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A Dynamic Calculus of Voting*

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Abstract

We construct a decision-theoretic model of turnout, in which individuals maximize their subjective expected utility in a context of *repeated* elections. In the model a nonnegative *signaling motivation* to vote exists for all citizens, regardless of their ideology or beliefs about the closeness of the election, and is proportional to a citizen's *external efficacy, patience,* and *electoral pessimism.* We find tentative support for all three effects in an empirical model of turnout using NES data (1976-1988). This paper suggests that the signaling motivation may play a role in a citizen's decision to vote.

Key words

Turnout, voting, elections, signaling motivation, external efficacy.

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For the past fifty years, an explanation for why people vote in large electorates has been a remarkable problem for rational choice theory. Rational choice scholars have primarily focused on models of turnout that rely on the pivotal motivation to vote in a single election (Downs 1957; Riker and Ordeshook 1968; Ferejohn and Fiorina 1974; Ledyard 1984; Palfrey and Rosenthal 1983, 1985). This motivation stems from the belief that there is a small chance that a single vote will decide the outcome of the election. Although the probability of being the pivotal voter is extremely small even in highly contested elections, one can still resort to the subjective nature of beliefs and argue that people may overestimate the probability of casting the pivotal vote. However, sometimes people actually know that their votes cannot be pivotal (Jackson 1983; Aldrich 1993), and yet they vote in large numbers despite widespread knowledge that there is a clear election favorite.

We construct a decision-theoretic model of turnout, in which individuals maximize their subjective expected utility in a context of repeated elections. We assume that the perceived probability of being pivotal is strictly zero – no one believes that there is a chance of being decisive. Instead, the turnout decision is driven by what we call the *signaling motivation.*[1] Suppose that parties are policy-motivated (Wittman 1977) and adjust their platforms in response to the margin of victory in the previous election. Specifically, several authors have suggested that winners move their platform towards the extremes to satisfy their own preferences while losers move towards the median voter in order to improve their chances of winning the next election (Stigler 1972; Kramer 1977; Stone 1980; Conley 2001; Fowler 2002) The size of the move depends on the size of the victory – landslides yield big changes in the platforms while close elections yield little if any change (Bernhard, Nokken, and Sala 2002). If so, then voters may have a signaling motivation to turnout because they can change the margin of victory in the

current election. If the voters believe that 'all votes count,' they believe that their vote will affect party platforms offered in the next election as well as policies that the winner is about to implement. A vote for the expected winner signals a tolerance for even more extreme platforms, while a vote for the expected loser signals a preference for platforms closer to the center.

Our model indicates that the signaling motivation exists for all possible beliefs about the closeness of the election. The size of this signaling motivation is proportional to a citizen's *external efficacy, patience,* and *electoral pessimism.* (1) External efficacy describes the 'belief in the influence of one's actions on the decision of the government' (Rosenstone and Hansen 1993: 143). Voters with high external efficacy believe that parties pay attention to the electorate (and, presumably, election results) when they are deciding what policies to offer. (2) Patient citizens who are willing to wait for future gains will place a higher value on the outcome of future elections. We therefore expect citizens with higher discount factors to be more likely to vote. (3) Electoral pessimists are those who expect their favorite party to lose the current election. An extra vote for a party expected to lose will have a small impact on the margin of victory, but an extra vote for a party expected to win 100% of the vote will not change the margin of victory at all—it will still win by 100%. We show that the impact of a single vote on the margin of victory decreases as the expected margin of victory increases. Thus, the worse a voter expects her favorite party to do in the election, the greater her incentive to balance the outcome by voting.

There is not enough space in this article to test our theory exhaustively, but we do provide limited support for all three of these effects in an empirical analysis of National Election Studies (NES) data on US Presidential elections from 1976 to 1988. Many studies have established a relationship between turnout and external efficacy. We extend this research and suggest both theoretically and empirically that turnout depends on subjective rates of time

preference and subjective beliefs about the probability that one's favorite party will win the election. The model may provide an explanation for the relationship between the closeness of the election and turnout. When we include variables for the signaling motivation, closeness is no longer a significant factor for turnout.

Finally, the model generates additional results regarding differences between voters with extreme and moderate preferences. In the model, a voter with extreme preferences always chooses the nearest party since that will tend to move both party platforms in the voter's preferred direction. Moderates, on the other hand, must also consider electoral probabilities. Voting for the winner would cause the winning platform to be adjusted further *away* from the center. Thus, even if a moderate prefers such a party, she may have an incentive to choose the party that is more likely to lose in order to keep her favorite party from straying too far away from her own preference. We call this counter-intuitive phenomenon *temporal balancing*, and we note that it may help to explain why moderates are more likely than extremists to vote for their least-preferred party. We also note that this phenomenon complements the directional voting (Rabinowitz and MacDonald 1989) and institutional balancing literatures (Fiorina 1988; Alesina and Rosenthal 1995) and may help explain why midterm elections in the US usually penalize the party of the President (Campbell 1960) and 'second-order' elections penalize the ruling party in parliamentary systems (Reif and Schmitt 1980).

Before proceeding, we want to emphasize the limitations of our approach. Fully-informed and interested rational voters in large electorates would probably not be willing to vote if the signaling motivation were the only incentive because the impact of a single vote on the margin of victory would be minimal. But we do not argue here that the signaling motivation is the only incentive to vote. Nor do we argue that all voters are fully-informed, interested, and

rational. Nor do we argue that our theory should supplant other theories of turnout. Instead, we concur with Rosenstone and Hansen (1993) and Verba, Schlozman, and Brady (1995) who argue that there are many factors that contribute to the decision to vote. Classic pivotal models of turnout have yielded a number of comparative statics results that have been confirmed empirically (Aldrich 1993). More importantly, other authors have used these comparative statics to establish a rational basis for turnout behavior, even if it is not fully rational. For example, resource mobilization theory (see Verba, Schlozman, and Brady 1995) suggests that people with better resources (like education and experience working in groups) are more likely to vote because the costs of gathering information and engaging in action are lower. This is a comparative static that results from the simple Downsian model. Similarly, our model's main contribution is to suggest comparative statics that might provide a rational basis for behavioral results like the relationship between turnout and external efficacy. Our model also yields comparative statics results that are counter-intuitive and that can be tested empirically. We test some implications here and find limited support for the theory, but there are far too many implications to test in a single article that is primarily devoted to theory. We encourage others to join us in future work to test the empirical validity of the signaling incentive to vote. The rest of this article is organized as follows. We start with a very basic framework and the intuition for our signaling model (details of the model and proofs are presented in the appendix). In proposition 1 we derive conditions for turnout and in proposition 2 we show what choices voters make if they do decide to turnout. In the next section we compare the pivotal and signaling motivations for different expectations about the outcome of the current election. .In the following section we derive empirical implications for turnout and vote choice from our theoretical model and test them using NES data. We also draw on recent work in economics (Harrison, Lau, and Williams

2002) to show how our model may explain why socioeconomic status (SES) variables are related to turnout. Finally, we summarize the results and conclude with suggestions for future research.

A dynamic model of the calculus of voting

We develop a formal model of turnout in which there is no pivotal motivation. For simplicity we assume that, in the voter's perception, the probability of casting a decisive vote is strictly zero. We also focus our attention only on the 'economic and political goals of an individual,' (Downs 1957: 6) specifically setting aside arguments about the duty motivation or a taste for voting because we are interested in exploring how individual self-interest in the outcome of the political process might affect one's decision to vote.

We also focus on the importance of political efficacy. As Abramson (1983) notes, 'next to party identification, no political attitude has been studied more extensively than feelings of political efficacy.' In this paper we suggest how external efficacy can yield electoral involvement. We hope it will reduce the gap between formal modeling and decades of qualitative and empirical research on a concept that 'lies at the heart of many explanations of citizen activity and involvement' (Verba, Schlozman, and Brady 1995: 346).

We start with a conventional spatial model of electoral competition (most of the formal discussion is presented in appendix). Citizens have ideal points that are located on a one-dimensional issue space and two parties compete for their votes in a winner-take-all election by proposing platforms located somewhere in the issue space. Each citizen prefers the party whose platform is located closer to her ideal point. In a static model potential voters care only about the outcome of the current election; in the dynamic model they also care about the future.

How does the outcome of the current election affect future elections? One possibility suggested by the mandates literature is that parties use the margin of victory from the past election to adjust the platform they offer in the next election (Smirnov and Fowler 2003). Stigler (1972) and Kramer (1977) were among the first to suggest that the margin of victory in an election can be 'valued in itself as a 'mandate' for the victor' (Kramer 1977: 317). In this case, larger margins of victory mean the party or candidate 'can do considerably more' (Stigler, p. 99). Examples of benefits from having a mandate include increased patronage, the election of legislators from marginal districts whose indebtedness to the party leadership ensures a more cooperative legislature (Kramer 1977: 317), and general political opportunity (Conley 2001). Thus, a landslide victory may cause changes in policy that shift the status quo more towards the winners' preferences. The new status quo would then become the new basis for party platforms in the next election.

Many events between elections might affect party platforms (e.g. terrorist attacks, stock market crashes, poll results). However, Conley argues that elections are uniquely important because they 'convey information about public preferences to elected representatives so that these representatives know whether or not to adjust the policy agenda.' (Conley 2001: 1). In particular, her formal model shows that politicians have an incentive to react appropriately to the margin of victory in the previous election, or else 'they will be punished at the polls in the future' (Conley 2001: 6). She also shows empirically that large margins of victory are more likely to yield large policy changes (see also Stone 1980; Fowler 2002).

We formalize voter perception of this party dynamic in the following response function:

(1) $F_{t+1}^{J} = F_{t}^{J} + \mu E$ (see appendix for derivation)

where F_{t+1}^{J} is party *J*'s platform for the election at time *t+1* and F_{t}^{J} is the platform for the election at time *t*. The variable μ denotes the margin of victory for party *J* in the election at time *t*, and is positive for a victory and negative for a loss. The variable E is an *efficacy* parameter indicating the magnitude of a party's response to an electoral victory. The sign on *E* indicates the preferred direction of movement for party *J* (negative if *J* is the left party and positive if *J* is the right party). The size of a platform shift is proportional to the margin of victory μ and the magnitude of E, which is how much a citizen believes parties pay attention to the views of the electorate. Citizens with low external efficacy do not think the parties adjust their platforms much in response to electoral outcomes, corresponding to low values of *E*. Citizens with high external efficacy believe that parties do react to the electorate, but only in proportion to the margin of victory. The importance of external efficacy for political participation has been documented in a rich literature (Rosenstone and Hansen 1993; Lane 1959; Craig and Maggiotto 1982; Finkel 1987; Iyengar 1980; Cassel and Luskin 1988; Huckfeldt and Sprague 1992; Timpone 1998).

Given these beliefs, why would a citizen choose to vote? The answer may be in a desire to make sure that her 'voice' is heard by the government (Pateman 1970; Mason 1982; Thompson 1970; Verba and Nie 1972). If we assume citizens believe their vote is not decisive in the current election, then there is only one variable that they can influence: by voting instead of abstaining they can change μ, the margin of victory. This in turn changes the platforms offered by *both parties* in the next election. Hence, citizens have an incentive to vote that is independent of the *closeness* and *outcome* of the current election. Each voter in every election has the capacity to signal to parties whether they should move their platforms left or right.[2]

Obviously, this signaling motivation depends critically on subjective beliefs about how much a single vote can change the margin of victory ($\Delta\mu$). This is in turn a function of the number *N* of people voting, and the expected proportion *p* of voters choosing the citizen's *preferred* party in the current election:

(2) $\Delta\mu = \frac{2(1-p)}{N+1}$ (see appendix for derivation).

The role of *N* is straightforward: the more people vote the less important is your 'voice.' The role of *p* requires a bit more explanation. As defined here, it contrasts with pivotal models where *p* can represent the probability of *either* party winning since it is only used to estimate how close the election will be. Why is this distinction important? Equation (3) shows that the effect of a single vote on the margin of victory declines as one expects one's favorite party to win a larger portion of the vote. In fact, when the margin of victory is expected to be 100%, giving one more vote to one's preferred candidate would not change the 100% margin of victory at all. Thus, citizens who expect their favorite party to lose should believe they have a *greater* impact on the margin of victory than those who expect their favorite party to win.

The size of this signaling motivation might seem relatively small in large populations since a citizen can only change the margin of victory by a single vote. However, the *perceived* importance of a vote also depends on *E*, how responsive one thinks the government is. Moreover, if voters believe parties update their platforms as shown above, then the effect of any decision made in the current election will persist since platforms in this election become the basis for platforms in the next election, the election after that, and so on.[3] Citizens who choose to vote in the current election thus capture a discounted stream of benefits for moving platforms in their preferred direction for *all future elections*. This means that the signaling motivation will be sensitive to an individual's discount factor δ.

Finally, suppose each citizen has a subjective belief about the likelihood *q* that the citizen's preferred party will win in future elections. This allows us to derive the following two propositions.

Proposition 1: *All citizens have a nonnegative signaling motivation to vote. Specifically, extremists with preferences to the left or right of both party platforms have a signaling motivation to vote* $(\delta/(1-\delta))\Delta\mu|E| \geq 0$. *Moderates with preferences between both party platforms have a signaling motivation to vote* $(\delta/(1-\delta))\Delta\mu|E||1-2q| \geq 0$.

Proof: see appendix.[4]

Notice that the first variable that determines the subjective value of a vote is the citizen's discount factor (δ). Those with higher discount factors care more about the future and thus receive greater benefits if they believe they can affect future elections. Thus, patience is a virtue for turnout—the more you are willing to wait, the more likely you are to vote.

The next variable is $\Delta\mu$, or how much a single vote changes the margin of victory. Recall from above that $\Delta\mu$ is decreasing in the expected proportion of votes received by one's preferred party (*p*). This means that those who are more pessimistic about their favorite party's performance in the upcoming election think their single vote will have a relatively larger impact on the margin of victory and future platforms. Thus, electoral pessimism is actually good for turnout—the worse you expect your favorite party to do in the election, the more likely you are to vote.

The efficacy parameter *E* is also very important. Even if other factors make voting utility significant, a citizen who believes that parties do not care about election margins will not believe that any number of votes can have an impact on future party platforms, let alone her own. For these citizens a victory is a victory and a loss is a loss, regardless of how close or lopsided the

election is. On the other hand, if a citizen has a strong sense of external efficacy she is more likely to believe that every vote helps parties shape the platforms they offer in the future. The more responsive you think parties are to the 'voice' of the people as expressed in elections, the more likely you are to vote.

The variable *q*, the likelihood of your favorite party winning *in the future*, decreases the signaling motivation for moderates. This is because moderates, whose preferences lie between the party platforms, want to keep the platforms close to the center. If they expect their favorite party to win the next election, then voting for it now will cause the party to move the platform towards its own preferences and away from the center. Thus, the signaling motivation to vote for one's favorite party actually becomes negative when $q > 0.5$! Meanwhile, notice that *q* is not present in the equation for extremists, whose signaling motivation is always weakly positive. This is because one's vote moves platforms of both parties in the voter's preferred direction *regardless* of expected future probabilities. Therefore, a single vote always matters regardless of the outcome of the current and all future elections. This distinction between extremists and moderates generates differences not only in the utility of turnout, but in the choice of party, as shown in the following proposition:

Proposition 2: *If no other incentives exist, extremists vote for the party with the closest platform if* $(\delta/(1-\delta))\Delta\mu|E| > c$*, otherwise they abstain. Moderates vote for the party that is more likely to lose in the future elections if* $(\delta/(1-\delta))\Delta\mu|E||1-2q| > c$*, otherwise they abstain.*

Proof: see appendix.

Since an extremist always votes for her first choice, the decision-making problem that she faces is clear: vote if the benefit from voting is greater than the associated cost. A moderate has to make a more difficult turnout decision. Given the citizen's belief about how parties respond

to elections (equation 2), she knows that a higher margin of victory would lead her preferred party to move to its extreme, further from her preference point. The same logic applies for the other party. Obviously a moderate voter is interested in moderate outcomes. By voting for the party she expects to lose more often in future elections, she decreases the margin of victory for the winner and thus discourages the adoption of extreme platforms. Hence, moderates do not vote for their first choice—they balance future platforms by voting for the party they expect to lose future elections. We call this phenomenon *temporal balancing*.

Interestingly, this corresponds to similar results in a pivotal voting model developed by Feddersen and Pesendorfer (1996). They argue that *less informed* moderates prefer to abstain. Similarly, moderates in our model who have no information about future electoral probabilities might assume the two parties are equally likely to win ($q = 0.5$) which would drive the signaling motivation to vote to zero. More informed moderates, on the other hand, might have some intuition about the future. For example, a moderate who prefers the Democratic party in the United States and believes that demographic factors favor the Democratic party may strategically vote for Republicans in order to make future platforms by the former less extreme. However, this belief would have to be strong enough to overcome the cost of voting. Since less certainty yields beliefs closer to $q = 0.5$, moderates with less information have a smaller signaling motivation to vote. This might not exceed the cost, yielding abstention by uninformed moderates. Thus, our model is also consistent with the finding that moderates tend to vote less often than extremists (Keith et al 1992).

Empirical implications

Our model makes at least three testable predictions about turnout. If the signaling motivation exists for voters, then turnout should be positively associated with external efficacy (E) and the discount factor (δ), and negatively associated with expectations about how well one's favorite party will do (p).[5] The strongly positive impact of external efficacy on turnout has already been widely documented (Rosenstone and Hansen 1993; Colby 1982; Craig and Maggiotto 1982; Finkel 1987; Iyengar 1980; Cassel and Luskin 1988; Huckfeldt and Sprague 1992; Timpone 1998), but we are not aware of any empirical tests of the other two variables. To measure p we index respondents according to whether or not they think the election will be close, which presidential candidate they think will win, and which candidate they prefer.[6] We code p=0 for respondents who think their favorite candidate will lose in an election that is not close, p=1/3 if the candidate is expected to lose a close election, p=2/3 if the candidate is expected to win a close election, and p=1 if the candidate is expected to win an election that is not close.[7]

To measure δ we note that the NES has asked two questions related to subjective time preferences. 1) 'Do you think it's better to plan your life a good way ahead, or would you say life is too much a matter of luck to plan ahead very far?' 2) 'When you do make plans ahead, do you usually get to carry out things the way you expected, or do things usually come up to make you change your plans?' Respondents who answer yes to the first question have a *normative* preference for future planning, indicating that in principle it would be good to think about the future effects of current actions. Those who say yes to the second question have an *experiential* preference for future planning, indicating that past efforts to incorporate the future effects of current actions have yielded successful results. It seems reasonable to assume that a preference

for future planning correlates with subjective time preferences. However, the correlation may be weak and the binary nature of allowable responses means that we can only coarsely divide respondents into two groups: those with higher discount factors and those with lower discount factors. To mitigate this problem somewhat, we create a discount factor index that is the average of the two responses.

Since we are comparing the signaling model of turnout to other rational models, we include variables related to the pivotal motivation to vote (see the appendix for coding specifications). These include the benefit of voting as measured by the perceived difference between the two candidates, and the probability of being pivotal as measured by the perceived closeness of the election. We also add a variable for civic duty. This addition is especially challenging for testing our theory about the signaling motivation because it is based on the following question: 'If a person doesn't care how an election comes out then that person shouldn't vote in it.' A negative answer to this question has often been interpreted to mean that respondents believe there is an obligation to vote that transcends individual incentives. However, we note that respondents might also answer negatively to this question if they consider the impact on future elections important enough to warrant a vote regardless of their incentives to vote in the current election. Nonetheless, we include it in our model to be sure that we have controlled for those respondents who answered negatively because they believe in a civic duty of voting.

We include several other variables related to turnout as controls (see the appendix). Verba, Schlozman, and Brady (1995) argue that *socioeconomic status* variables like education and income are related to turnout because they affect the costs of acquiring information about politics—higher status individuals are more likely to vote because their costs are lower. They

also note the importance of *institutional affiliation*. In particular, people acquire civic skills in organizations (writing letters, public speaking, and so on) that may make it easier for them to participate in politics. Verba, Schlozman, and Brady point out that *psychological* variables are important for turnout as well. The more informed people are about politics and the more they feel that they can understand political issues (internal efficacy), the more likely it is that they will be able to make a choice at the polls. Moreover, interest in politics and strength of partisan identification indicate how politically engaged potential voters are, which tends to correlate with turnout. Turnout has been shown to depend on these three factors in a wide variety of studies besides Verba, Schlozman, and Brady (e.g. Timpone 1998).

Each additional control reduces the efficiency of estimation, so we follow King, Keohane, and Verba (1994) in restricting our attention to variables that are correlated with and causally prior to our variables of interest. Several socioeconomic status, institutional affiliation, and psychological factors correlate with our variables of interest and might also be causally prior to them. For example, a taste for future planning might be affected by feelings of personal security, which could be a function of socioeconomic status. Similarly, perceptions of government responsiveness and the likelihood one's favorite candidate will win might be related to one's institutional experience and psychological factors related to politics. We therefore include them as controls.

Granberg and Holmberg (1991) note that self-reported turnout is significantly higher than aggregate turnout percentages would imply, so we focus on elections in which turnout was validated in the NES (1976, 1980, 1984, 1988). We model validated turnout using probit with heteroskedastic-consistent standard errors, but first we must address the problem of missing data. Listwise deletion restricts the observations to 1976 since this is the only year in which votes were

validated and questions about subjective rates of time preferences were asked. We report these results because this is the default method of dealing with missing data in political science analyses. However, listwise deletion inefficiently wastes much of the information available in the NES, and even worse it may produce biased estimates since several independent variables are correlated with missingness in our dependent variable.[8] We therefore also report results based on multiple imputation of missing data. Details of this procedure and a discussion are provided in the appendix.

In addition to predictions about turnout, our model also makes predictions about vote choice. In proposition 2 we show that when no other incentives exist, extremist voters should always choose the closest party. However, moderates will only choose the closest party if they think it will lose future elections. We do not have a good empirical proxy for expectations of future electoral performance, but if we assume that at least some moderates believe their favorite party is likely to win future elections then moderates should be more likely than extremists to abandon their first choice. We create a dichotomous dependent variable that is 0 if a respondent says she will vote for the candidate she places closest to herself on a seven-point liberal-conservative scale, and 1 if she says she will vote for the candidate she places farther away. We then define moderates as those who place themselves in between the Democratic and Republican candidates on the liberal-conservative scale, and all others as extremists.

There are three major controls we include in our vote choice analysis (see the data appendix for precise specifications). First, the directional voting literature (Rabinowitz and MacDonald 1989) suggests that voters may choose the candidate who is spatially further away because she is on the same side of the center of the issue space. In other words, it might be easier for a moderate liberal to vote for an extreme liberal who is farther away than for a

moderate conservative who is closer. We therefore include a control that indicates when a voter has chosen a second choice candidate who is on the same side of the liberal-conservative scale. Second, the institutional balancing literature (Fiorina 1988; Alesina and Rosenthal 1995) points out that some voters who prefer moderate outcomes may split their ticket between the Congress and the President by voting for candidates from different parties. This would also cause some voters to abandon their first choice, so we include a control for split-ticket voting. Third, certain psychological factors may make it more difficult for some voters to choose a candidate who is further away even if they know it is in their best interests. We therefore include controls for the ability to discern a strategic option (internal efficacy, political information, and interest in the campaign), and the level of attachment to the sincere option (strength of party identification). As in the turnout model, we use both listwise deletion and multiple imputation for missing data and for our analysis we use probit with heteroskedastic-consistent standard errors.

Results

Table 1 shows estimates of the effect of pivotal, signaling, and civic duty variables on the probability of voting. Only one variable related to the pivotal motivation is significant — the candidate differential has a significant effect on turnout, but the perceived closeness of the election does not. Meanwhile, all three variables related to the signaling motivation are significant. In particular, respondents with high levels of external efficacy are 12% more likely to vote than those with low levels. Those who value future planning are 8% more likely to vote than those who do not. And those who think their favorite candidate will surely win are 7% *less* likely to vote than those who think he will surely lose. The civic duty motivation is also significant at 8%, but recall from above that respondents who believe in a signaling motivation

TABLE 1. Effects on the Probability of Turnout

Variable	Pooled Model Using Multiple Imputation		Model for 1976 Using Listwise Deletion	
Pivotal Motivation				
Candidate differential (*B*)	8	(+/- 6)		-
Closeness of Election (*P*)		-		-
Signaling Motivation				
External efficacy (*E*)	12	(+/- 5)	11	(+/- 10)
Discount factor (δ)	8	(+/- 5)	8	(+/- 4)
Probability favorite party wins (*p*)	-7	(+/- 5)	-16	(+/- 14)
Duty Motivation				
Civic Duty (*D*)	8	(+/- 3)	7	(+/- 7)

Note: Probabilities are based on model in Table A-1 in the Appendix and they reflect the difference in the probability of turnout when each variable is changed from its lowest to its highest observed value holding all other variables at their mean. Simulated coefficients are used to incorporate estimation uncertainty (for details see King, Tomz, and Wittenberg 2001). 95% confidence intervals are shown in parenthesis and estimates not significantly different from zero are not shown.

might answer the civic duty question in the same way as those who believe in a normative obligation to vote. Thus, part of the civic duty effect in the model could be capturing the signaling motivation, meaning the signaling estimates may be too small and the civic duty estimate too large.

Unlike several other statistical models of turnout (e.g. Cox and Munger 1989; Berch 1993; Hanks and Grofman 1998; Grofman et al 1998; Shachar and Nalebuff 1999, Alvarez and Nagler 2000), closeness in our model is insignificant. The closeness variable typically divides respondents between those who expect a close election and those who expect a landslide. The variable *p* further divides respondents who expect a landslide election into two groups—those who think their favorite candidate will lose (electoral pessimists) and those who think he will win (electoral optimists). The pivotal model predicts that pessimists will stay home because they cannot help their favorite candidate who is sure to lose. The signaling model, on the other hand, predicts that pessimists will be the most likely to vote because they think they will have the

greatest impact on future platforms. The NES data confirm that electoral pessimists do vote more often (64%) than optimists (58%) and those who think the election will be close (60%).

This suggests that the finding that closeness encourages turnout may be spurious. NES respondents are much more likely to be electoral optimists (25%) than pessimists (6%), meaning four out of five of those expecting a landslide also expect their favorite candidate to win. The average *p* for this group is thus quite high (0.80 in our specification). The group expecting a close election has lower average expectations for their favorite candidate and a lower average value of *p* (0.58), and is therefore more likely to vote according to the signaling model. Thus, the closeness variable may be picking up the effect of *p*, which is supported by the fact that including *p* in our model causes the closeness variable to become insignificant.

Although this evidence suggests the importance of variables related to the signaling motivation, the SES variables in the model are still doing much of the work for explaining turnout. A variety of explanations have been advanced for why this might be, but our model suggests another. We conjecture that SES variables are, in part, proxies for the discount factor. The discount factor index we use here is a coarse estimate of subjective time preferences that may be only weakly correlated with respondents' true discount factors. However, the

TABLE 2. Socioeconomic Effects on the Discount Factor and Turnout

Change in Variable (from → to)	Difference in Discount Factor (%)	Rank	Difference in Turnout (%)	Ran
High School Ed. or less → College ed. or more	+6.8**	1	+31**	1
Poor (lowest quartile) → Rich (highest quartile)	+6.4**	2	+29**	2
Not a Homeowner → Homeowner	+3.7**	3	+24**	4
Young (18-30) → Old (50-75)	+2.3**	4	+26**	3
Single → Married	+1.2**	5	+14**	5
Female → Male	+0.1	6	+3**	6

Note: Differences in discount factors are calculated from mean discount rates estimated in Table 3 of Harrison, Lau, and Williams (2002). Differences in turnout are based on mean validated turnout rates in the NES data, 1976-1988. **p<.01

experimental economics literature on subjective time preferences has recently made progress in measuring discount factors and relating them to SES variables. Table 2 shows how education, income, home ownership, age, marital status, and gender affect discount rates (Harrison, Lau, and Williams 2002). For example, homeowners are expected to have discount factors that are 3.7% higher than non-homeowners. Notice that the direction of SES effects on discount factors correlates perfectly with SES effects on turnout. Moreover, notice that the magnitude of the effects is also strongly correlated ($\rho = .88$). This suggests to us that the causal flow might be SES variables → discount factor → turnout.

In addition to predictions about turnout, our model also makes predictions about vote choice. Among those who position themselves closer to one party than the other on this scale in the raw NES data, moderates are indeed more likely (34.1%) to vote for their second choice than extremists (21.9%). When we control for other explanations like directional voting, institutional balancing, and psychological factors, both our models of vote choice (see Table 3) indicate that

Table 3. Vote Choice Models for the NES, 1976-88

Variable	Pooled Model Using Multiple Imputation		Pooled Model Using Listwise Deletion	
Moderate	0.35*	(0.05)	0.45*	(0.08)
Directional Voter	0.12*	(0.04)	0.13	(0.09)
Split-Ticket Voter	0.14*	(0.07)	0.36*	(0.10)
Psychological Variables				
Political Interest	-0.20*	(0.07)	-0.35*	(0.13)
Political Information	-0.29*	(0.05)	-0.03	(0.11)
Internal Efficacy	-0.33*	(0.05)	-0.29*	(0.09)
Strength of party ID	-0.20*	(0.05)	-0.30*	(0.13)
Intercept	-0.08	(0.05)	-0.57*	(0.15)
Pseudo R2	0.05		0.06	
N	8158		1420	

Note: Dependent variable is 0 if voter chooses most proximate party on the liberal-conservative scale, 1 otherwise. Coefficient estimates are from a probit model with heteroskedastic-consistent errors. Missing data are imputed using EMis (King, et al 2001). *p<.05. Standard errors are in parenthesis.

moderates are 13% more likely to vote for their second choice than extremists.[9] This evidence is consistent with the prediction that moderates engage in *temporal balancing*, but we admit it is not definitive. A finer test will require specific questions about perceptions of party strength and how respondents expect it to change over time.

Conclusion

Our decision-theoretic model focuses on a citizen's subjective but rational estimates of whether she is better off voting or abstaining. The model emphasizes the value of a vote as a signal of one's preferences. Three empirical implications of our theoretical model are that citizens with higher levels of *external efficacy*, *patience*, and *electoral pessimism* should be more likely to vote. We find limited empirical support for all three implications using validated turnout from NES data (1976-1988). Turnout is higher among citizens with higher external efficacy, higher discount factors, and lower expectations about the proportion of votes their favorite candidate will receive.

We draw several conclusions from our model. First, the analysis suggests why a citizen may vote when elections are *not* close and there is a clear favorite. In fact, the signaling incentive to vote is actually strongest for citizens who expect their favorite candidate to lose in a landslide. Second, *temporal balancing* may explain why a voter might rationally support a party that is farther from her ideal point. This happens when moderates support a party that is more likely to lose future elections in order to keep future winners from becoming too extreme. Third, as in Feddersen and Pesendorfer (1996) we provide a rational explanation for why less informed moderates may be more likely to abstain. Fourth, studies based on the NES that show civic duty is an important motivation for turnout may, in fact, be capturing the effect of the signaling

motivation. The civic duty question asked in the NES does not distinguish between those who believe in an obligation to vote and those who believe voting is an important signal for future elections. Fifth, we also suggest that the empirical relationship between the closeness of an election and turnout is spurious. When we include the expected proportion of votes for one's favorite candidate in the empirical model, closeness ceases to be significant.

Furthermore, we conjecture that the discount factor may explain why socioeconomic status variables are related to turnout. In this respect, our model bridges the gap between formal theory and the large literature on turnout that emerged in the 1950s and 1960s exemplified by such works as *Voting* (Berelson, Lazarsfeld, and McPhee 1954) and *The American Voter* (Campbell et al 1960). Drawing on recent work in economics, we show that income, education, age, home ownership, marriage, and gender affect the discount factor in the same direction and magnitude as they affect turnout. We also speculate that other socioeconomic variables may have such an effect on the discount factor. For example, Becker and Mulligan (1997: 741) argue that religious people have higher discount factors because they believe in an afterlife and thus have longer time horizons. If so, this might explain the strong correlation between church activity and turnout. Also, blacks may have lower discount rates because of institutional discrimination, (e.g. less access to credit markets), which in turn might drive their difference in turnout. These are speculative arguments, but they are meant to illustrate reasons why future studies of turnout should take discount factors seriously. We urge future election surveys to include questions about subjective time preferences and experimental studies of discount factors to keep enough information about their subjects so that their turnout behavior can be validated.

Our analysis may also contribute to literatures on macropolitical economy and spatial modeling, and institutional balancing. For example, unlike many existing macropolitical

economy models our model explains why citizens with extreme preferences may abstain. Extremists who think parties are not responsive to the electorate or who expect their favorite party to do well (electoral optimists) get less utility from signaling and are thus *less likely* to vote. In a spatial context, we also explain why party platforms might be more stable over time than otherwise expected. If supporters of the party expected to lose tend to be more motivated than supporters of the party expected to win, then the result will be *negative feedback* in an electoral system that keeps margins of victory closer to zero. Thus parties would have less of an incentive to make dramatic changes in their platforms, making the system more stable and slower to change than one might otherwise expect.

Finally, we note that both the *negative feedback* effect and the tendency of moderates to engage in *temporal balancing* may help to explain party surge and decline. Suppose that a party wins a national election (surge). If this causes voters to increase their estimate of the probability that the party will win the next election, our model suggests two effects. First, supporters of the winning party will have less incentive to vote in the next election because they are more optimistic about their favorite party's chances. Similarly, supporters of the opposition will have a greater incentive to vote. As a result, the vote share for the winning party should be lower in the next election (decline). Second, some moderates may change their mind about who is likely to win the next election. Since moderates have an incentive to balance by voting for the party less likely to win future elections, this would increase the vote share for the opposition and decrease it for the party that recently won (again, decline). Citizens might be relatively more inclined to use their vote as a signal in lower stakes elections when the pivotal motivation is less important. Thus, this may be why midterm elections in the US usually penalize the party of the President (Campbell 1960; Fiorina 1988; Alesina and Rosenthal 1995) and 'second-order'

elections penalize the ruling party in parliamentary systems (Reif and Schmitt 1980). Future work should examine the impact of the signaling motivation on surge and decline by modeling change in voter beliefs about electoral probabilities in a context of alternating high stakes and low stakes elections.

Appendix A: model and propositions

In the model each 'citizen' *i* has an ideal point in one-dimensional issue space $Q_i \in \Re^1$ and faces a decision problem to maximize subjective expected utility. The decision problem takes place in the context of infinitely repeated elections starting with the current election at time $t = 0$. In every election two parties (*J* and ~*J*) compete with each party proposing a platform $F \in \Re^1$. Each citizen has three choices: vote for the closest ('favorite' or 'preferred') party (*J*), vote for the party furthest away (~*J*), or abstain. Citizen *i*'s single period utility from voting is $U_i^V = -|F - Q_i| - c$, where $c > 0$ is the cost of voting in the current election, and F is platform of the winning party. Correspondingly the single period utility from abstention is the same except that a citizen does not incur the cost $U_i^A = -|F - Q_i|$. For simplicity we assume that a voter believes her vote will not change the outcome of the current election (the probability of being pivotal is $P = 0$). Nor does she get extra benefits from voting related to a normative obligation to vote ($D = 0$).

The total number of 'voters' is the sum of votes for each party $N = V_J + V_{\sim J}$, which is different from the total number of 'citizens' if there is at least one abstention. Candidate J wins elections by simple majority rule and the margin of victory for candidate J is

(3) $\mu = \frac{V_J - V_{\sim J}}{N}$.

Notice that if party *J* loses the election, μ is negative: in this case the 'margin of victory' is, in fact, a margin of a loss. We assume that voters believe that parties use the margin of victory from the previous election to adjust the platform they offer in the next election. Specifically, voters think parties act in accordance with an exogenously given response function

(4) $F_{t+1} = F_t + \mu E$,

where F_{t+1} is a new platform, F_t is the previous platform, μ is the past margin of victory, and E is an 'efficacy' parameter denoting how much the voter thinks parties pay attention to citizen preferences. Furthermore, the sign of *E* indicates the voter's belief about the preferred direction of movement for party *J* ($E \geq 0$ if *J* is the right party and $E \leq 0$ if *J* is the left party). This means that μE is positive for both parties when the right wins (they both move right) and negative when the left wins (they both move left).

Let $p = V_J / N$ be the citizen's expectation of the proportion of votes her favorite party will receive in the current election. Note that this can also be thought of as the probability that any other given voter will vote for candidate *J*. One vote for party *J* has the following effect on the margin of victory:

(5) $\Delta\mu = \mu^{V(J)} - \mu^A = \frac{V_J - V_{\sim J} + 1}{N+1} - \frac{V_J - V_{\sim J}}{N} = \frac{2V_{\sim J}}{N(N+1)} = \frac{2(1-p)}{N+1}$

By the same logic, one vote for party ~*J* has the exact opposite effect on the margin of victory, changing it by:

(6) $\mu^{V(\sim J)} - \mu^A = \frac{V_J - V_{\sim J} - 1}{N+1} - \frac{V_J - V_{\sim J}}{N} = \frac{-2V_{\sim J}}{N(N+1)} = -\Delta\mu$.

A citizen's decision to vote thus has a direct effect on the platforms both parties offer in the next election. A vote for party *J* changes both party platforms by

(7) $\left[F_t + (\mu + \Delta\mu)E\right] - \left[F_t + \mu E\right] = \Delta\mu E$.

Moreover, this change in the party platform persists into the future since it becomes the new basis for future platforms. For example, the effect of a vote today on the platform 2 elections from now is the same:

$$
\begin{aligned}
&F_{t+2}^{A,t} = F_{t+1} + \mu_{t+1}E = F_t + \mu_t E + \mu_{t+1}E \\
(8)\quad &F_{t+2}^{V(J),t} = F_{t+1} + \mu_{t+1}E = F_t + (\mu_t + \Delta\mu)E + \mu_{t+1}E \\
&F_{t+2}^{V(J),t} - F_{t+2}^{A,t} = \Delta\mu E
\end{aligned}
$$

Given a subjective rate of time preference (discount factor $0 < \delta < 1$), a citizen who abstains expects utility

$$(9)\quad U_i^A = \sum_{t=1}^{\infty} \delta^t \left(-q \mid F_t^J + \mu_t E - Q_i \mid -(1-q) \mid F_t^{\sim J} + \mu_t E - Q_i \mid\right),$$

where *q* is the subjective probability that party *J* wins future elections ($t > 0$). A citizen who abstains does not change the margin of victory so she has no effect on the new platforms of either candidate. If she votes for her preferred candidate *J*, her utility is:

$$(10)\qquad U_i^{V(J)} = \sum_{t=1}^{\infty} \delta^t \left(-q \mid F_t^J + (\mu_t + \Delta\mu)E - Q_i \mid -(1-q) \mid F_t^{\sim J} + (\mu_t + \Delta\mu)E - Q_i \mid\right).$$

If she votes for her least preferred candidate *J* her utility is:

$$(11)\qquad U_i^{V(\sim J)} = \sum_{t=1}^{\infty} \delta^t \left(-q \mid F_t^J + (\mu_t - \Delta\mu)E - Q_i \mid -(1-q) \mid F_t^{\sim J} + (\mu_t - \Delta\mu)E - Q_i \mid\right).$$

To determine the utility from voting, we divide citizens into four types. Each citizen prefers either the left or right candidate and is either an 'extremist' (with preferences to the left or right of both parties) or a 'moderate' (with preferences between both parties). First we consider an extremist who prefers the right party, $F^{\sim J} < F^J < Q_i$. The utility gain from voting for one's preferred party is:

$$U_i^{V(J)} - U_i^A = \sum_{t=1}^{\infty} \delta^t (q((F_t^J + (\mu + \Delta\mu)E - Q_i) - c) + (1-q)((F_t^{\sim J} + (\mu + \Delta\mu)E - Q_i) - c)) -$$
(12)
$$\sum_{t=1}^{\infty} \delta^t (q(F_t^J + \mu E - Q_i) + (1-q)(F_t^{\sim J} + \mu E - Q_i)) = \frac{\delta}{1-\delta}\Delta\mu E - c.$$

The case for a left extremist ($Q_i < F^J < F^{\sim J}$) yields a similar result:

$$U_i^{V(J)} - U_i^A = \sum_{t=1}^{\infty} \delta^t (q(-F_t^J - (\mu + \Delta\mu)E + Q_i - c) + (1-q)(-F_t^{\sim J} - (\mu + \Delta\mu)E + Q_i - c)) -$$
(13)
$$\sum_{t=1}^{\infty} \delta^t (q(-F_t^J - \mu E + Q_i) + (1-q)(-F_t^{\sim J} - \mu E + Q_i)) = -\frac{\delta}{1-\delta}\Delta\mu E - c.$$

Since $E \le 0$ for left extremists and all other variables in the first term are nonnegative, the signaling motivation to vote for all extremists is:

(14) $$\frac{\delta}{1-\delta}\Delta\mu|E| \ge 0$$

If extremists vote for their less preferred party (~*J*) the sign on $\Delta\mu$ simply changes and yields nonpositive utility:

(15) $$-\frac{\delta}{1-\delta}\Delta\mu|E| \le 0$$

Thus, if no other incentives exist extremists will choose to vote for their preferred candidate when $(\delta/(1-\delta))\Delta\mu|E| > c$. Otherwise they will abstain.

Moderates have different incentives. Consider the case of a right moderate ($F^{\sim J} < Q_i < F^J$). The utility of voting for one's preferred candidate is:

$$U_i^{V(J)} - U_i^A = \sum_{t=1}^{\infty} \delta^t (q(-F_t^J - (\mu + \Delta\mu)E + Q_i - c) + (1-q)(F_t^{\sim J} + (\mu + \Delta\mu)E - Q_i - c)) -$$
(16)
$$\sum_{t=1}^{\infty} \delta^t (q(-F_t^J - \mu E + Q_i) + (1-q)(F_t^{\sim J} + \mu E - Q_i)) = \frac{\delta}{1-\delta}\Delta\mu(1-2q)E - c.$$

For left moderates ($F^J < Q_i < F^{\sim J}$) the result is similar:

$$U_i^{V(J)} - U_i^A = \sum_{t=1}^{\infty} \delta^t (q(F_t^J + (\mu - \Delta\mu)E - Q_i - c) + (1-q)(-F_t^{\sim J} - (\mu - \Delta\mu)E + Q_i - c)) -$$
(17)
$$\sum_{t=1}^{\infty} \delta^t (q(F_t^J + \mu E - Q_i) + (1-q)(-F_t^{\sim J} - \mu E + Q_i)) = -\frac{\delta}{1-\delta}\Delta\mu(1-2q)E - c.$$

Since $E \le 0$ for left moderates and all other variables in the first term are nonnegative, the signaling motivation for all moderates is:

$$\frac{\delta}{1-\delta}\Delta\mu|E|(1-2q) \ge 0 \quad (18)$$

If a moderate votes for her less preferred party (~*J*), the sign on $\Delta\mu$ changes and so does the signaling motivation utility:

$$\frac{\delta}{1-\delta}\Delta\mu|E|(2q-1) \ge 0\,. \quad (19)$$

Recall that q is the citizen's belief about the probability that party *J* will win future elections. When $q < 0.5$ the utility for voting for party *J* is positive and the utility for voting for party ~*J* is negative. The reverse is true when $q > 0.5$. Thus moderates only get positive utility from voting for the party they think is more likely to lose future elections, and they do so only when $(\delta/(1-\delta))\Delta\mu|E||1-2q| > c$. Otherwise, they abstain.

We include one last technical proposition about citizen types. When parties shift their platforms this causes some citizens with ideal points very close to the platform to change from being a moderate to an extremist or vice versa as we have defined them. The following proposition shows that it is the type in the election at time *t*+1 that determines a citizen's strategy.

Proposition 3: The citizen's strategy in period *t* is contingent upon her type in period *t*+1.

A right extremist believes that she will become a moderate if the winning candidate's new platform will be to the right from the voter's ideal point. This happens when

(20) $F_t^J + (\mu_t \pm \Delta\mu)E - Q_i < 0$.

If this inequality holds, we change the signs of the variables inside the absolute values in equation (12). This changes equation (12) to equation (16), which corresponds to the case of a right moderate. A right moderate believes that she will become an extremist if the winning candidate's new platform will be to the left from the voter's ideal point. This happens when

(21) $F_t^J + (\mu_t \pm \Delta\mu)E - Q_i > 0$.

If this inequality holds, we change signs of the variables inside the absolute values in formula (16). This changes formula (16) to formula (12), which corresponds to the case of a right extremist.

The same logic applies for left extremists and moderates.

Appendix B: data

For variables with an asterisk we follow the coding procedure in Timpone (1998). Numbers in parentheses indicate the NES variables in order by year, 1976 first, 1980 second, 1984 third, and 1988 last. *Candidate differential** (*B*) is the absolute value of the difference in evaluations of the candidates on the 100 point thermometer scale (3298, 3299; 154, 155; 290, 293; 154, 155). *Closeness of election* (*P*) is coded 1 = the presidential race will be close, 0 = one candidate will win by quite a bit (3027; 55; 77; 99). For *external efficacy* (*E*) we follow Craig, Niemi and Silver (1990) and Niemi, Craig, and Mattei (1991) by creating an index that averages responses from four questions: 'People like me don't have any say about what the government does' (3815; 1030; 312; 937), 'I don't think public officials care much what people like me think'

(3818; 1033; 313; 938), 'How much do you feel that having elections makes the government pay attention to what the people think?' (3743; 890; 309; 959), and 'Over the years, how much attention do you feel the government pays to what the people think when it decides what to do?' (3741; 888; 310; 960). The first two questions are coded 0 = agree, 0.5 = neither, and 1 = disagree in 1976-1984. For 1988 they are 0 = agree strongly, 0.25 = agree somewhat, 0.5 = neither, 0.75 = disagree somewhat, and 1 = disagree strongly. The third and fourth questions are coded 1 = a good deal, 0.5 = some, and 0 = not much. Coding for the *discount factor* (δ) (3736, 3737 in 1976 only) and the *probability favorite party wins* (p) (3026, 3027, 3044, 3045; 54, 55, 137; 76, 77, 425; 98, 99, 763) are described in the text. *Civic duty* (D) is coded 1 = yes and 0 = no for 'If a person doesn't care how an election comes out he shouldn't vote in it.' (3350; 145; 311; 936)

*Education** is the number of years completed (3384; 429; 431; 419). *Income** is family income in constant 1976 dollars, using the Bureau of Labor Statistics measure of the CPI to transform income in later years (686; 725; 680; 520). *Employed* is coded 1 = employed and 0 otherwise (3409; 515; 457; 429). *Home Ownership** is coded 1 for homeowners, 0 for others (3509; 719; 706; 552). *Age** is in number of years and *age-squared** is mean-centered to reduce collinearity (3369; 408; 429; 417). *Marital status** is 1 for married and 0 for all others (3370; 409; 430; 418). *Gender** is 1 for female, 0 for male (3512; 720; 707; 413). *Race** is 1 for black, 0 for others (3513; 721; 708; 534). *South** is 1 for people from southern states, 0 for others. *Church attendance** is an index of religious attendance, 0 = never/no religious preference, 0.25 = a few times a year, 0.5 = once or twice a month, 0.75 = almost every week, and 1 = every week. Group membership* is coded 1 if people belong to any organizations representing the group they feel closest to and 0 otherwise (3868; 1169; 1103; 1114). *Political interest* in the campaign is

coded 1 = very much interested, 0.5 = somewhat interested, 0 = not much interested (3031; 53; 75; 97). Following Verba, Schlozman, and Brady (1995), *political information* is based on answers to factual questions: 'Do you happen to know which party elected the most members to the House of representatives in the elections this/last month?'(3683; 1028; 1006; 878) and 'Do you happen to know which party had the most members in the House of Representatives in Washington before the elections?' (3684; 1029; 1007) The second question was not asked in 1988 so we substitute and 'Do you happen to know which party had the most members in the Senate before the elections?' (879 in 1988 only). We code the variable 1 = correct answer to both questions, 0.5 = correct answer to one question, 0 = no correct answers. *Internal efficacy** is a binary response (0 = true, 1 = false) to the question 'Sometimes politics and government seem so complicated that a person like me can't really understand what's going on.' (3817; 1032; 314; 939) *Strength of party identification** is coded 0 = independents and apoliticals, 1/3 = independents leaning towards a party, 2/3 = weak partisans, and 1 = strong partisans. (3174; 266; 318; 274)

Spatial positioning for variables in the vote choice model are determined by self-placement and placement of the major party candidates on the liberal-conservative scale (3286, 3287, 3288; 267, 268, 269; 369, 371, 372; 228, 231, 232). *Strategic voting* is coded 0 if respondents vote for the candidate they place closest to their own position. Otherwise, it is coded a 1. (3044, 3045; 137; 425; 397). *Moderates* are coded 1 if they place themselves between the two candidates and 0 otherwise. *Directional voting* is coded 1 for those who intend to vote for a candidate on the same side of (and including) the 'cutpoint' of 4 on the 7 point liberal-conservative scale. *Institutional balancing* is coded 1 for those who vote for a different party for

President than they do for the House or Senate, and 0 for straight-ticket voters (3044, 3045, 3670, 3673; 137, 998, 1002; 425, 792, 798; 397, 768, 773).

For multiple imputation we use a procedure called *Amelia* developed by Honaker et al. (2000). King, et al (2001) show that multiple imputation is more efficient and no more biased than listwise deletion, *regardless of the nature of the variables being imputed*.[10] Gelman, King, and Liu (1999) also note that multiple imputation has the further benefit of permitting us to use data that was observed in only one year by estimating how respondents might have answered a question had it been asked in other years.[11] We include all variables from the turnout model in the imputation model for turnout and all variables from the vote choice model in the imputation model for vote choice. In both cases we impute five datasets and use the analysis model to generate five sets of coefficients and standard errors. The final coefficients are simply the mean of the coefficients generated. Final standard errors must include uncertainty about the imputation, so they are the mean of the standard errors generated plus their variance across the datasets. For additional details please refer to King et al (2001).

Table A-1. Turnout Models for the NES, 1976-88

Variable	Pooled Model Using Multiple Imputation		Model for 1976 Using Listwise Deletion	
Pivotal Motivation				
Candidate differential (*B*)	0.21*	(0.08)	0.29	(0.19)
Closeness of Election (*P*)	0.01	(0.04)	0.15	(0.13)
Signaling Motivation				
External efficacy (*E*)	0.33*	(0.07)	0.32*	(0.14)
Discount factor (δ)	0.20*	(0.07)	0.24*	(0.12)
Probability favorite party wins (*p*)	-0.18*	(0.07)	-0.49*	(0.24)
Duty Motivation				
Civic Duty (*D*)	0.20*	(0.04)	0.20*	(0.09)
Socioeconomic Variables				
Education	0.05*	(0.01)	0.06*	(0.02)
Income	0.02	(0.01)	0.03	(0.06)
Employed	0.06	(0.04)	0.13	(0.10)
Home Ownership	0.36*	(0.04)	0.58*	(0.10)
Age	0.03*	(0.01)	0.05*	(0.02)
Age-squared/1000	-0.20*	(0.06)	-0.04*	(0.02)
Marital status (married)	0.15*	(0.05)	0.19	(0.10)
Gender (female)	0.02	(0.04)	0.05	(0.10)
Race (black)	-0.15*	(0.05)	-0.11	(0.15)
South	-0.31*	(0.04)	-0.39*	(0.09)
Institutional Affiliation				
Church Attendance	0.50*	(0.05)	0.67*	(0.13)
Non-Political Organization	0.13*	(0.04)	0.16	(0.10)
Psychological Variables				
Political Interest	0.48*	(0.05)	0.15	(0.14)
Political Information	0.33*	(0.06)	0.31*	(0.12)
Internal Efficacy	0.01	(0.05)	0.04	(0.11)
Strength of party ID	0.36*	(0.06)	0.38*	(0.16)
Intercept	-2.70*	(0.17)	-3.41*	(0.48)
Pseudo R2	0.20		0.23	
N	8158		1040	

Note: Coefficient estimates are from a probit model of *validated* turnout with heteroskedastic-consistent errors. Missing data are imputed using EMis (King, et al 2001). *p<.05, **p<.01. Standard errors are in parenthesis.

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Endnotes

[1] See also Lohmann 1993, Piketty 2000, Razin 2001, and Shotts 2000 for game-theoretic signaling models of participation.

[2] Note that the literature on "protest voting" suggests that some citizens vote for a party other than their first choice in order to send a signal to one or both parties (e.g. Niemi, Whitten, and Franklin 1992; Heath and Evans 1994). In contrast, our model suggests that this signaling motivation exists for *all* citizens.

[3] See the appendix (equation 9) or Hamilton (1994, p. 443) for a more detailed explanation of persistence of innovations in unit root processes.

[4] To be sure our reasoning applies to all citizens including those who may be moderates at time t and extremists at time t+1 (or vice versa) we show that a citizen's type is technically determined in the election at time t+1. See Proposition 3 in the appendix.

[5] One might argue that the discount factor could also be important for the pivotal motivation since benefits gained from a vote today may not accrue until well into the winner's term in office. However, the benefits from being pivotal will be less sensitive to the discount factor than the benefits related to the signaling motivation. Small changes in the discount factor may change the

pivotal motivation directly through δ, but they will affect the signaling motivation through $\delta/(1-\delta)$. For example, a 1% change in δ from 0.9 to 0.91 changes the pivotal motivation by 1% but changes the signaling motivation by 12%.

[6] This is similar to the measure of electoral expectations used in Scheve and Tomz (1999).

[7] Including each of these categories as a dummy variable does not change the results.

[8] Specifically, the NES is significantly ($p<.01$) more likely to try to validate respondents' votes if they are white, rich, well-educated, or own their homes. The NES is also less likely ($p<.01$) to validate votes in the south.

[9] The models differ only in their uncertainty of the estimate. The model using listwise deletion suggests a 95% confidence interval of +/- 5% while the model using multiple imputation suggests an interval of +/-3%.

[10] It is a misconception to assume that "objective" variables can be imputed while "subjective" variables like attitudinal responses cannot. If attitudinal variables correlate with other observed variables, then EMis can impute them like any other variable.

[11] This depends on the assumption that the same types of respondents (as reflected by their answers to other questions in the imputation model) would respond similarly to a question when it was not observed as when it was observed. This assumption may seem restrictive, but we note that it is also made implicitly for all pooled models (e.g. Timpone 1998), regardless of whether or not they use multiple imputation. We also note that multiple imputation estimates not only point values but the uncertainty of those imputations. Estimates are thus conservative in the sense that they are based on uncertainty from both the imputation and analysis models.