Why People Vote: Ethical Motives and Social Incentives*

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Abstract

Some individuals vote because they are motivated by a civic duty to do so whereas others may vote because they wish to appear pro-social to others. This paper proposes a simple framework in which voters have these motivations and is consistent with findings on turnout, e.g. that turnout is responsive to the expected closeness and importance of an election, to the observability of one's choice to vote or abstain, and to social rewards and punishments associated with voting. We study various extensions of this framework in which community monitoring plays a role, and explore the implications that voter mobilization has for electoral competition.

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Contents

1 Introduction

Understanding why people vote is fundamental to the theory and practice of democracy. Analyses rooted in rational choice face difficulty in explaining why so many people incur the cost of voting even when it is improbable that any one of them is pivotal. An obvious shortcoming of pivotal-voter models is that it restricts voter motivations to be purely instrumental in terms of affecting the electoral outcome to the exclusion of motives rooted in civic duties, ethics, the desire to have voice, social norms, and social pressures. The evidence on voter motivations and turnout calls for alternative theories of why people vote; this paper offers a framework that unifies ethical motives and social incentives to vote.

Our starting point is the paradigm of *expressive voting*, which assumes that voters derive satisfaction from fulfilling their civic duties. Early incarnations of such models (e.g. Riker and Ordeshook, 1968) modeled the act of voting as having a constant consumption value for those who vote, which rationalizes voting without explaining why turnout varies across elections. Recent contributions have addressed this issue by imposing greater structure on what duty entails: in the *ethical voter* framework, some citizens are rule-utilitarian and so vote according to the rule that is optimal for their group to follow. Harsanyi (1980) initially proposed this framework in an election with common interests, and Feddersen and Sandroni (2006a,b,c) generalize it to elections with competing political interests; importantly, they show that linking civic duties to the primitives of an election can generate aggregate turnout that is responsive to voting costs, the importance of the election, and the expected closeness of the race.[1]

Although the ethical voter framework is useful to understand turnout, it is predicated on behavior being *intrinsically motivated* and is divorced from social mechanisms and pressures that are widely believed to drive voting. A growing empirical literature has instead emphasized the importance of *extrinsic motives* for turnout and pro-social behavior. For example, Gerber et al. (2008) find that informing voters in the 2006 Michigan Primary that their neighbors will be told whether they voted increases turnout among registered voters from 29.7% to 37.8%, garnering an increase greater than most campaign mobilization strategies. Funk (2010) finds similar evidence studying a natural experiment in Switzerland in which optional postal voting was adopted sequentially across cantons; although voting costs were reduced substantially,

[1] Coate and Conlin (2004) also develop a model based on this approach and find that a structurally estimated version of it provides a good fit for turnout data in Texas liquor referenda, and outperforms simple expressive voting models. Coate et al. (2008) finds that pivotal voter models also offer a poor fit, particularly of the margin of victory, despite the small scale of these elections. Feddersen (2004) surveys the literature on turnout.

aggregate turnout does not significantly increase. In addition to the academic research on this issue, social pressures and signals are at the core of many campaign mobilization strategies that seek to induce communities and religious organizations to vote in groups so that individuals may see and be seen by others in their community. The importance of the *visibility* of the act of voting suggest that many citizens are motivated to vote not for ethics but social image.

It is perhaps less than surprising that voting behavior may be motivated by social pressures and the desire to be esteemed by others especially since the importance of these motives for "good behavior" have been widely studied in other domains.[2] While the importance of extrinsic motives and social pressure in turnout decisions is discussed in prior work (e.g. Knack, 1992; Shachar and Nalebuff, 1999; Grossman and Helpman, 2002), its form has lacked an explicit description. Models with reduced-form benefits and costs for voting fail to capture the dependence of social motivations on features of the election such as its expected closeness or its importance and do not elucidate the source of social motivation. Addressing this gap, in our view, suggests a theory in which voters are *extrinsically motivated* to vote because they wish to *appear intrinsically motivated*. Our objective in this paper is to integrate the ethical voter framework with models of social pressure and incentives.

We study an election in which each of two opposing groups have a continuum of citizens, each of whom may find voting costly. Citizens in each group are either *ethical* or *pragmatic*. An ethical citizen is group-utilitarian: she follows the rule that maximizes the social welfare of her group given the behavior of the opposition. A pragmatic citizen (henceforth pragmatist) votes only because she wishes others to think of her as being ethical. We characterize and show existence of a *political equilibrium* in which ethical citizens in each group are *sophisticated* about the behavior of pragmatists and their opponents, and follow the optimal ethical rule, and pragmatists choose whether to vote on the basis of signaling incentives induced by the behavior of ethical citizens.

By anchoring social incentives to ethical motivations, the framework accommodates the *competitive predictions* at the core of ethical voter models: because ethical citizens respond to the importance of the election, voting costs, or its expected margin of victory, so do pragmatists, and thus, *all citizens* respond to these changes. Pragmatists also respond to the visibility of their vote, and hence, are further inclined to vote when their choice is observable to neighbors, when voting is at a public polling location, or when there is information that is shared publicly

[2]See e.g. Bernheim (1994), Harbaugh (1998), Bénabou and Tirole (2006), Andreoni and Bernheim (2009), Ariely et al. (2009), and DellaVigna et al. (2011).

about the importance of an election. Stronger signaling incentives decrease the participation of ethical citizens: because ethical citizens attempt to compensate for the lower turnout of pragmatists, greater turnout from pragmatists dampens the ethical motive. Nevertheless, a group as a whole benefits from stronger social incentives insofar as this improves its likelihood of winning the election.

The role that social incentives play in turnout may raise the concern that excessive social pressure could distort individual incentives towards *too much* voting. Unlike other settings in which this inefficiency emerges,[3] social pressure never induces a pragmatist to vote at costs that the rule-utilitarian ethical citizen would deem socially inefficient to do so. The force that countervails "over-voting" is that were it to arise, abstention would induce a more favorable equilibrium image than voting in which case no pragmatist should vote.

We believe that integrating conceptions of social duties and pressures helps illustrate the role that communities play in turnout.[4] Towards that aim, we discuss two extensions in which we enrich the informational setting to match voter mobilization efforts that communities undertake. First, we investigate behavior when pragmatists may lie about whether they have voted, but such lies may be detected by others in the community. Second, we study turnout when individuals may possess some information about the voting costs of others in which case a pragmatist may be unable to pool with ethical citizens whose voting costs are too high. Both of these features offer lens to understand why it is that tightly-knit groups in which individuals meet frequently have greater turnout, as discussed by Grossman and Helpman (2002).

We also investigate the impact of our model of turnout for electoral competition in which the importance of the election is endogenously determined by the platforms of political candidates. That candidates select platforms to influence not only *how* people vote, but also *who* votes has been widely recognized in academic and media analyses, and is an issue that looms large in political rhetoric.[5] Yet, in most models of electoral competition, voting is costless thereby obscuring the motive that candidates may have to pander to groups that are able to effectively

[3] Daughety and Reinganum (2010) show in the context of public goods how too much social pressure can lead agents to distort their actions away from what would be socially optimal. Bénabou and Tirole (2003) argue that extrinsic incentives can crowd out intrinsic motives. Similar issues arise when agents have extrinsic motives or career concerns and are privately informed about the right action to take as highlighted by Levy (2005, 2007), Prat (2005), and Visser and Swank (2007).

[4] Putnam (2000) argues that the decline in political participation in the United States has followed a decline in social ties; similarly Alesina and Ferrara (2000) finds that inequalities in communities reduce participation.

[5] A salient illustration of this effect is the extent to which candidates pander on issues of Social Security and the cost of prescription drugs in their platforms to the greater turnout of the elderly, as noted by Campbell (2003). Similarly, in both developed and developing countries, the importance of lower-class mobilization for political redistribution is widely noted and studied (e.g. Hill et al., 1995; Varshney, 2007).

mobilize turnout.[6] In a stylized setting, we show that candidates motivated by office converge to a common platform ensuring no turnout while candidates motivated by policy diverge ensuring some turnout. In both cases, asymmetries across the two groups creates a motive to pander towards those who are more responsive to policy or have stronger social incentives.

2 The Basic Model: Ethicals and Pragmatists

2.1 Environment

We build on Feddersen and Sandroni (2006a,c): each citizen of a continuum decides whether to vote for alternative 1, alternative 2, or abstain, and the winner of the election is determined by majority rule. Citizens belong to one of two groups, 1 and 2, and those who belong to group 1 prefer that alternative 1 win, and others prefer that alternative 2 wins. Voting by citizen i for alternative i is denoted by $a_i = 1$ and abstention is denoted by $a_i = 0$. The cost of voting for citizens is distributed according to cdf F whose pdf, f, is continuous and strictly positive on $[0, \infty)$.[7]

Citizens are uncertain about the relative size of each group: the fraction of citizens in group 1, denoted by k, is a random variable with support $[0, 1]$ and governed by a symmetric Beta distribution with parameter α. The beta distribution encompasses both the uniform distribution ($\alpha = 1$) and those that are single-peaked around $\frac{1}{2}$ ($\alpha > 1$). Instead of using the expression for the density of k in our analysis,[8], it is simpler to formulate probabilities in terms of $x = \dfrac{k}{1-k}$, whose density denoted by h is

$$h(x, \alpha) = \frac{x^{\alpha-1}}{(1+x)^{2\alpha} B(\alpha, \alpha)},$$

in which $B(\alpha, \alpha)$ is the Beta function. For expositional convenience, we suppress the dependence of h on α and use $H(x)$ to denote its cdf.

Citizens are either ethical ($t_i = E$) or pragmatic ($t_i = P$): the fraction of ethical citizens in each group is q in $(0, 1)$. We describe voter motivations in greater detail below.

[6] A few models have studied the interaction of turnout and electoral competition—Glaeser et al. (2005) and Virág (2008), study political extremism when platforms are not publicly observed, and Valasek (2011) studies the interplay of electoral competition and voting costs in an ethical voter framework—but none to our knowledge have focused on this motive to pander towards particular groups.

[7] Introducing an upper-bound on voting costs does not affect the analysis but requires more notation.

[8] The density of k being a symmetric Beta distributed random variable is $\dfrac{k^{\alpha-1}(1-k)^{\alpha-1}}{\int_0^1 \tilde{k}^{\alpha-1}\left(1-\tilde{k}\right)^{\alpha-1} d\tilde{k}}$.

2.2 Voter Motivations

An ethical citizen votes according to the rule that maximizes his perception of social welfare, even though he recognizes that his own vote is not pivotal in this large election. Each citizen believes that the collective gain is w when his preferred candidate wins, which denotes the *importance of the election*, and prefers for aggregate voting costs to be minimized. Assuming that every citizen is ethical, and holding fixed the behavior of pragmatists and the other group, the ethical rule specifies the utilitarian optimal decision rule, which necessarily takes the form of a threshold rule: an ethical citizen i in group G votes if and only if $c_i \leq c_G^*$ for some cost c_G^*.

A pragmatist, in contrast to the ethical citizen, recognizes that her vote is not pivotal in the electoral outcome, but that it is pivotal in how she is perceived by others (insofar as ethical individuals are esteemed). Her payoff from taking action a_i is

$$-c_i a_i + \lambda \Pr\left(t_i = E | a_i\right).$$

The second term represents her social esteem, in which the coefficient $\lambda > 0$ represents the marginal payoff from social image. Naturally, this coefficient reflects both her image-payoffs and the probability with which her act of voting is observed by others in her group.[9]

Image is attributed to citizens' actions via Bayes' rule. The payoff induces a threshold $\hat{c}_G$ such that a pragmatist citizen i in group G votes if and only if $c_i \leq \hat{c}_G$. Suppose that the expected cutoff for ethical citizens in group G is c_G^*; it follows that the perception of a citizen's moral type that a pragmatist expects denoted by $\zeta\left(a, \hat{c}_G, c_G^*\right)$, is

$$\zeta\left(a, \hat{c}_G, c_G^*\right) = \begin{cases} \frac{qF\left(c_G^*\right)}{qF\left(c_G^*\right) + (1-q)F(\hat{c}_G)} & \text{if } a_i = 1, \\ \frac{q\left(1-F\left(c_G^*\right)\right)}{q\left(1-F\left(c_G^*\right)\right) + (1-q)(1-F(\hat{c}_G))} & \text{if } a_i = 0. \end{cases} \tag{1}$$

Implicit in the above equation is that when a citizen's type is being assessed, her group is known and so inferences about her type are driven solely by the prior and the relative participation rates of ethical citizens and pragmatists in that group. Our assumption may be motivated by homophily (McPherson et al., 2001; Currarini et al., 2009): peers from whom one wishes to gain approval are likely to belong to the same group, and hence, judge one's actions based on behavior within that group. Political polarization reinforces these incentives: pragmatists may

[9] Voting may be directly observed when communities coordinate on voting or register together, as they often do. In other contexts, it may be spread by word-of-mouth communication through the social network in the community.

be valued on the basis of showing loyalty to their particular group rather than to the entire electorate.[10]

A pragmatist with the threshold cost is necessarily indifferent between voting and abstaining, and so this cost offsets the pragmatist's gain in social esteem from voting:

$$\lambda \left(\zeta \left(1, \hat{c}_G, c_G^*\right) - \zeta \left(0, \hat{c}_G, c_G^*\right)\right) = \hat{c}_G. \tag{2}$$

For each value of c_G^*, we let $P\left(c_G^*\right)$ denote a solution (if any exists) to the above equation.

Definition 1. *For an ethical cutoff, c_G^*, a cutoff for pragmatists $\hat{c}_G$ is a **Pragmatic Best Response** if $\hat{c}_G = P\left(c_G^*\right)$.*

Before turning attention to ethical citizens, we highlight useful properties of P.

Lemma 1. *The Pragmatic Best Response exists, is unique, and is strictly increasing in c_G^*.*

The argument for uniqueness is straightforward: the marginal gain in social image from voting for a pragmatist in group G is strictly decreasing in $\hat{c}_G$ because when pragmatists vote in greater number, they sully the image of voting and improve that of abstaining. In contrast, more voting by ethical citizens strengthens the signaling incentives of pragmatists and hence increases the Pragmatic Best Response.

As the pragmatists respond to their expectations of how ethical citizens behave, ethical citizens respond to their expectations of pragmatists' participation. For pairs of cutoffs for ethical citizens, (c_1, c_2), and pragmatists, $(\hat{c}_1, \hat{c}_2)$, the expected social cost of voting is

$$\begin{aligned}\phi\left(c_1, c_2, \hat{c}_1, \hat{c}_2\right) =& E[k]\left(q\int_0^{c_1} cdF + (1-q)\int_0^{\hat{c}_1} cdF\right) \\ &+ (1-E[k])\left(q\int_0^{c_2} cdF + (1-q)\int_0^{\hat{c}_2} cdF\right).\end{aligned}$$

Accordingly, the aggregate welfare as perceived by ethical citizens in each group is

$$\begin{aligned}V_1\left(c_1, c_2, \hat{c}_1, \hat{c}_2\right) =& w\left(1 - H\left(\frac{qF\left(c_2\right) + (1-q)F\left(\hat{c}_2\right)}{qF\left(c_1\right) + (1-q)F\left(\hat{c}_1\right)}\right)\right) - \phi\left(c_1, c_2, \hat{c}_1, \hat{c}_2\right), \\ V_2\left(c_1, c_2, \hat{c}_1, \hat{c}_2\right) =& wH\left(\frac{qF\left(c_2\right) + (1-q)F\left(\hat{c}_2\right)}{qF\left(c_1\right) + (1-q)F\left(\hat{c}_1\right)}\right) - \phi\left(c_1, c_2, \hat{c}_1, \hat{c}_2\right).\end{aligned} \tag{3}$$

[10] In the symmetric setting, results are identical if we assumed alternatively that a citizen's political affiliation is unknown, and hence, her image is determined using the fraction of ethicals in both groups. However, if groups are asymmetric, slightly different results follow when citizens' affiliations are unknown.

The optimal ethical rule for each group is the cutoff c_G^* which, holding all else fixed, maximizes V_G. This notion of *consistency*, offered by Coate and Conlin (2004) and Feddersen and Sandroni (2006a,b,c), is adapted to our setting in which non-ethical citizens vote:

Definition 2. *A profile (c_1^*, c_2^*) is a **Consistent Ethical Response** to $(\hat{c}_1, \hat{c}_2)$ if for every group G,*

$$V_G\left(c_G^*, c_{-G}^*, \hat{c}_1, \hat{c}_2\right) \geq V_G\left(c, c_{-G}^*, \hat{c}_1, \hat{c}_2\right) \text{ for all } c > 0.$$

2.3 Political Equilibrium

Based on the voter motivations described in the prior section, we describe the appropriate solution-concept: pragmatists in each group hold correct beliefs about the behavior of ethical citizens and best-respond based on their signaling motives, and given the beliefs (and behavior) of pragmatists, ethical citizens in each group prefer to not deviate to an alternative ethical rule.

Definition 3. *A **Political Equilibrium** is a profile of thresholds $\{(c_1^*, c_2^*), (\hat{c}_1, \hat{c}_2)\}$ such that:*

1. *(c_1^*, c_2^*) is a Consistent Ethical Response to $(\hat{c}_1, \hat{c}_2)$*
2. *$(\hat{c}_1, \hat{c}_2)$ are Pragmatic Best Responses to (c_1^*, c_2^*).*

We first show that a political equilibrium exists and is unique. Based on the pragmatists' cutoffs, $(\hat{c}_1, \hat{c}_2)$, one can derive the Consistent Ethical Response by examining the two first-order conditions from Equation 3 with respect to c_1 and c_2; comparing the two reveals that at the optimum

$$c_1^*\left(qF\left(c_1^*\right) + (1-q)F\left(\hat{c}_1\right)\right) = c_2^*\left(qF\left(c_2^*\right) + (1-q)F\left(\hat{c}_2\right)\right). \tag{4}$$

Since in equilibrium, $\hat{c}_G = P\left(c_G^*\right)$ and P is strictly increasing, it follows that $c_1^* = c_2^*$. Substituting this symmetry into the FOC and verifying that the SOC is satisfied demonstrates existence and uniqueness.

Theorem 1. *There is a unique political equilibrium: for every group G, c_G^* solves*

$$c_G^*\left(qF\left(c_G^*\right) + (1-q)F\left(P\left(c_G^*\right)\right)\right) = \frac{2^{1-2\alpha}w}{B(\alpha,\alpha)}. \tag{5}$$

Using this expression, we describe various properties of the unique political equilibrium. Since the LHS is increasing in c_G^*, changes in parameters that monotonically change the value on the RHS must have the same effect on the political equilibrium. The term w captures the importance of the election and α offers a metric for its competitiveness[11]. Finally, voting cost distributions can be ranked by first-order stochastic dominance; we say that voting costs decrease if the resulting distribution is dominated by the initial distribution.

Property 1 (Competitive Effects)**.** *The participation rate of all citizens is increasing in the importance and competitiveness of the election, and as voting costs decrease.*

This property highlights how political equilibrium captures competitive aspects of an election without predicating behavior on an individual's pivot considerations. Our solution-concept inherit this property directly from its ethical voter foundations, and analogous results without social signaling are derived by Feddersen and Sandroni (2006a). The intuition is straightforward: as the election becomes more important or competitive, ethical types in each group consider it more important to vote, and this spurs the pragmatists to also vote in greater numbers. When costs decrease, the marginal cost of increasing turnout from the standpoint of the consistent rule decreases, and so the participation rate of ethical citizens rises. Holding the pragmatists' participation rate fixed, the greater participation of ethical citizens increases the gap in social image between voters and abstainers. Therefore, in a political equilibrium, the participation rate of pragmatists also increases.

Our next set of properties describe the signaling incentives in the framework. The term λ includes a number of concerns relevant for pragmatists, including the observability of voting, the impact of social image, the social rewards attached with being perceived as ethical or loyal, and the sanctions of being perceived as non-ethical. Its changes can therefore be attributed to variations in the observability of voting (Gerber et al., 2008; Funk, 2010), or the role of group leaders in generating social pressure (Shachar and Nalebuff, 1999).

Property 2. *An increase in social incentives decreases the participation rate of ethical citizens but increases the participation rate of pragmatists and the average participation rate.*

That the participation of pragmatists increases with social incentives is intuitive but the more subtle effect is that of social incentives on ethical citizens. With stronger social incentives, ethical citizens are less motivated to compensate for pragmatists and therefore decrease their participation. Overall participation nevertheless increases.

[11] Increasing α shifts probability mass for k from the tails and concentrates it around the peak of $1/2$ (where the election is close)

That turnout is increasing in extrinsic motivation invites a concern: perhaps social pressure could induce more turnout than that which would be ethical. Such inefficiencies emerge generally in public goods settings (e.g. Daughety and Reinganum, 2010) but are precluded in our framework.

Property 3 (No Overvoting)**.** *Regardless of the strength of social incentives, pragmatists in group G vote only at costs that an ethical voter also does so: $\hat{c}_G < c^*_G$.*

The mechanism for Property 3 is simple: were pragmatists to participate more than ethical citizens, abstention rather than voting would signal that one is ethical, in which case the proposed behavior involves pragmatists taking a costly action that only tarnishes their image. Since such adverse signaling cannot occur in equilibrium, pragmatists must participate less than ethicals and as $\lambda \to \infty$, the pragmatists' cutoff approaches that of ethicals thereby dissolving the gap in image between voters and abstainers.

The final set of properties that we discuss depart from symmetry but a challenge in studying asymmetric groups is that a political equilibrium may no longer exist or be unique when it does. We show in the Supplementary Appendix that if k is uniformly distributed on $[0, 1]$, a unique political equilibrium exists;[12] in this more restrictive setting, we describe how asymmetries between the ethical citizens in the two groups affect the unique political equilibrium.

Property 4. *When the election is more important to group 2 than it is to group 1 ($w_2 > w_1$), or group 2 has a lower distribution of voting costs (F_1 first-order stochastically dominates F_2), then the participation rates of both ethical citizens and pragmatists are higher in group 2 than in group 1. Therefore, group 2 has a higher probability of winning the election.*

With asymmetric social incentives—suppose $\lambda_1 < \lambda_2$—the Pragmatic Best Response for group 2 (denoted by P_2) exceeds that for group 1 (denoted by P_1) for every ethical cutoff, c^*. An analogue of Equation 4 holds whose implication is

Property 5. *When group 2 has stronger social incentives than group 1, ethical citizens in group 2 participate less than ethical citizens in group 1. Nevertheless, the average participation rate in group 2 is higher, and therefore, group 2 has a higher probability of winning the election.*

The above result is analogous to the *underdog effect*: when group 1 has weaker social incentives, its ethical citizens participate more to compensate for the rest of their group, although

[12] Feddersen and Sandroni (2006c) offer conditions for existence and uniqueness of consistent rule profiles in the setting without social incentives.

it is not sufficient to overcome group 2's aggregate turnout. Because ethical citizens in group 1 participate more than those in group 2 and pragmatists in group 1 participate less than those in group 2, the image gap between voters and abstainers is higher in group 1. Yet, because $\lambda_2 > \lambda_1$, the equilibrium social incentives in group 2 are greater. We return to these properties in Section 4 in discussing how candidates may pander to particular groups.

3 Extensions

This section explores several extensions to our framework. We study the role of community monitoring in fostering turnout: Section 3.1 allows for the possibility for individuals to lie about voting, and examines how turnout varies with the probability with which communities foster hard information about voting decisions; Section 3.2 studies a different setting in which communities vary in the extent to which their members know the voting costs of other members. Section 3.3 explores an alternative form of ethical behavior that is less sophisticated about each group's distribution of ethics. Section 3.4 permits greater heterogeneity among pragmatists by modeling a continuum of types who vary in their commitment to ethics.

3.1 Votes and Lies

The social incentive to vote comes from persuading others that one is ethical, which invites an important question: why do pragmatists vote at all when they can lie about voting? That reported turnout (to pollsters) exceeds actual turnout suggests that voting is socially rewarded. Yet, a pragmatist may find it more difficult to lie about voting to others in one's community, especially if voting and registration in that community are organized in groups. Information diffuses quickly in tightly-knit communities and so in concocting a voting experience, an abstainer may reveal that he has not voted and in lying, revealed his type. In contrast, when voting, a citizen may be seen by others (or choose to vote when others are doing so) in which case the hard evidence speaks in favor of his type. We investigate the interplay of lying and signaling incentives in turnout.[13]

Suppose that once a voter chooses whether to vote, a perfectly informative signal of her action is revealed to others with probability s and with complementary probability, no external

[13] Harbaugh (1996) studies these issues in a setting in which individuals vote because they enjoy receiving praise and dislike lying whereas some others prefer to lie, and a third category of people admit that they did not vote. Our model derives the value of praise or sanctions endogenously in equilibrium.

signal is generated. Prior to this signal being generated but after she has chosen whether to vote, a citizen can communicate via a cheap-talk message to members of her community about her choice. We assume that ethical citizens follow the ethical rule, and reveal their decisions truthfully. Others assess a citizen's type by the message that she sends and hard information about her action if any such information is revealed.

Towards finding the Pragmatist Best Response in this setting, let c_G^* and $\tilde{c}_G$ denote the threshold cost cutoffs used by ethical citizens and pragmatists respectively. For a pragmatist that abstains, the payoff from lying is invariant to her voting cost; μ_G denotes the fraction of pragmatists that falsely claim to vote.[14] A voter thus expects a social image of

$$s\frac{qF\left(c_G^*\right)}{qF\left(c_G^*\right)+(1-q)\,F\left(\tilde{c}_G\right)}+(1-s)\,\frac{qF\left(c_G^*\right)}{qF\left(c_G^*\right)+(1-q)\left(F\left(\tilde{c}_G\right)+\mu_G\right)}, \qquad \text{(Voter's Image)}$$

in which the first term is the social image when hard information is revealed proving that the voter voted, and the second term is the image relying on cheap-talk alone. A citizen who abstains and admits this to others has a social image of

$$\frac{q\left(1-F\left(c_G^*\right)\right)}{q\left(1-F\left(c_G^*\right)\right)+(1-q)\left(1-F\left(\tilde{c}_G\right)-\mu_G\right)}. \qquad \text{(Truthful Abstainer's Image)}$$

Finally, a citizen who abstains but claims to vote expects an image of

$$s(0)+(1-s)\,\frac{qF\left(c_G^*\right)}{qF\left(c_G^*\right)+(1-q)\left(F\left(\tilde{c}_G\right)+\mu_G\right)}. \qquad \text{(Lying Abstainer's Image)}$$

In understanding behavior, it is helpful to begin with the case without hard information ($s=0$): no pragmatist ever votes but a positive fraction claims to vote. Yet, a positive fraction must also confess to abstention for otherwise this message would be sent by only ethical citizens and then command the greatest social esteem. In equilibrium, the fraction of pragmatists that claims to vote equates the fraction of ethical citizens that votes so that a citizen's social image is invariant to what she tells others.

Greater monitoring induces more voting and truth-telling from pragmatists. In equilibrium, a pragmatist who abstains is truthful with positive probability for the reason described above,[15]

[14] While in principle, a pragmatist could vote and lie that she abstained, she has no reason to do so in equilibrium, and so we ignore this case.

[15] The underlying principle is akin to that which drive experts in Dziuda (2011) to reveal unfavorable information: when an "honest" type sometimes takes an unfavorable action, an imitating strategic type has a strong signaling motive to pool.

and so must randomize between lying and telling the truth if she lies at all. We define the Pragmatic Best Response in this setting as follows

Definition 4. *For an ethical cutoff, c_G^*, the Pragmatist Best Response is a vector $(\tilde{c}_G, \mu_G)_{G=1,2}$ such that:*

1. *A pragmatist citizen with cost below $\tilde{c}_G$ votes and reveals this truthfully to others.*
2. *Pragmatists with costs above $\tilde{c}_G$ abstain; the fraction of these that claims to vote is μ_G.*
3. *For every G, $\tilde{c}_G = \lambda\Big(\text{Voter's Image} - \text{Truthful Abstainer's Image}\Big)$.*
4. *If $\mu_G > 0$, then Truthful Abstainer's Image = Lying Abstainer's Image.*

We show in the Appendix that for every $\tilde{c}_G$, the Pragmatist Best Response exists and is unique.[16] Since pragmatists' behavior varies with s, so does the Consistent Ethical Response.

Theorem 2. *There is a unique political equilibrium in which for every group G,*

$$c_G^* \left(qF\left(c_G^*\right) + (1-q)\,F\left(\tilde{c}_G\right)\right) = \frac{2^{1-2\alpha}w}{B(\alpha,\alpha)}.$$

The participation rate of all citizens and pragmatists in each group is increasing in s while that of ethical citizens is decreasing in s. The fraction of pragmatists that falsely claim to vote in each group, μ_G, is decreasing in s and there exists $\tilde{s} < 1$ such that $\mu_G = 0$ for every $s > \tilde{s}$.

This result illustrates how aspects of our basic model extend to accommodate lying: when citizens are concerned that lies may be detected by others, some of them vote for the sake of social image. With improvements in monitoring, pragmatists have a stronger incentive to vote and thus, ethical citizens (as in Property 2) have less of an incentive to vote; on net, average turnout increases. Because the social image of an abstainer is always strictly positive, community monitoring need not be perfect to discourage lying altogether as identified by $\tilde{s} < 1$. It is straightforward to show that analogous to Property 5, if monitoring is permitted to be asymmetric across groups, *ceteris paribus*, the group with better monitoring has a higher probability of winning the election.

[16] Because ethical citizens communicate truthfully, the language is exogenously fixed and not subject to issues of babbling or inversion of messages. The Pragmatist Best Response does not uniquely define the behavior of every pragmatist type with cost above $\tilde{c}_G$ but specifies the fraction that falsely claims to vote and the complementary fraction that truthfully admits to abstention. The multiple strategies that correspond to a Pragmatist Best Response are necessarily payoff-equivalent.

3.2 Observable Voting Costs

A different channel by which differences across communities may manifest in turnout is that in those with frequent interaction, more may be known about each individual's voting cost. Instead of being able to abstain on the grounds of a high cost of voting, a pragmatist may feel compelled to vote because others known her voting cost to be low.

Suppose that each individual believes that with probability $p \in [0,1]$, others in her community know her cost realization, and with complementary probability, no one else knows the realization. She is thus unsure of the social image attached to her choosing to vote or abstain, and this uncertainty affects her decision to vote. For pragmatist i whose voting cost is $c_i < c^*$, the cutoff for ethical citizens in her group, she reveals that she is a pragmatist if she chooses to abstain and her voting cost is known by others. If she votes, and it is expected that a pragmatist with that cost would vote with probability 1, then her social image corresponds to the prior belief about her type; thus, voting is not socially rewarded but a failure to do is penalized. On the other hand, if it is expected that a pragmatist would not vote with that cost, but an ethical would, then her social image corresponds to that of an ethical citizen.

This race between actions and social expectations precludes the existence of a simple threshold equilibrium in which pragmatists vote at all costs below some $\hat{c} < c^*$ because the expected social image from voting would be discontinuous around $\hat{c}$. Therefore, equilibrium behavior involves pragmatists mixing between voting and abstention: suppose that a pragmatist with cost c is expected to vote with probability μ^c, and let $\hat{\mu} = \int_0^{\bar{c}} \mu^c dF$ denote the participation rate from all pragmatists in this group. Let $\mu^* = F(c^*)$ denote the participation of all ethical citizens in the group. Her expected social image if she votes is:

$$\zeta\left(1, c, \mu^c, \mu, \mu^*\right) = \begin{cases} p\dfrac{q}{q + (1-q)\,\mu^c} + (1-p)\,\dfrac{q\mu^*}{q\mu^* + (1-q)\,\hat{\mu}} & \text{if } a = 1, c \leq c^*, \\ (1-p)\,\dfrac{q\mu^*}{q\mu^* + (1-q)\,\hat{\mu}} & \text{if } a = 1, c > c^*. \end{cases}$$

When the cost is known by others, then a citizen's image is assessed relative to the fraction of ethical citizens and pragmatists who vote at that cost in her group; when the cost remains hidden, then it is relative to the participation rate of all ethical and pragmatic citizens in her group. By reasoning similar to Property 3, there exists no equilibrium in which pragmatists vote at costs higher than that of the ethical cut-off, and so the second entry concerns an off-path event. Using this property, if a citizen abstains, her expected social image is:

$$\zeta\left(0,c,\mu,\mu^{*}\right)=\begin{cases}(1-p)\,\dfrac{q\left(1-\mu^{*}\right)}{q\left(1-\mu^{*}\right)+\left(1-q\right)\left(1-\hat{\mu}\right)} & \text{if } a=0, c\leq c^{*},\\[2ex] pq+(1-p)\,\dfrac{q\left(1-\mu^{*}\right)}{q\left(1-\mu^{*}\right)+\left(1-q\right)\left(1-\hat{\mu}\right)} & \text{if } a=0, c>c^{*}.\end{cases}$$

If a citizen abstains at costs below the ethical cutoff, the only hope for preserving some reputation is if one's voting costs weren't observed by others. In contrast, if a citizen abstains at costs above the ethical cutoff, then her behavior doesn't distinguish her from an ethical citizen conditional on the cost being observed.

If the attribution of image to actions follows that from above, then for every cost such that $\mu^{c}\in(0,1)$, it follows that

$$\lambda\left(\zeta\left(1,c,\mu^{c},\mu,\mu^{*}\right)-\zeta\left(0,c,\mu,\mu^{*}\right)\right)=c, \tag{6}$$

which uniquely defines μ^{c} in terms of $\hat{\mu}$. Notice that because the gap in image, $\zeta\left(1,c\right)-\zeta\left(0,c\right)$, is decreasing in $\hat{\mu}$, it follows that Equation 6 holds if and only if μ^{c} is decreasing in $\hat{\mu}$. This property guarantees uniqueness of the pragmatists' best-response.

Theorem 3. *There exists a unique political equilibrium for every p in $[0,1]$ in which for every group G,*

$$c_{G}^{*}\left(q\mu_{G}^{*}+(1-q)\hat{\mu}\right)=\frac{2^{1-2\alpha}w}{B(\alpha,\alpha)}.$$

Turnout behavior is depicted in Figure 1 for the case in which $p=1$, and $\lambda q<c^{*}<\lambda$. The solid curve in red depicts the probability with which a pragmatist at a given cost votes and the dashed curve in blue denotes the social image associated with someone voting at that cost. As noted earlier, pragmatists with low voting costs always vote generating a social image that corresponds to the prior q. At voting costs greater than λq, such a social image is not enough to convince a pragmatist to vote but it is also not an equilibrium to abstain with probability 1; pragmatists thus randomize so that the social reward matches their private cost. However, no pragmatist votes at costs that exceed the ethical cutoff, c^{*}.

The combination of observable voting costs and social incentives can induce all pragmatists to participate exactly as much as ethical citizens (in contrast to the baseline model of Section 2).

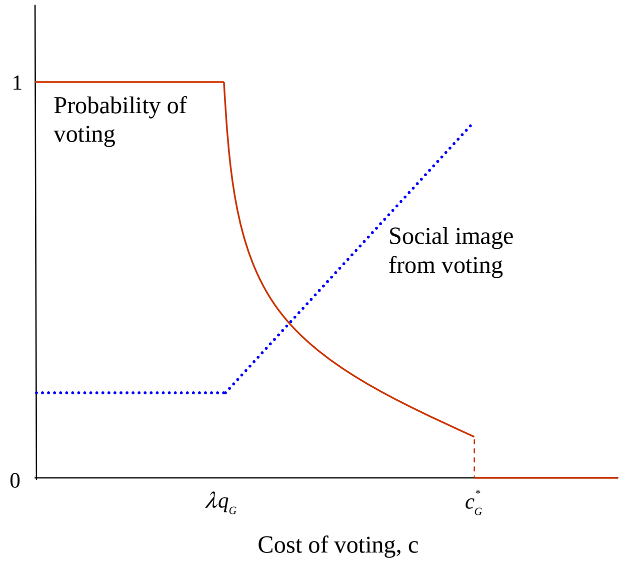

Figure 1: Voting behavior with observable costs

Consider the ethical cutoff that would be selected in a political equilibrium if all pragmatists voted just like ethical citizens: this cutoff, denoted by $c^\dagger$ uniquely solves $cF(c) = \frac{2^{1-2\alpha}w}{B(\alpha,\alpha)}$. Suppose that $p > 0$ and λ is sufficiently high that λpq is greater than $c^\dagger$. Then it trivially follows that the unique political equilibrium prescribes that all pragmatists vote in the same way as ethical citizens. Interestingly, pragmatists earn no social rewards from voting—their social image corresponds exactly to the prior q when they vote—but they are nevertheless punished by having no social esteem if they abstain at costs less than c^* and their voting cost is known by others. In communities in which others have good information about other's voting costs, extrinsic incentives have a powerful effect on turnout.

3.3 Naïve Vs. Sophisticated Ethics

Ethical decisionmaking embeds a sophisticated understanding of the motives of citizens across and within groups and in particular, accounts for pragmatists not fully complying with the ethical rule. Although such sophistication resonates with equilibrium analysis, it may be more sophisticated than ethical heuristics used in practice, and perhaps departs from a notion of *golden rule* that prescribes that one behaves as one would have all others in one's group behave. We propose a tractable variant of naïve ethics and consider it an empirical matter as to which formulation is more appropriate.

Our model of naïve ethics involves all ethical citizens behaving as if all citizens are ethical. The ethical rule considers only the cutoffs of ethical citizens (c_1, c_2), and therefore (incorrectly) deems the social cost of voting to be

$$\phi^N(c_1, c_2) = E[k] \int_0^{c_1} c dF + (1 - E[k]) \int_0^{c_2} c dF.$$

The aggregate welfare as perceived by group 1 is

$$\begin{aligned} V_1^N(c_1, c_2) =& w\left(1 - H\left(\frac{F(c_2)}{F(c_1)}\right)\right) - \phi(c_1, c_2), \\ V_2^N(c_1, c_2) =& wH\left(\frac{F(c_2)}{F(c_1)}\right) - \phi(c_1, c_2). \end{aligned} \tag{7}$$

Definition 5. *A profile $\left(c_1^N, c_2^N\right)$ is a* ***Naïve Ethical Rule*** *if for every group G,*

$$V_G^N\left(c_G^N, c_{-G}^N\right) \geq V_G^N\left(c, c_{-G}^N\right) \text{ for all } c > 0.$$

In contrast to Definition 2, Naïve Ethical Rules are not "best-responses" to the behavior of pragmatists but to the ethical rule of the opposing party. In this sense, naïve ethical rules are simpler than consistent ethical responses. A naïve political equilibrium then is simply a profile of thresholds $\left\{\left(c_G^N, \hat{c}_G\right)_{G=1,2}\right\}$ such that (c_1^N, c_2^N) are Naïve Ethical Rules, and pragmatists behave according to their Pragmatic Best Response to the behavior of ethical citizens. Analogous to Theorem 1, it is straightforward to show that the following holds.

Theorem 4. *There is a unique naïve political equilibrium: for every group G, c_G^N solves*

$$cF(c) = \frac{2^{1-2\alpha} w}{B(\alpha, \alpha)}. \tag{8}$$

By comparison to the political equilibrium described in Section 2.3, the naïve political equilibrium has a lower participation rate among ethical citizens and pragmatists. Unlike consistent ethical responses, naïve ethical citizens do not vote more because pragmatists vote less and independently of the strength of social incentives. It is straightforward to show however that the remaining properties (Properties 1 and 3, and the statements in Properties 2 and 5 regarding average participation) continue to apply.

3.4 Continuum of Types

A simplification of our basic framework is its bifurcation of the population into ethical citizens and pragmatists; this section studies a setting in which individuals value ethics to different degrees. Nevertheless, a subtle aspect of the definition of ethical rules is that it requires the identification of group of "pure ethical citizens" whose behavior, holding fixed the behavior of all others, follows the ethical rule; in the absence of this, a Consistent Ethical Response fails to exist.[17] Accordingly, we define pure ethical citizens to be those who have a strict incentive to follow the ethical rule.

Given an ethical rule, let $R_G(a_i, c_i)$ be a binary indicator that is 1 if and only if the action a_i is ethical when the cost of voting is c_i. Each citizen privately knows how much she values following the ethical rule; her *ethical coefficient* D_i scales her private gain from behaving ethically and is drawn from the interval $[0, \infty)$ with a smooth cdf F^E, independent of her voting cost; as before, the individual's voting cost c_i is drawn from $[0, \infty)$. Within this setting, a citizen i is ethical if $D_i > c_i$ since she is willing to vote or abstain as required by the ethical rule.[18]

When an agent i belongs to group G, her payoff from taking action a_i is

$$-c_i a_i + D_i R_G(a_i, c_i) + \lambda \Pr(D_i \geq c_i | a_i). \tag{9}$$

This formulation encapsulates intrinsic motivation towards ethics, as captured by D_i, and the extrinsic motivation to appear to be a member of this ethical group, as captured by λ.

Figure 2 describes voting behavior in this context. One can partition the citizens types (D_i, c_i) into three categories: those who abstain, those who vote because of social incentives, and ethical citizens who vote absent social incentives. The vertical line at c_G^* represents the cost cutoff from the ethical rule, and the 45 degree line through the origin separates the citizens in the latter two categories. The gap between the two 45 degree lines illustrates the extrinsic motives for voting, and all other types abstain. As in the binary types model, no citizen with costs above the ethical cut-off chooses to vote.

Theorem 5. *There exists a unique political equilibrium.*

[17] This tension does not arise with the naïve ethical rule.

[18] Were voting costs to have an upper-bound, $\bar{c}$, a simpler definition of an ethical citizen would be one for whom $D_i > \bar{c}$. To maintain consistency with the rest of the paper, we model costs as being unbounded.

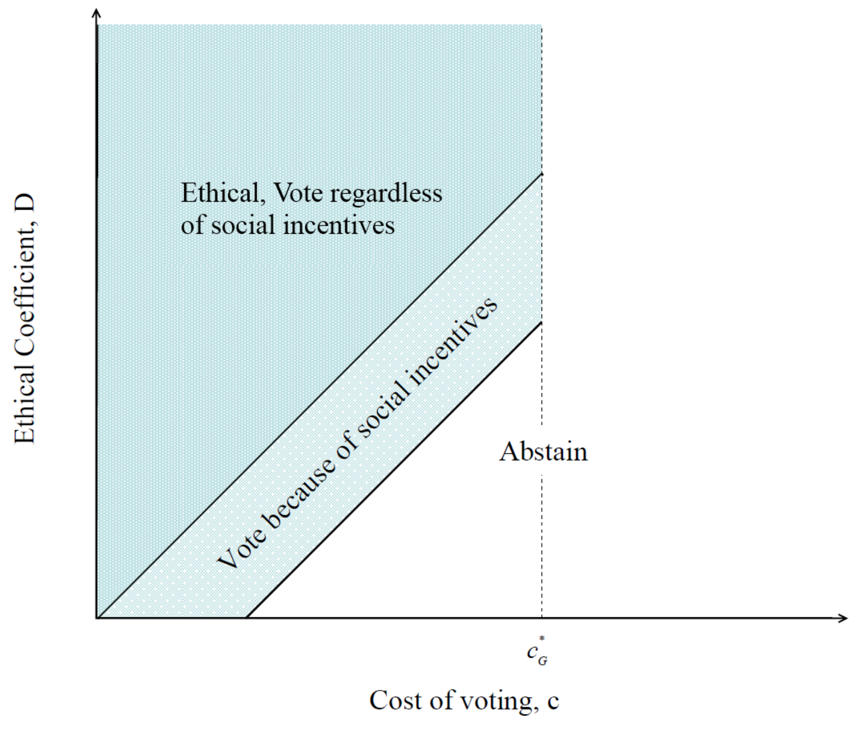

Figure 2: Voting behavior with a continuum of types

4 An Application to Electoral Competition

This section discusses the implications that our framework for turnout has on how political candidates choose platforms in a competitive election. We show that office-motivated candidates converge to a single platform so that there is no turnout in equilibrium whereas policy-motivated candidates diverge generating a non-trivial turnout in equilibrium. In both cases, candidates pander towards the group that is more mobilized to vote, i.e. the one that is most responsive to policy, or has stronger social incentives.

We illustrate these issues using the simplest possible example: each of the two candidates commit to a platform p from a policy space, P_x, with three possible locations, $\left\{\frac{3}{2} - x, \frac{3}{2}, \frac{3}{2} + x\right\}$, in which $x \in (0, 1/2)$. The payoff of group G from the selected policy being p is $\kappa_G u\left(|p - G|\right)$ in which $\kappa_G > 0$ is the responsiveness of group G to policy, and the function u is smooth, strictly decreasing, and strictly concave. When candidates 1 and 2 choose platforms p_1 and p_2

respectively, the difference between the two endogenizes the importance of the election:

$$w_G(p_1, p_2) = \kappa_G \Big| u\left(|p_1 - G|\right) - u\left(|p_2 - G|\right) \Big|.$$

When the two candidates choose the same platform, then no citizen votes ensuring that each candidate wins with equal probability. To guarantee existence and uniqueness of a Consistent Ethical Response, we assume that the fraction of citizens in group 1 is uniformly distributed on $[0, 1]$. The groups are entirely symmetric except that group 2 may be more responsive to policy ($\kappa_2 > \kappa_1$) or have stronger social incentives ($\lambda_2 > \lambda_1$). For expositional clarity, we separate the two forms of asymmetries; as a normalization, we set $\kappa_1 = 1$ and write κ for κ_2.

We begin by studying candidates who are motivated purely by office. In any equilibrium, each candidate must have an equal probability of winning since otherwise, a candidate can deviate to the other's position to ensure no turnout and split the election. Accordingly, candidate incentives are assessed by examining when a platform in P_x defeats another platform with probability greater than $\frac{1}{2}$. When one candidate chooses platform $\frac{3}{2}$ and the other selects $\frac{3}{2} + x$, the ratio of the importance of the election to groups 1 and 2 is

$$\frac{w_1\left(p_1, p_2\right)}{w_2\left(p_1, p_2\right)} = \left(\frac{1}{\kappa}\right)\left(\frac{u\left(\frac{1}{2}\right) - u\left(\frac{1}{2} + x\right)}{u\left(\frac{1}{2} - x\right) - u\left(\frac{1}{2}\right)}\right).$$

Because u is strictly concave, the second term on the RHS (henceforth denoted by κ_x) exceeds 1: distinct platforms biased towards group 2's preferred policy would induce greater turnout from members of group 1 if the groups are equally responsive. Accordingly, a sufficiently large gap in responsiveness or social incentives is needed for platforms to pander to group 2.

Theorem 6. *Office-motivated candidates select the same platform in the unique equilibrium, which is either $\frac{3}{2}$ or $\frac{3}{2} + x$.*

1. Asymmetric Responsiveness*: The equilibrium platforms satisfy*

$$p_1 = p_2 = \begin{cases} \frac{3}{2} & \text{if } \kappa < \kappa_x, \\ \frac{3}{2} + x & \text{if } \kappa > \kappa_x. \end{cases}$$

2. Asymmetric Social Incentives*: There exists $\overline{\kappa} > 1$ and $\underline{\lambda}$ such that if $\kappa_x < \overline{\kappa}$ and $\lambda_2 > \underline{\lambda}$, then the unique platform is $\frac{3}{2} + x$.*

All citizens abstain on the equilibrium path and each candidate wins with equal probability.

This example highlights some interesting features that emerge from the interplay of turnout and electoral competition. First, when citizens balance the costs of voting with its benefit, the intensity of their preferences as captured by responsiveness affects policy choice. Second, even if no citizen turns out in equilibrium, platforms can pander towards groups that have a greater incentive to vote. Were both platforms to remain centrist, but citizens of group 1 were sufficiently more responsive or had stronger social incentives, then one candidate would have an incentive to diverge towards that group and increase its relative turnout. Third, if the policy space were continuous, our results indicate that any asymmetry in responsiveness or social incentives will induce at least some bias in policy choice (since $\kappa_x \to 1$ as $x \to 0$).

While office-motivated candidates converge to a single policy to ensure a tie, policy-motivated candidates choose divergent platforms sacrificing the probability of victory for a more preferable policy should they win.[19] Suppose that candidate G like members of group G has a preferred policy of G, and her payoff from the winning policy p is $v\left(|p-G|\right)$, where v is smooth, strictly decreasing, and concave. Since the candidates do not choose the same platform in equilibrium, their divergent profiles induce turnout in equilibrium. The asymmetries between the groups shapes electoral competition, and therefore influence whether equilibrium platforms are $\left(\frac{3}{2}-x, \frac{3}{2}+x\right)$ or $\left(\frac{3}{2}, \frac{3}{2}+x\right)$; also playing a critical role is the extent to which candidate 1 is willing to select the centrist position. Let

$$v_x = \frac{v\left(\frac{1}{2}-x\right) - v\left(\frac{1}{2}+x\right)}{v\left(\frac{1}{2}\right) - v\left(\frac{1}{2}+x\right)} \geq 1.$$

Theorem 7. *Policy-motivated candidates select different platforms in the unique equilibrium. The equilibrium platforms are either* $\left(\frac{3}{2}-x, \frac{3}{2}+x\right)$ *or* $\left(\frac{3}{2}, \frac{3}{2}+x\right)$*; the latter is the unique equilibrium if responsiveness or social incentives are sufficiently asymmetric as described below:*

1. Asymmetric Responsiveness*: There exists* $\overline{v} > 1$ *and* $\overline{\kappa}$ *such that if* $\kappa > \overline{\kappa}$ *and* $v_x < \overline{v}$.

2. Asymmetric Social Incentives*: There exists* $\overline{v} > 1$, $\overline{\kappa} > 1$, *and* $\underline{\lambda}$ *such that if* $v_x < \overline{v}$, $\kappa_x < \overline{\kappa}$, *and* $\lambda_2 > \underline{\lambda}$.

Citizens vote on the equilibrium path, and the probability with which candidate 2 *wins is increasing in the relative responsiveness* (κ) *or social incentives* (λ_2) *in group* 2.

[19] This divergence echoes results from Wittman (1983) and Calvert (1985) who show that policy-motivated candidates diverge when voting is costless and candidates are uncertain about the distribution of voter preferences.

A policy-motivated candidate 1's only incentive to pander to group 2 is that it increases his probability of victory at the expense of the policy should he win: by biasing platforms towards group 2, the election becomes relatively less important to group 2 than to members of group 1. Thus, pandering is able to partially correct for the asymmetries in responsiveness and social incentives.

The above results illustrate in this stylized setting as to how candidates have an incentive to pander towards groups that are more mobilized to vote. This pandering motive highlights why political elites wish to expend effort towards social incentives, as studied in group mobilization models (e.g. Uhlaner, 1989; Morton, 1991; Shachar and Nalebuff, 1999): mobilization efforts influence not only the probability with which one's favored candidate wins, but the platforms of each candidate.

5 Conclusion

This paper offers a simple model for turnout that integrates ethical and signaling motives, generates predictions for turnout that are consistent with existing evidence, and may be useful to understand the links between voter mobilization and community monitoring as well as electoral competition. We conclude by briefly noting two important directions in which the current work may be extended.

We anchor social incentives and esteem to the rule-utilitarian notion of duty and ethics formulated by Coate and Conlin (2004) and Feddersen and Sandroni (2006a,c). Apart from its intrinsic appeal, the ethical voter framework has proven useful in a number of contexts and thus presents a natural starting point for our analysis. Alternative notions of ethics may involve the ethical type experiencing a constant warm-glow from voting or being a strategic agent with altruistic preferences. The weakness of the first approach is that by divorcing the content of duty from the fundamentals of the election, it fails to capture the competitive nature of turnout, and the resulting impact that this has on electoral competition. The latter is vein is more compelling, and such models of duty have been studied by Edlin et al. (2007) and Evren (2010). These models behave similarly to the ethical voter framework but with the attractive feature of relying on standard equilibrium concepts; it would be interesting to understand the extent to which insights similar to those may be derived in that setting.

Our framework models social incentives as being exogenous to the political process ignoring how they are shaped by the choices of political elites and leaders. Grossman and Helpman (2002) and Shachar and Nalebuff (1999), among others, suggest that leaders exert costly effort towards monitoring and motivating "followers" to vote; we have attempted in this paper to model a form of social incentive without studying the strategic choices that leaders face in mobilizing turnout. We consider it an important direction for future work to endogenize the strength of social incentives, and integrate the incentives of leaders with that of followers to appear ethical.

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A Appendix

In the Appendix, we prove Lemma 1, and Theorems 1-7, with the exception of Theorem 4 whose proof we suppress because it is virtually identical to Theorem 1. The remaining proofs are in the Supplementary Appendix.

Proof of Lemma 1. Consider a generic group G, and let $S(c, c^*)$ denote the marginal gain in image when pragmatist voters use cutoff c and the ethical voter has cutoff c^*. Thus,

$$S(c, c^*) = \lambda \left(\zeta(1, c, c^*) - \zeta(0, c, c^*)\right).$$

Observe that the first term above is strictly decreasing in c and the second term is strictly increasing in c, and so $S(c, c^*)$ is strictly decreasing in c. Moreover,

$$S(0, c^*) = \lambda \left(1 - \frac{q(1 - F(c^*))}{1 - qF(c^*)}\right) > 0,$$

and $S(c^*, c^*) = 0$. Since S_G is continuous in c, it follows that there exists a unique $\hat{c}_G$ that satisfies Equation 2. Applying the Implicit Function Theorem to Equation 2 yields that

$$\frac{dP(c^*)}{dc^*} = -\frac{\frac{dS(c,c^*)}{dc^*}}{\frac{dS(c,c^*)}{dc} - 1}$$

which is positive because numerator is strictly positive and the denominator is strictly negative.

Q.E.D

Proof of Theorem 1. Consider the first-order conditions with respect to c_1 and c_2 respectively:

$$\begin{aligned}
\frac{qF(c_2) + (1-q)F(\hat{c}_2)}{(qF(c_1) + (1-q)F(\hat{c}_1))^2} wh\left(\frac{qF(c_2) + (1-q)F(\hat{c}_2)}{qF(c_1) + (1-q)F(\hat{c}_1)}\right) qf(c_1) - \left(\frac{1}{2}\right) c_1 qf(c_1) = & \quad 0, \\
\frac{1}{qF(c_1) + (1-q)F(\hat{c}_1)} wh\left(\frac{qF(c_2) + (1-q)F(\hat{c}_2)}{qF(c_1) + (1-q)F(\hat{c}_1)}\right) qf(c_2) - \left(\frac{1}{2}\right) c_2 qf(c_2) = & \quad 0.
\end{aligned}$$

Comparing the two first-order conditions yields that at an interior solution,

$$\frac{c_1}{c_2} = \frac{qF(c_2) + (1-q)F(\hat{c}_2)}{qF(c_1) + (1-q)F(\hat{c}_1)},$$

which translates into Equation 4, from which Equation 8 follows. We now verify the second order condition for a maximum. Without loss of generality, we analyze the second-derivative of V_2 at the symmetric solution which is

$$\begin{aligned}
&\frac{w}{qF(c_1^*)+(1-q)F(\hat{c}_1)} q\left[h(1)f'(c_2^*) + f(c_2^*)h'(1)\frac{qf(c_2^*)}{qF(c_1^*)+(1-q)F(\hat{c}_1)}\right] - \tfrac{1}{2}q[f(c_2^*) + c_2^* f'(c_2^*)] \\
&= f'(c_2^*)\left[\frac{w}{qF(c_1^*)+(1-q)F(\hat{c}_1)} qh(1) - \tfrac{1}{2}qc_2^*\right] + f(c_2^*)q\left[\frac{wf(c_2^*)}{(qF(c_1^*)+(1-q)F(\hat{c}_1))^2} h'(1) - \tfrac{1}{2}\right]
\end{aligned}$$

At an interior optimum, the term in the first set of square brackets is equal to $\frac{dV_2}{dc_2}$ and so is 0 at the solution to the FOC. It therefore suffices to establish that $h'(1) < 0$, as shown below:

$$\begin{aligned}
h'(1) &= \left(-(2\alpha)(\frac{1}{x+1})^{2\alpha+1}\frac{x^{\alpha-1}}{B(\alpha,\alpha)} + (\alpha-1)(\frac{1}{x+1})^{2\alpha}\frac{x^{\alpha-2}}{B(\alpha,\alpha)}\right)|_{x=1} \\
&= -2\alpha(\frac{1}{2})^{2\alpha+1}\frac{1}{B(\alpha,\alpha)} + (\alpha-1)(\frac{1}{2})^{2\alpha}\frac{1}{B(\alpha,\alpha)} \\
&= -\frac{1}{2^{2\alpha}B(\alpha,\alpha)} \\
&< 0.
\end{aligned}$$

Q.E.D

Proof of Theorem 2. We begin by establishing that the Pragmatist Best Response is unique. For $P(c^*)$ as defined in Definition 1, and for arbitrary c^*, consider

$$(1-s)\zeta\left(1, P\left(c^*\right), c^*\right) - \zeta\left(0, P\left(c^*\right), c^*\right).$$

The term above is continuously decreasing in s, is strictly positive when $s = 0$, and strictly negative when $s = 1$. Let $\bar{s}(c^*)$ be the unique value of s such that the term above is 0.

First, suppose that $s \geq \bar{s}(c^*)$: we claim that the unique Pragmatist Best Response in this setting is identical to $P(c^*)$ (of Definition 1) and with $\mu_G = 0$. Notice that the Truthful Abstainer's Image is at least as large as the Lying Abstainer's Image, and therefore, no pragmatist has an incentive to deviate. Suppose that there was another pragmatist response in which $\mu_G > 0$ and the pragmatist's cost cutoff is $\tilde{c}$. To satisfy (4) of Definition 4, it follows that $F(\tilde{c}) + \mu_G \leq F(P(c^*))$. Because a pragmatist with cost $\tilde{c}$ is indifferent between voting and not,

$$\begin{aligned}
\tilde{c} &= \lambda \left(\begin{array}{l} s\dfrac{qF\left(c^*\right)}{qF\left(c^*\right) + (1-q)F\left(\tilde{c}\right)} + (1-s)\dfrac{qF\left(c^*\right)}{qF\left(c^*\right) + (1-q)\left(F\left(\tilde{c}\right) + \mu_G\right)} \\ - \dfrac{q\left(1 - F\left(c^*\right)\right)}{q\left(1 - F\left(c^*\right)\right) + (1-q)\left(1 - F\left(\tilde{c}\right) - \mu_G\right)} \end{array} \right) \\
&\geq \lambda\left(\zeta\left(1, P\left(c^*\right), c^*\right) - \zeta\left(0, P\left(c^*\right), c^*\right)\right) \\
&= P(c^*),
\end{aligned}$$

which is a contradiction.

Now, suppose that $s < \bar{s}(c^*)$: for all $s \leq \bar{s}(c^*)$, find the unique cost, $c(s, c^*)$, that makes a voter indifferent between voting and obtaining the Voter's Image, and abstention-lying obtaining the Lying Abstainer's Image when ethical citizens use a cutoff of c^*. It follows that

$$c(s, c^*) = \lambda s \frac{qF\left(c^*\right)}{qF\left(c^*\right) + (1-q)F\left(c(s, c^*)\right)}.$$

For the equality to hold, $c(s, c^*)$ is increasing in s, and by construction, $c(\bar{s}(c^*), c^*) = P(c^*)$. Therefore, for $s < \bar{s}(c^*)$, $c(s, c^*) < P(c^*)$. Setting $\tilde{c}_G = c(s, c^*)$ consider the expression given by Lying Abstainer's Image $-$ Truthful Abstainer's Image: it is continuously decreasing in μ_G

and strictly negative at $\mu_G = 1 - F(\tilde{c}_G)$. Moreover, at $\mu_G = 0$, the term is

$$
\begin{aligned}
&(1-s)\zeta\left(1, c(s,c^*), c^*\right) - \zeta\left(0, c(s,c^*), c^*\right) \\
>&(1-\overline{s}(c^*))\zeta\left(1, c(s,c^*), c^*\right) - \zeta\left(0, c(s,c^*), c^*\right) \\
>&(1-\overline{s}(c^*))\zeta\left(1, P\left(c^*\right), c^*\right) - \zeta\left(0, P\left(c^*\right), c^*\right) \\
=&0,
\end{aligned}
$$

in which the first inequality follows from $s < \overline{s}(c^*)$, the second inequality follows from $c(s,c^*) < P(c^*)$, and the equality is by construction. Therefore, there exists a unique μ_G that equates Lying Abstainer's Image and Truthful Abstainer's Image.

Thus, we have constructed the unique Pragmatist Best Response in the model that permits lying. Based on the above discussion, we extend $c(s,c^*)$ to the entire domain $[0,1] \times [0,\infty)$; since signaling incentives are increasing in c^*, it follows that $c(s,c^*)$ is increasing in c^*. The first-order condition generated by the Consistent Ethical Rule is similar to that in Theorem 1, and yields an analogue to Equation 4:

$$c_1^*\left(qF\left(c_1^*\right) + (1-q)\,F\left(c(s,c_1^*)\right)\right) = c_2^*\left(qF(c_2^*) + (1-q)F\left(c(s,c_2^*)\right)\right).$$

Since $c(s,c^*)$ is increasing in c^*, it follows that $c_1^* = c_2^*$, from which the characterization Theorem 2 follows.

Consider the ethical cutoff from the unique political equilibrium in Theorem 1 and denote this by C. Let $\tilde{s} = \overline{s}(C)$. It follows that if $s \geq \tilde{s}$, the unique equilibrium corresponds to Theorem 1. On the other hand, if $s < \tilde{s}$, then the unique equilibrium involves $\mu_G > 0$, and a pragmatist participation less than that in the setting without lying $c(s,c^*) < P(C)$. As s increases, $c(s,c^*)$ increases and so it follows that c_G^* decreases for each group G while overall turnout increases. Q.E.D

Proof of Theorem 3. We first establish the existence and uniqueness of a pragmatic best response. Holding fixed an ethical participation rate μ^*, notice that $\zeta\left(1, c, \mu^c, \mu, \mu^*\right)$ is strictly decreasing in μ^c and $\hat{\mu}$ and $\zeta\left(0, c, \mu, \mu^*\right)$ is strictly increasing in $\hat{\mu}$. For each c, and for each $\mu \in [0,1]$, let $h^c\left(\mu, \mu^*\right)$ define the participation rate among pragmatists with cost c when the participation rates among all pragmatists and ethical citizens in group G are μ and μ^* respectively. Formally, for $c \le c^*$, $h^c = 1$ if $c \le \lambda\left(\zeta\left(1, c, 1, \mu, \mu^*\right) - \zeta\left(0, c, \mu, \mu^*\right)\right)$, $h^c = 0$ if $c > \lambda\left(\zeta\left(1, c, 0, \mu, \mu^*\right) - \zeta\left(0, c, \mu, \mu^*\right)\right)$, and otherwise,

$$h^c\left(\mu, \mu^*\right) = \left[\left(c/\lambda + \zeta\left(0, c, \mu, \mu^*\right) - \zeta\left(0, c, 1-\mu, 1-\mu^*\right)\right)^{-1} pq - q\right] / (1-q).$$

In essence, h^c is 1 (resp. 0) if a citizen with cost c is better off voting (resp. abstaining) even when it is known that all citizens with that cost vote (resp. abstain). Otherwise, h^c finds the randomization probability that makes a voter with cost c indifferent. It follows that h^c is weakly decreasing and continuous in μ.

For $\mu \in [0,1]$, let $h\left(\mu, \mu^*\right) = \int_0^{\bar{c}} h^c\left(\mu, \mu^*\right) dF$. Since $h\left(\mu, \mu^*\right) \in [0,1]$, and h is continuous and weakly decreasing in μ, it follows that there exists a unique μ that satisfies $\mu = h\left(\mu, \mu^*\right)$. This is the unique Pragmatist Best Response. The remainder of the argument for existence and uniqueness follows Theorem 1. Q.E.D

Proof of Theorem 5. First, we show that there exists a unique Pragmatic Best Response given any ethical rule c_G^*. Fix a given c_G^*, and for a fixed S, consider the sets of types:

$$\Gamma_S = \Big\{ \left(D_i, c_i\right) : D_i\left(R_G\left(1, c_i\right) - R_G\left(0, c_i\right)\right) + S \ge c_i \Big\},$$
$$\tilde{\Gamma}_S = \Re_+^2 \backslash \Gamma_S.$$

The sets above consider those types that vote (resp. abstain) when the extrinsic incentive corresponds to S. Let

$$\iota\left(S\right) = \lambda\left(\Pr\left[D_i \ge c_i | \Gamma_S\right] - \Pr\left[D_i \ge c_i | \tilde{\Gamma}_S\right]\right)$$

denote the payoff gap induced from social esteem between voters and abstainers when it is believe that only types in Γ_S vote. A Pragmatist Best Response satisfies $\iota\left(S\right) = S$.

Towards showing that a Pragmatist Best Response exists, observe that $\iota\left(0\right) > 0$: Γ_0 comprises types above the 45 degree line in Figure 2, and therefore, $\Pr\left[D_i \ge c_i | \Gamma_0\right] = 1$. In contrast, $\tilde{\Gamma}_0$ comprises types below the 45 for costs below c_G^*, and therefore, $\Pr\left[D_i \ge c_i | \tilde{\Gamma}_0\right] < 1$. Now, observe that $\iota\left(c_G^*\right) \le 0$: $\Gamma_{c_G^*}$ comprises all types for which $c_i \le c_G^*$, and $\tilde{\Gamma}_{c_G^*}$ comprises all types for which $c_i > c_G^*$. Because $\Pr\left[D_i \ge c_i | c_i\right]$ is decreasing in c_i, it follows that $i\left(c_G^*\right) \le 0$. Finally, we note that $\iota(S)$ is strictly decreasing in S. Let $S^\dagger > S$. Observe that

$\Pr[D_i \geq \bar{c}|\Gamma_{S^\dagger}] \leq \Pr[D_i \geq \bar{c}|\Gamma_S]$, and $\Pr\left[D_i \geq \bar{c}|\tilde{\Gamma}_{S^\dagger}\right] \geq \Pr\left[D_i \geq \bar{c}|\tilde{\Gamma}_S\right]$ from which it follows that $\iota(S^\dagger) \leq \iota(S)$. Therefore, the Pragmatic Best Response exists and is unique. It is straightforward to show that the participation rate of pragmatists is increasing in c^*_G.

We turn to proving existence and uniqueness of the Consistent Ethical Response. Let $Q(c)$ denote the fraction of citizens in group G who participate when the ethical cutoff is c; it follows that $Q(c)$ is increasing in c. By reasoning analogous to Theorem 1, it follows that in a political equilibrium,

$$c_1 Q(c_1) = c_2 Q(c_2),$$

which as before implies that the political equilibrium exists, and the associated ethical cutoff solves $cQ(c) = 2^{1-2\alpha} w / B(\alpha, \alpha)$. Q.E.D

Proof of Theorem 6. We first establish that $\frac{3}{2} - x$ is not an equilibrium platform because it is defeated by each of the other platforms with probability greater than 1/2:

$$\frac{1}{\kappa \kappa_x} = \frac{w_1\left(\frac{3}{2}, \frac{3}{2} - x\right)}{w_2\left(\frac{3}{2}, \frac{3}{2} - x\right)} < \frac{w_1\left(\frac{3}{2} + x, \frac{3}{2} - x\right)}{w_2\left(\frac{3}{2} + x, \frac{3}{2} - x\right)} = \frac{1}{\kappa} \leq 1.$$

Therefore, by Property 4, $\frac{3}{2} - x$ is defeated by each of the other platform with probability strictly greater than $\frac{1}{2}$ if $\kappa > 1$, and by Property 5 if $\kappa = 1$ and $\lambda_2 > \lambda_1$.

When responsiveness is asymmetric, $\frac{3}{2}$ defeats (resp. is defeated by) $\frac{3}{2} + x$ if $\kappa <$ (resp. $>$)κ_x with probability exceeding $\frac{1}{2}$, yielding the unique equilibrium prediction. When social incentives are asymmetric, notice that if $\kappa_x = 1$ then by Property 5 it follows that $\lambda_2 > \lambda_1$ implies that $\frac{3}{2} + x$ defeats $\frac{3}{2}$ with probability exceeding $\frac{1}{2}$. Therefore, the desired result follows by continuity. Q.E.D

Proof of Theorem 7. For proposals (p_1, p_2), let $\Pi(p_1, p_2)$ denote the probability with which candidate 1 wins. Candidate G's payoff therefore is:

$$\Pi(p_1, p_2) v\left(|p_1 - G|\right) + \left(1 - \Pi(p_1, p_2)\right) v\left(|p_2 - G|\right).$$

Since $\Pi(p_1, p_2) \in (0, 1)$ for every (p_1, p_2), it follows that in every pure strategy equilibrium, candidates run on different platforms. Moreover, notice that if $(p_1, p_2) = \left(\frac{3}{2} - x, \frac{3}{2} + x\right)$, then

Candidate 2 wins with probability of at least $\frac{1}{2}$, and therefore, $\left(\frac{3}{2}, \frac{3}{2}+x\right)$ is not an equilibrium. When responsiveness is asymmetric, then the unique equilibrium platform is $\left(\frac{3}{2}, \frac{3}{2}+x\right)$ if $v_x = 1$ and $\kappa > \kappa_x$, and therefore the result follows by continuity. When social incentives are asymmetric, then the unique equilibrium platform is $\left(\frac{3}{2}, \frac{3}{2}+x\right)$ if $v_x = 1$, $\kappa_x = 1$ and $\lambda_2 > \lambda$, and therefore the result follows by continuity. Q.E.D

B Supplementary Appendix

Before proving the results in the paper, we first establish that a unique political equilibrium exists even when groups are asymmetric if k is uniform on $[0, 1]$. For group G, we denote by w_G the importance of the election for members of group G, by F_G the distribution of their voting costs, and by λ_G the strength of social incentives. Let P_G denote the Pragmatist Best Response for group G, and for a cost c_G, let $T_G(c) = qF_G(c) + (1-q)F_G(P_G(c))$ denote the total turnout from group G; it follows that T_G is increasing in c. The first-order conditions are

$$\begin{aligned} \frac{T_2(c_2)}{\left(T_1\left(c_1\right)\right)^2} w_1 h\left(\frac{T_2(c_2)}{T_1\left(c_1\right)}\right) &= \frac{c_1}{2}, \\ \frac{1}{T_1\left(c_1\right)} w_2 h\left(\frac{T_2(c_2)}{T_1\left(c_1\right)}\right) &= \frac{c_2}{2}. \end{aligned} \tag{10}$$

Therefore at an interior solution,

$$\frac{c_1 T_1\left(c_1\right)}{w_1} = \frac{c_2 T_2(c_2)}{w_2}. \tag{11}$$

For the claims that follow, we assume that k is uniformly distributed on $[0, 1]$; the two claims together imply existence and uniqueness of political equilibrium.

Claim 1. (c_1, c_2) *that satisfy the first-order conditions in Equation 10 are maxima.*

Proof. As in the proof of Theorem 1, it suffices to establish that $h'\left(\frac{T_2(c_2)}{T_1(c_1)}\right) < 0$, which is necessarily true when $\alpha = 1$ since $h'(x) = -\frac{2}{(x+1)^3} < 0$ for all x. Q.E.D

Claim 2. *There is a unique solution to Equation 10.*

Proof. Our argument adapts the proof of Fact 1 on p. 22-23 of Feddersen and Sandroni (2006c) to our environment. Suppose that there were two solutions c_1, c_2 and c_1', c_2'. It follows from

Equation 11 that if $c'_1 > (=, <) c_1$, then $c'_2 > (=, <) c_2$, and so WLOG, we assume that $c'_1 > c_1$. Let $\tau = \frac{T_2(c_2)}{T_1(c_1)}$ and $\tau' = \frac{T_2(c'_2)}{T_1(c'_1)}$. It follows from Equation 11 that

$$sgn\left(\tau' - \tau\right) = sgn\left(\frac{c'_1}{c'_2} - \frac{c_1}{c_2}\right).$$

We study two complementary cases below and show how each yields a contradiction.

1. $\dfrac{c'_1}{c'_2} \geq \dfrac{c_1}{c_2}$: Re-writing the second equation in Equation 10 yields that

$$c'_2 T_1(c'_1) = 2w_2 h(\tau') \leq 2w_2 h(\tau) = c_2 T_1(c_1),$$

   in which the inequality follows h being a decreasing function if $\alpha = 1$ and $\tau' \geq \tau$. Since T_1 is a strictly increasing function, the above equation contradicts $(c'_1, c'_2) >> (c_1, c_2)$.

2. $\dfrac{c'_1}{c'_2} < \dfrac{c_1}{c_2}$: Analogous to h, consider the density function of $\frac{1-k}{k}$ denoted by $\tilde{h}$. It follows that the first equation of Equation 10 can be re-written as

$$\frac{1}{T_2(c_2)} w_1 \tilde{h}\left(\frac{1}{\tau}\right) = \frac{c_1}{2}. \tag{12}$$

   Since $\tilde{h}$ is decreasing in its argument, and $\tau' < \tau$, it follows that

$$c'_1 T_2(c'_2) = 2w_1 h(\frac{1}{\tau'}) < 2w_1 h(\frac{1}{\tau}) = c_1 T_2(c_2),$$

   which contradicts $(c'_1, c'_2) >> (c_1, c_2)$.

Q.E.D

Proof of Property 1. Since the RHS is increasing in w, it follows that c^*_G is increasing in w for an interior solution. Demonstrating that the RHS is increasing in α is more involved: it suffices to show that $2^{1-2\alpha}/B(\alpha, \alpha)$ is increasing in α. Let Γ be the gamma function: since

$B(\alpha,\alpha)=\frac{(\Gamma(\alpha))^2}{\Gamma(2\alpha)}$, we have

$$\begin{aligned} & \frac{2^{1-2\alpha}}{B(\alpha,\alpha)} \\ = & \frac{2^{1-2\alpha}\Gamma(2\alpha)}{(\Gamma(\alpha))^2} \\ = & \frac{1}{\sqrt{\pi}}\frac{\Gamma\left(\alpha+\frac{1}{2}\right)}{\Gamma(\alpha)}, \end{aligned}$$

in which the last equality uses the duplication formula for the gamma function, $\Gamma(z)\Gamma\left(z+\frac{1}{2}\right)=2^{1-2z}\sqrt{\pi}\Gamma(2z)$.

$$\begin{aligned} & \frac{d}{d\alpha}\left(\frac{1}{\sqrt{\pi}}\frac{\Gamma\left(\alpha+\frac{1}{2}\right)}{\Gamma(\alpha)}\right) \\ = & \frac{\Gamma(\alpha)\Gamma\left(\alpha+\frac{1}{2}\right)\left(\psi\left(\alpha+\frac{1}{2}\right)-\psi(\alpha)\right)}{(\Gamma(\alpha))^2\sqrt{\pi}} \\ = & \frac{2^{1-2\alpha}}{B(\alpha,\alpha)}\left(\psi\left(\alpha+\frac{1}{2}\right)-\psi(\alpha)\right), \end{aligned}$$

where the first equality follows from the quotient rule, and $\frac{d}{d\alpha}\Gamma(\alpha)=\Gamma(\alpha)\psi(\alpha)$, where $\psi(\alpha)=-\gamma+\int_0^1\frac{1-x^{\alpha-1}}{1-x}dx$ is the digamma function, and γ is the Euler-Mascheroni constant; the second equality follows from above. Since the term outside brackets is strictly positive, it suffices to show that $\psi\left(\alpha+\frac{1}{2}\right)-\psi(\alpha)\geq 0$:

$$\begin{aligned} & \psi\left(\alpha+\frac{1}{2}\right)-\psi(\alpha) \\ = & \int_0^1\frac{x^{\alpha-1}-x^{\alpha-\frac{1}{2}}}{1-x}dx \\ = & \int_0^1\frac{x^{\alpha-1}}{1-x}\left(1-x^{1/2}\right)dx \\ > & 0. \end{aligned}$$

Finally, we show that participation increases as the voting costs decrease. Suppose that costs are initially distributed according to cdf F and decrease to cdf $\tilde{F}$. Let c^* and $\tilde{c}$ be the solution to Equation 8 with cdf F and $\tilde{F}$ respectively, and let $\hat{c}$ and $\overline{c}$ be the respective cutoff for pragmatists. It follows that

$$c^*\left(qF(c^*)+(1-q)F(\hat{c})\right)=\tilde{c}\left(q\tilde{F}(\tilde{c})+(1-q)\tilde{F}(\overline{c})\right).$$

Given the above equation, it suffices to establish that $c^* \geq \tilde{c}$; suppose otherwise towards a contradiction. Because F strictly first-order stochastically dominates $\tilde{F}$, it follows that $\tilde{F}(\tilde{c}) > F(\tilde{c}) > F(c^*)$. From the signaling incentives, it follows that $\tilde{F}(\bar{c} > F(\hat{c})$: otherwise, $\bar{c} < \hat{c}$, and so a pragmatist at cost $\hat{c}$ is not willing to vote when costs are distributed according $\tilde{F}$ despite the stronger social incentive to vote. The equation above however is false if $\tilde{F}(\tilde{c}) > F(c^*)$ and $\tilde{F}(\bar{c} > F(\hat{c})$ leading to a contradiction. Q.E.D

Proof of Property 2. Applying the Implicit Function Theorem to Equation 2 yields that

$$\frac{dP}{d\lambda} = -\frac{\zeta\left(1, P\left(c^*\right), c^*\right) - \zeta\left(0, P\left(c^*\right), c^*\right) + \frac{dS(P(c^*), c^*)}{dc^*}\frac{dc^*}{d\lambda}}{\frac{dS(c, c^*)}{dc} - 1}$$

From the above expression, it follows that $dc^*/d\lambda > 0$ implies $d\hat{c}_G/d\lambda > 0$. Yet, if c^* increases with λ, then the entire term on the LHS of Equation 8 increases, resulting in a contradiction. Therefore, c^*_G must decrease with λ, and to satisfy Equation 8 , it follows that $qF(c^*_G) + (1-q)F(P(c^*_G)$ is increasing in λ: therefore, both the overall participation rate and that of pragmatists increases with λ. Q.E.D

Proof of Property 3. By Equation 2, $\hat{c}_G > 0$ if and only if $S\left(\hat{c}_G, c^*_G\right) > 0$, which is true if and only if $F_G\left(\hat{c}_G\right) < F_G\left(c^*_G\right)$. Q.E.D

Proof of Property 4. Suppose that $w_2 > w_1$; Equation 11 fails if $c^*_2 \leq c^*_1$ because $T_1 = T_2$ and is increasing in its argument. Therefore $c^*_2 > c^*_1$ and $\hat{c}_2 = P(c^*_2) > P(c^*_1) = \hat{c}_1$. The argument for when costs are asymmetric and F_1 strictly first order stochastically dominates F_2 is identical to that in Property 1 substituting F_1 for F and F_2 for $\tilde{F}$. Q.E.D

Proof of Property 5. It follows from Property 2 that $P_2(c) > P_1(c)$ for every c. Equation 11 holds if and only if $c^*_1 > c^*_2$, which implies that $T_1\left(c^*_1\right) < T_2\left(c^*_2\right)$. Q.E.D