Weak Democrats (%)</i>	<i>Weak Republicans (%)</i>	<i>Strong Republicans (%)</i>
Question 1	64.9	44.2	35.7	56.9
Question 2	75.7	44.2	21.4	35.3
Question 4	59.5	33.3	25.0	34.6
Question 3	75.7	62.8	46.4	71.2

to vote if one does not perceive a difference between the parties or candidates running for office. Altruism would then be akin to civic duty, i.e. a consumption theory of voting, rather than the instrumental version presented in my formal analysis. To capture this instrumental aspect of altruistic voting, I created an interactive variable: PERCEIVED PARTY DIFFERENCE (PARTY DIFF)*ALTRUISM.

It is hypothesized that the two interactive terms by themselves will not affect the decision to vote. Thus, if an individual perceives a difference between the two parties, but is motivated purely by self interest, she will abstain from voting because her expected benefit from voting is less than the cost.

The 1994 NES survey asked respondents if they perceived a difference between the Republican and Democratic parties. The coding of the responses is: 1 = perceives a difference, 5 = perceives no difference. Thus, we have a dichotomous measure of the perception of party difference. Clearly, a cardinal measure or at least a scaled, ordinal measure is to be preferred, because if the perceived difference is small, it would be irrational to vote. But we must do with what is available.

Therefore, the central hypothesis that altruism explains voter turnout is tested when the coefficient relating the interactive version of altruism (PARTY DIFF*ALTRUISM) with turnout is positive. The expected sign is positive, given the coding of the variables. Voting is coded as 1, strong agreement with the altruism measure is coded as 1 and perception of a difference between parties is coded as 1.

Other factors might affect voter turnout. Hence, I reviewed the literature and found additional control variables for the statistical analysis. The most common factors cited to affect turnout are: age, income and education. Voting turnout clearly increases with age. Education and income also have a positive impact on turnout (see, e.g. Teixeira 1987). Thus, I include all three as control variables in the analysis. (All variables come from the 1994 NES or 1995 NES Pilot survey and specification of variables and their description are in the Appendix.)

In addition, Uhlaner (1989) and Rosenstone and Hansen (1993) argue that mobilization by parties and religious groups induces individuals to vote. I include two measures of whether individuals were contacted, by political parties and by religious groups, to control for mobilization effects. Respondents were asked if they were contacted by political parties, and by religious or moral groups, and encouraged to vote.

Lastly, I include two other controls. The first measure is that of 'external political efficacy,' i.e. the belief that the political authorities will respond to attempts to influence them, which Teixeira and Rosenstone and Hanson found to affect turnout. The second measure is that of the strength

of party attachment. The coding follows the discussion of party identification above. Aldrich (1993) argues that from a rational-choice perspective, party attachment should increase turnout because it reduces the information costs of voting. Many studies, starting with ‘The American Voter’ have found a relationship between party attachment and turnout.

Table 2 presents the results from a logistic regression analysis of the hypothesis. The dependent variable is always the decision to vote or abstain. A simple *t*-test for the coefficient of the interactive term is

Table 2. Logistic regression analyzing role of altruism in turnout dependent variable: respondent voted in 1994 Election

		<i>Altruism</i> <i>Q3</i>	<i>Altruism</i> <i>Q1</i>	<i>Altruism</i> <i>Q2</i>	<i>Altruism</i> <i>Q4</i>	<i>Altruism</i> <i>Q3</i>
Age	-.032*** (.006)	-.044*** (.012)	-.041*** (.012)	-.041*** (.012)	-.039*** (.012)	-.043*** (.012)
Education	-.228*** (.055)	-.162* (.076)	-.181* (.075)	-.177* (.076)	-.187* (.075)	-.156* (.078)
Income	-.031 (.021)	-.083* (.033)	-.078* (.032)	-.082* (.033)	-.076* (.032)	-.083* (.033)
Party mobilization	0.447*** (.087)	0.510*** (.130)	.474*** (.123)	.465*** (.124)	.477*** (.123)	.488*** (.127)
Religious group mobility	0.267* (.124)	.549* (.273)	.557* (.267)	.555* (.268)	.554* (.267)	.543* (.270)
External efficacy	-.179 (.136)	-.120 (.090)	-.121 (.088)	-.108 (.089)	-.111 (.088)	-.132 (.090)
Partisan attachment	.178 (.136)	-.255 (.206)	-.218 (.207)	-.189 (.201)	-.211 (.203)	-.279 (.214)
Party Diff*		.137**	.034	.053	.038	—
Altruism		(.051)	(.037)	(.038)	(.034)	
Party Diff	.017 (.064)	—	—	—	—	.179 (.101)
Altruism 3		—	—	—	—	.435 (.233)
Constant	1.419 (1.183)	.413 (1.974)	.952 (1.927)	.773 (1.944)	.781 (1.935)	-.015 (2.009)
Pseudo-R ²	.326	.448	.413	.418	.418	.433

Notes: Binary logistic regression (maximum likelihood) analysis of decision to vote in 1994 elections. *N* = 208.

Standard errors in parentheses.

***probability less than 0.000

**probability less than 0.00

*probability less than 0.05

Pseudo-R² is Nagelkerke measure.

sufficient because it is hypothesized that the two terms by themselves will not impact the voting decision, i.e. their coefficients will be equal to zero (Ai and Norton 2003).²⁰

Four measures of altruism are used to test the hypothesis that altruistic motivation is a crucial motivator in the decision to vote, i.e. that voting is instrumental. Three versions of strong altruism (Q1, Q2 and Q4) are contrasted with one version of weak altruism (Q3).

As hypothesized, only weak altruism is significantly correlated with the decision to vote. All three measures of strong altruism are statistically insignificant. They do, however, have the correct sign. Why the measures of strong altruism are statistically insignificant remains an interesting puzzle. It requires further research to clear up.

In column 6, I report the test of a linear additive version of altruism and the perceived difference between parties. Neither measure is statistically significant. Only the interactive version is statistically significant. Since the question of whether one has a civic duty to vote has not been asked in a number of years, the additive version is an indirect test of the consumption hypothesis. If altruism had been statistically significant, it would have indicated that a sense of altruism by itself was correlated with turnout, even if there was no perceived difference between the parties. Hence, voting would be purely symbolic or brought on by civic duty because it would not be an instrumental act. But, this indirect test rejects the consumption hypothesis since neither is statistically significant.

Of the control variables age, income, education, and the two measures of mobilization, each perform as hypothesized and are statistically significant. Only external efficacy and party attachment do not have the hypothesized impact. External efficacy has the correct sign but is not even remotely significant. Partisan attachment is not only not statistically significant, it has the wrong sign.²¹ However, as suggested by Table 2, there is a relationship between weak altruism and partisan attachment. If I drop the interactive version of altruism, partisan attachment does become statistically significant, and it has the hypothesized sign. Hence, there is a degree of collinearity between the two measures. However, as seen in column 2, the interactive version of altruism dominates partisan attachment when the two are simultaneously estimated.

Overall, the hypothesized relationship between weak altruism and voting turnout is substantiated.²² Moreover, if I drop the altruism measure from the equation (column 1), the explained variance drops to 0.326. Thus, this single measure of altruism accounts for approximately one-quarter of the total explained variance. It is by far the best single predictor of voting turnout.

But, the goodness-of-fit measure is misleading when we test for mixed-strategies. Even individuals who are altruistically motivated will abstain if that is required in a mixed-strategy equilibrium. Thus, the goodness-of-fit measure and the regression coefficients will underestimate the impact of altruism in empirical tests. I have no way of judging the extensiveness of this underestimation.

Additional evidence for the altruism-voting hypothesis is provided by Fowler (2004). In a laboratory experiment, he used the excessive contribution in dictator games to measure the altruism of individuals. He then found the same interactive term was correlated with reported voting.²³

Indirect evidence is provided by Sigelman et al. (1985). Their study examined individual voting in ten successive elections. Only 3.4% of the individuals voted in all 10 elections; and only one in eight voted in five or more elections. Many people believe that voting is highly, serially correlated for individuals. But, these findings show a pattern more consistent with a mixed-strategy equilibrium where the probability of voting/abstaining is somewhat less than 50/50.

7. Discussion

Rational-choice theorists have attempted to explain voting and non-voting with a narrow self-interested model of human behavior. Their efforts have not been successful. As noted by Myerson (1998), they cannot explain the relatively high turnout rates in elections without recourse to unrealistic assumptions as to the knowledge of voters. Otherwise, their models, e.g. Palfrey and Rosenthal (1985), can only produce low turnouts of voters. When their analyses incorporate civic duty or expressive voting, then empirical problems arise. Jankowski (2002) notes that non-instrumental motives for voting cannot explain the standard facts of voting such as strategic voting. Lastly, Jankowski (2002) argues that the addition of altruistic benefits can produce high-turnout levels. However, he offers no analysis that high-turnout levels are equilibrium strategies with the addition of altruism.

I show that high voter-turnout rates are an equilibrium if we assume an altruistic motive on the part of voters. This altruism is a weak version of sympathy. Individuals are willing to donate only approximately 3% of their income to help others. Thus, altruism does not overwhelm self-interested behavior. Individuals would not, because of pure altruism, voluntarily pay their income taxes. The dominant force in human behavior is still self interest, but we cannot deny that altruism does play a limited

role in human motivation. Weak altruism has an effect in voting precisely because the costs of voting are so small.

Incorporating a weak form of pure altruism into the decision calculus also allows us to explain a number of empirical facts of voting. Pure altruistic voting by its very nature is instrumental. The altruistic benefit affects decisions with regard to voting. Jankowski (2002) notes that civic duty and expressive voting are non-instrumental in nature. Hence, they cannot explain a number of empirical facts of voting. For example, Abramson et al. (1992) and Cain (1978) present evidence that voters engage in strategic voting, i.e. when their most-preferred candidate has little chance of winning, they vote for their second-most preferred candidate. Neither civic duty nor expressive voting can explain strategic voting because it is instrumental. The reason one shifts from one's most preferred candidate to one's second-most preferred candidate is because it maximizes one's expected benefit in terms of policies. Thus, the expected benefits from the voting outcome, and not some sense of duty or expressive benefit, drives one's choice.

Sen (1977) argues that the inclusion of altruism in rational-actor models creates inconsistencies. Specifically, he argues that moral obligation entails a lexicographic ordering which undermines von Neumann–Morgenstern utility theory, and hence, expected utility analysis. Lexicographic orderings violate the continuity condition, and hence, cannot be represented by a utility function. Sen is correct with regard to strong moral obligations. However, his objection does not hold for altruism as sympathy.

Altruism as sympathy is compatible with formal, rational-choice theory to the extent that preference orderings are: transitive, complete and reflective. Andreoni and Miller (2002) show that altruism as sympathy meets these conditions and thus satisfies the general axioms of revealed preference. In addition, altruism as sympathy satisfies the continuity condition and hence is compatible with expected utility analysis.

For other rational-choice theorists (e.g. Olson, 1965) the inclusion of altruism eliminates the possibility of empirical testing. However, I have shown a direct test of altruistic voting is possible, and that the evidence supports the hypothesis.

My findings might also shed light on the question of why there has been a decline in turnout in the USA since the early 1960s. Teixeira (1987) and others have been addressing this question. They have focused upon the socio-economic characteristics of voters. My analysis of altruistic voting fits into Putnam's (1998) analysis of the decline of civic engagement in the USA. Putnam finds evidence of a decline in

altruistic giving during this period, but his analysis of declining civic engagement focuses upon generalized trust, which should not affect vote turnout. However, a decline in altruism, following from my analysis, would have the impact of reducing turnout. Hence, my interpretation is consistent with the known facts of the decline in turnout since the early 1960s.²⁴ It also raises the question of whether there is a link between generalized trust and altruism.

Altruistic voting explains a number of empirical facts of voting, and in particular, high turnout rates in elections. But this is not the only reason for incorporating altruism into rational-actor models. There is abundant evidence of altruistic behavior. As already noted, Tullock (1983) finds that Americans contribute approximately 3% of their income annually to charities. How many times have you given blood to the American Red Cross? Hoffman et al. (1994) and other experimental studies of individuals playing ultimatum and dictator games find that a fairly large number of individuals exhibit altruistic behavior.²⁵ Hence, the proper response to Green and Shapiro (1994) is to bring more realism into the rational-choice model by admitting and explicitly modeling altruistic behavior. The crucial feature of incorporating altruism as sympathy is that it does the least amount of damage to the standard rational-actor model. The functional form of altruism as sympathy is equivalent to the benefit derived from a normal good as seen in equation (4). Weak altruism is fully compatible with rational choice theory, and moreover, consistent with observed human behavior.

This study is just one step in establishing the altruism-voting hypothesis. Much more work still needs to be done. Empirically, better measures of altruism are needed. I was forced to use what was available from the NES. I would prefer a better measure of weak altruism.

Theoretically, ethical theories of voting need to be developed. As indicated by Sen (1977), commitment is an alternative view of altruism. But, any empirical test of sympathy versus commitment as the basis of voting requires that clear predictions be generated by an ethical theory of voting; and as noted, such a theory is still lacking.

Lastly, voting choices (like many decisions) are made in the context of incomplete information. In large n cases this problem is especially severe. Following Myerson (1998, 2000), I have modeled the incomplete information as one of population uncertainty. But, there are several other potential sources of incomplete information. The strength of altruism could vary among individuals; the costs of voting could vary. We cannot formally model the game with so many, unknown parameters, because the number of unknowns would exceed the number of equations. We

could attempt to theoretically generate additional constraints, but our understanding of human behavior is still not sufficiently nuanced to overcome this weakness in the formal modeling.

NOTES

1. There are several varieties of consumption theories of voting. Civic duty, expressive voting and warm-glow voting are the prime examples. The unifying characteristic is that individuals obtain utility from the very act of voting, rather than the outcome of the election as with instrumental voting.
2. For a good review of the literature on rational choice and turnout, see Aldrich (1993).
3. The citizen could vote for C_B . Because it does not affect the analysis, I exclude this possibility.
4. Some rational-choice theorists (e.g. Olson 1965) argue that altruistic motivation is incompatible with rational-choice theory. Other rational choice theorists argue that there is no incompatibility. I am clearly in the latter camp, and will take up this disagreement in the conclusion.
5. Sen (1977) argues that 'If the knowledge of the torture of others makes you sick, it is a case of sympathy; if it does not make you feel personally worse off, but if you think it is wrong, and you are ready to do something to stop it, it is a case of commitment.'
6. Downs, Olson, Buchanan and Tullock in the development of rational choice analysis of politics understood that individuals were motivated by more than self interest. But, for the sake of parsimony, they attempted to determine how many political phenomena they could explain simply with the most parsimonious model, i.e. just economic self-interest as the goal of individuals. Their approach did yield substantial returns as witness the work of Downs, Olson, Buchanan and Tullock, etc. But, it is clear that there are a number of political phenomena that this most parsimonious model cannot explain. Hence, I propose to modify the basic self-interested model with a modicum of weak altruism. Thus, self interest still dominates but individuals are willing to expend some of their resources to help others. Parsimony in theory entails generating the greatest predictive value with the fewest parameters in the theory. We add parameters when there are phenomena that we cannot explain.
7. Because of the impossibility of knowing the subjective state of another, both Hume and Smith argue that the utility derived is ultimately subjective, i.e. it is the subjective evaluation of the individual experiencing the sympathy.
8. The consumption goods can be public goods as well. I present the analysis in terms of private goods only, because the introduction of public goods complicates the presentation, but does not change any of the conclusions.
9. There are several forms of interdependent utility functions. For the purposes of this article this representation is the most direct. See Sobel (2005) for a good review of alternative specifications.
10. There is no logical incompatibility between expressive and instrumental voting. See Andreoni's (1990) analysis of impure altruism which is a combination of instrumental and consumption benefits. However, expressive voting cannot stand on its own, as indicated by the evidence.
11. There is an unpublished work by Feddersen and Sandroni (2002) which is being developed. At this point, their analysis of voting based upon rule utilitarianism is not

- compatible with my analysis. Their version of rule utilitarianism produces a non-instrumentalist analysis of voting which cannot fully explain all the empirical facts of voting, such as strategic voting, as specified in Jankowski (2002).
12. Palfrey and Rosenthal's (1985) analysis is also based upon incomplete information. But, it is lack of information as to the costs of voting of other potential voters. It is assumed that the costs of voting are different for different individuals. To complete their analysis, they then have to assume that the number of voters in each group is known.
 13. I am directly applying the Poisson distribution though it could be used as an approximation to the binomial distribution. See Myerson (1998: 389).
 14. The standard approximation of a Poisson by a normal distribution cannot be used when the ratio of probabilities goes to zero, and $n \rightarrow \infty$.
 15. Another argument for the altruistic interpretation is that even the US\$125,000 per capita benefit cannot realistically accrue to everyone in society if the benefit was purely based upon self interest.
 16. To my knowledge, only Owen and Grofman (1984) have attempted to calculate the probability that one's vote is decisive in terms of the direct and indirect effect of one's vote. They call this composite voting. They take up the relatively simple case of voting for president, which is an indirect vote since one actually votes for representatives to the electoral college.
 17. Mixed-strategy equilibria require that the players (in this case the two groups) are indifferent between their actions (voting and abstaining). Since we, moreover, assumed that the game is zero-sum with symmetric losses and gains for the two groups, this requires that the expected benefit of voting be the same for both sides. The expected benefits for the two groups equalize only when the expected number of voters differs, when the groups are of different size. Specifically, the smaller group must vote in higher percentage than the larger group in equilibrium. When the members of the group randomize between their two actions, the large number of voters will guarantee that outcome will converge to the Bayes-Nash equilibrium. It might be argued that a mixed-strategy equilibrium predicts fifty-fifty ties in large elections. However, this is not the case. Since the actual number of individuals in either group is unknown, the strategies chosen are based upon the groups' expectations of the respective group memberships. The expectations are based upon the common knowledge as to the distribution of the group membership. The Bayes-Nash equilibria only require that knowing the other side's strategy, one does not have an incentive to deviate from one's own strategy. There is no implication that the actual vote will converge to a tie, because the true membership of the two groups is unknown. The Bayes-Nash equilibrium is just a function of the ex-ante beliefs of the individuals as to the population size of the two groups (Osborne and Rubinstein 1994: 44). If elections were repeated, and the number of voters in each group and net benefits remained constant over the elections, then, there should be convergence toward a tie.
 18. The 1995 Pilot Survey entailed a re-survey of the 1994 NES study. Hence, the data file was a merger of the two surveys. Of the original 1994 respondents, only a subgroup was re-interviewed, and of the subsample only 486 responded to the 1995 Pilot.
 19. If helping others is one's 'most important concern,' then it entails a lexicographic ordering of preferences. Thus, strong altruistic motivation would violate von Neumann-Morgenstern utility conditions.
 20. If the basic model is non-linear, i.e. the coefficients of the individual terms are not equal to zero, then the cross-derivatives must be computed and estimated (Ai and Norton 2003).

21. External efficacy, partisan attachment and the interactive version of altruism were also tested as categorical variables. In all cases, the Wald test rejects this specification.
22. I cannot test directly for the size of α in the empirical test. Because of mathematical restrictions, the formal model assumes that the degree of altruism is the same for everyone. The test for weak altruism is therefore in terms of the GSS questions used to measure altruism.
23. A limitation of Fowler's (2004) analysis is that he does not have a measure of perceived difference between parties. He uses partisan identification as a surrogate for perceived difference. However, I show that partisan identification is itself strongly correlated with altruism.
24. By contrast, see McDonald and Popkin (2001) who argue there has been no decline in turnout in the period since 1972.
25. Whether excessive contribution in dictator games is evidence of altruism is somewhat problematic. The recipient is anonymous, and hence, the donor's motivation cannot be sympathy for the recipient's situation. An additional important question left unaddressed by this paper is why individuals exhibit both altruistic and self-interested preferences. I require a separate paper to give the due consideration this question requires.

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Appendix

All data comes from either the 1995 NES Pilot Study or the 1994 NES Election Study. Which variables came from which survey can be determined by the '94XXXX' or '95XXXX' prefix on the variable ID code.
Voted in this (1994) election: 940601

1 'YES, DID VOTE'

5 'NO, DID NOT VOTE'

Any Difference between Parties: 940798

1 'YES'

5 'NO'

Income of Family: 941404

Education (number of years of schooling): 941206

Age: Age reconstructed from date of birth. 941203

Party Mobilization: 940801 Q: As you know, the political parties try to talk to as many people as they can to get them to vote for their candidate. Did anyone from one of the political parties call you up or come around and talk to you about the campaign this year?

1. YES

5. NO

Religious Group Mobilization 940807 Q: Were there any groups concerned with moral or religious issues that tried to encourage you to vote in a particular way?

1. YES THERE WERE
5. NO THERE WEREN'T

Party Attachment: Summary measure: 940655.

- 0 'STRONG DEMOCRAT'
- 1 'WEAK DEMOCRAT'
- 2 'INDEPENDENT-DEMOCRAT'
- 3 'INDEPENDENT-INDEPENDENT'
- 4 'INDEPENDENT-REPUBLICAN'
- 5 'WEAK REPUBLICAN'
- 6 'STRONG REPUBLICAN'

Recoded Strong (both Democrat and Republican) = 1.

Moderate (both Democrat and Republican) = 2.

External Efficacy: Sum of 941037 + 941038

V941037: 'PUBLIC OFFICIALS DONT CARE'

V941038 '94PO: PEOPLE LIKE R HAVE NO SAY'

- 1 'AGREE STRONGLY'
- 2 'AGREE SOMEWHAT'
- 3 'NEITHER AGREE NOR DISAGREE'
- 4 'DISAGREE SOMEWHAT'
- 5 'DISAGREE STRONGLY'

Humanitarianism Measures

VAR 952236 One should always find ways to help others less fortunate than oneself.

VAR 952237 The dignity and well-being of all should be the most important concerns in any society.

VAR 952238 One of the problems of today's society is that people are often not kind enough to others.

VAR 952239 All people who are unable to provide for their own needs should be helped by others.

- 1 'AGREE STRONGLY'
- 2 'AGREE SOMEWHAT'
- 3 'NEITHER AGREE NOR DISAGREE'
- 4 'DISAGREE SOMEWHAT'
- 5 'DISAGREE STRONGLY'

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