# Civic Duty and Political Advertising*

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**Abstract**

Should voter awareness policies and *get-out-the-vote* movements be promoted? We address this question using a model of political advertising that incorporates both the mobilization and the persuasion aspects of advertising. An uncertain-voter model of two-candidate political competition is proposed, where candidates have fixed symmetric ideological positions and unknown qualities and can use political advertising, to inform voters about their qualities. By reducing or eliminating voters' uncertainty about who the right candidate is, political advertising can both mobilize citizens and change their minds about which candidate to vote for. We characterize the equilibrium and conduct comparative static analysis allowing us to evaluate the effect of voter awareness policies or the activity of *get-out-the vote* movements on political advertising, turnout, and electoral outcomes. We find that, although successful at increasing voter turnout, they may lead to either an increase or a decrease in political advertising as well as in the probability that the candidate preferred by a majority of (all informed) citizens is elected.

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# 1 Introduction

There is an open debate about whether voter turnout should be fostered. On the one hand there is a widespread view, especially among political scientists and political commentators, that high levels of turnout are good for democratic societies. This idea, which dates back to Downs (1957), is based on the presumption that the higher the turnout the higher the legitimacy of democracy. Inspired by this perspective, many non-partisans voter awareness movements have emerged aiming at boosting existing turnout levels in the US, where turnout has always been historically very low, and an important body of work in political science (see, e.g., Gerber and Green 2004) have used experimental data to analyze the effectiveness of *get-out-the-vote* drives at increasing levels of turnout.

On the other hand, there is also a widespread consensus that the outcome of elections should reflect the actual preferences of a majority of citizens. Since this may not be the case if those who vote have different preferences from those who abstain or do not have all the relevant political information about candidates, turnout levels should be fostered only insofar as this would imply electoral outcomes that better represent the will of the citizenry. Motivated by this second perspective, economists have analyzed the effect of policies that subsidize(sanction) voting(non-voting) or make voting compulsory on electoral outcomes (see, e.g., Borgers 2004, Ghosal and Lockwood 2009, Krasa and Polborn 2009, and Krishna and Morgan 2008). While these studies reach mixed conclusions, they are all based on pivotal-voter models with costly voting and most of them take information as given.

The objective of this paper is to provide new insights in the above debate using a model of informative political advertising whose novelty is to let advertising affect both the decision to vote and whom to vote for. The theoretical model is motivated by the fact that political candidates spend vast amounts of money on their campaigns[1] –with an average of about 45% of the overall campaign budgets absorbed by mass media advertising[2]– and

[1] To provide an example, in 2006 House and Senate candidates spent on average 995 and 7,992 thousand dollars, respectively. Statistics on campaign spending are available on the site of the Federal Election Commission at www.fec.gov.

[2] See Jacobson (2004).

by supporting evidence of two main effects of campaign spending on citizens' behavior in elections. First, it can mobilize citizens by activating them to vote.[3] Second, it can persuade citizens by influencing their decision about which candidate to vote for.[4]

Existing theoretical studies of political competition with campaign spending have examined these effects separately. Models of mobilization assume that spending directly affects the probability that citizens with predefined political preferences will vote (see, e.g., Herrera, Martinelli, and Levine 2008, and Shachar and Nalebuff 1999). Models of persuasion abstract from abstention and assume that a candidate's campaign spending directly affects the probability that voters will vote for him. In earlier works such a persuasion mechanism was also considered as a black box (see, e.g., Grossman and Helpman 1996). However, recent studies explicitly incorporate the persuasion aspect of campaign spending in the form of "informative advertising". In these models advertising transmits to voters information about the running candidates, either indirectly (see Prat 2002*a*, 2002*b*) or directly (see Coate 2004*a*, 2004*b*).

This paper proposes a model of directly informative political advertising that implicitly incorporates both the mobilization and the persuasion aspects of advertising. Modeling both aspects within the same theoretical framework allows us to study the effect of policies that affect citizens' ex-ante predisposition to vote, on citizens' political information, turnout, voting, and electoral outcomes.

The main analysis is based on an *uncertain-voter* model of two-candidate political competition, where candidates have fixed symmetric ideological positions and unknown qualities.[5] Citizens have an ex-ante predisposition/benefit to vote (civic duty). However, in spite of this predisposition, they may choose to abstain. In fact, the uncertainty about the candidates' qualities generates a psychological cost caused by the possibility of voting for the wrong candidate. This endogenous cost is weighted against the exogenous

[3] Papers that find evidence of the mobilization or demobilization effect of political advertising include, for instance, Ansolabehere and Iynegar (1997), Goldstein and Freedman (2002), and Hylligus (2005).

[4] See, e.g., Alvarez (1998), Bergan et al. (2005), Eagles (2004), Erikson and Palfrey (2000), Gerber (1998), Jacobson (1985, 2004), Levitt (1994), and Rekkas (2007).

[5] For an explanation of *uncertain-voter* models of turnout see Merlo (2006).

benefit when deciding whether to vote. Candidates can use campaign spending, in the form of (positive) advertising, to inform voters about their qualities. In particular they choose what we call the "intensity of information", that is, the probability that a voter is reached by their ads.[6] By reducing or eliminating voters' uncertainty about who the right candidate is, political advertising can mobilize citizens as well as make them change their minds about whom to vote for. We characterize the level of political advertising that candidates choose, as well as conditions under which abstention emerges in equilibrium. We find that low-quality candidates do not advertise their quality and that the cost of advertising determines whether high-quality candidates advertise and whether the equilibrium exhibits full or partial turnout.

The main results concern the comparative static analysis with respect to civic duty, where an increase in civic duty can be viewed as the result of public policies that make citizens aware of their right/duty to vote or of the intensification of the activities of non-partisan *get-out-the-vote* movements. We find that an increase in civic duty always leads to a higher turnout. However, it may lead to either a higher or a lower equilibrium intensity of information depending on the initial belief about the candidates' quality and the cost of advertising. We then investigate whether the outcome of the election reflects the preferences of a majority of (all informed) citizens, that is, whether information is aggregated efficiently. As one may expect from the fact that low-quality candidates do not advertise their quality and that information about high-quality candidates reaches only a fraction of citizens, this is not always the case. However, the possibility that the "wrong" candidate is elected exists only when candidates have different qualities, and the probability that this happens is decreasing in the equilibrium intensity of information. It follows that policies aiming at increasing civic duty, such as voter awareness policies, although effective at increasing turnout may have the perverse effect of skewing the results of the elections away from the one representing the will of a majority of citizens.

Finally, we consider an extension of our model where the endogenous psychological value of voting is given by a weighted sum of the cost of voting for the wrong candidate

[6] This terminology is borrowed from Galeotti and Mattozzi (2007).

and the benefit of voting for the right one and where the exogenous benefit of voting is allowed to be negative. This extension allows evaluating the robustness of our main results and to compare our setting to the standard expressive-voting model, where voters weight equally the benefit and the cost of voting for the right and wrong candidate, respectively.

The structure of the paper is as follows. Section 2 proposes the basic model. Section 3 describes and discusses the voter's problem. Section 4 describes the candidate's problem and characterizes the political equilibrium with advertising. Section 5 studies the comparative statics of the equilibrium intensity of information, turnout, and the information aggregation properties of the equilibrium. Section 6 proposes a generalization of the basic model and discusses the robustness of the results. Section 7 concludes. All proofs can be found in the Appendix.

## 2 The Basic Model

Our basic setup combines the informative advertising model of Coate (2004*a*) and the *uncertain-voter* model of Degan (2006) and Degan and Merlo (2008).[7] The population set, $N$, is composed of a continuum of citizens divided into three groups: *Democrats*, *Republicans*, and *Independents*. Each citizen $i \in N$, has ideology $y_i \in Y$, where $Y = [-1, 1]$ is the liberal-conservative ideological space. For simplicity, as Coate (2004*a*), we assume that *partisans* (*Democrats* and *Republicans*) are equally sized and have symmetric ideologies. In particular $y_i = -1$ if $i$ is a *Democrat,* and $y_i = 1$ if $i$ is a *Republican.* *Independents*' ideologies are assumed to be uniformly distributed in the interval $[m - h, m + h]$.[8] The parameter $h$ determines the extent of heterogeneity among *Independents,* and $m$ is the ideology of the median *Independent*, whose identity is uncertain. In particular $m$ is the realization of a uniform random variable distributed along the interval $[-\varepsilon, \varepsilon]$,

[7]The notation is kept as close as possible to these two models so as to facilitate the reader to make comparisons.

[8]The assumption that *Independents* are uniformly distributed is common to many theoretical models of campaign advertising (see, e.g., Coate (2004a, 2005b) and Herrera, Martinelli, and Levine (2008)). It assures that the probability that a candidate wins has an explicit and tractable form. The same is true in this model, where there is the possibility of abstention. Similarly, the fact that the median voter is uncertain guarantees that the probability of winning is continuous in the candidate choice variable.

where $\varepsilon$ is a measure of the uncertainty about voters' ideologies and, obviously, $\varepsilon + h \leq 1$.

There are two parties, a republican party and a democratic party, constituted of a fraction of *Democrats* and *Republicans*, respectively. There is one election and each party randomly selects a candidate among their members. We denote by $D$ the candidate from the democratic party, by $R$ the one from the republican party, and by $j \in \{D, R\}$ a generic candidate. Candidates differ in their potential quality $\theta_j$. Each candidate can have high quality, $\theta^H$, or low quality, $\theta^L$. We normalize the latter to 0 and let $\sigma$ denote the probability that a candidate has high quality. We let $\{LL, LH, HL, HH\}$ be the possible states of the world where, for instance, state $HL$ is the state where candidate $D$ has high quality and candidate $R$ has low quality.

Each citizen $i$ evaluates candidate $j$ with ideological position $y_j$ and quality $\theta_j$ according to the following payoff function:[9]

$$u_i(j) = -|y_i - y_j| + \theta_j. \tag{1}$$

Since we will allow candidates to provide information about their quality, we let $I_D$ and $I_R$ indicate the information a citizen has about the quality of candidate $D$ and $R$, respectively, and we will refer to $(I_D, I_R)$ as the citizen's information status. To ease notation, we drop the index for the citizen. We introduce the details of what this information is and the corresponding beliefs about the candidates' qualities in Section 3, after the general description of the model. Unless a citizen is perfectly informed about both candidates' qualities, conditional on voting, she may not be able to avoid the possibility of voting for the wrong candidate. As in Degan (2006) and Degan and Merlo (2008) this possibility generates a cost of voting, which is modeled as the expected payoff loss from potentially making voting mistakes.[10] In other words, the cost of voting for a candidate corresponds

[9] It is standard in the literature to assume linearity in quality. The assumption of absolute distance rather than quadratic is inconsequential in our model where the candidates' ideological positions are known.

[10] Degan (2006) and Degan and Merlo (2008) consider situations where citizens only care about the ideological positions of candidates. While in Degan (2006) citizens can acquire information about the candidates' ideological positions, in Degan and Merlo (2008) information is exogenous.

to the expected payoff loss for citizen $i$ when the candidates' qualities are such that she would prefer the other candidate. In particular the cost of voting for candidate $D$ (the cost of voting for candidate $R$ is analogous) is:

$$c_i(D; I_D, I_R) = E[(u_i(R) - u_i(D)) \cdot 1\{u_i(R) > u_i(D)\} | I_D, I_R], \tag{2}$$

where $1\{\}$ is an indicator function denoting whether the expression inside the brackets is satisfied, and the expectation is taken with respect to the probability distribution of candidates' qualities induced by information status $(I_D, I_R)$ and the corresponding beliefs.[11] This cost is a purely psychological component of utility incurred upon voting, which derives from the fact that the citizen is concerned by the possibility of making an unwise choice if she were to vote. It is experienced "upon" making a possibly wrong choice and not "ex-post" and depends on the individual's voting choice but is independent of the electoral outcome.

We assume that citizens also have an exogenous benefit of voting $d > 0$, which can be viewed as the citizen's ex-ante propensity to vote. This term, standard in models of turnout, has been interpreted in the literature as the utility derived from fulfilling a citizen's civic duty to vote or alternatively the direct benefit of self-expression.[12] We therefore refer to $d$ as *civic duty* and assume it to be constant in the population.[13]

The idea that citizens feel a moral obligation to vote because such an act is essential to the survival of democracy dates back to Downs (1957) and is supported by empirical evidence (Knack, 1992, and Opp, 2001). The complementary interpretation of $d$ as a direct expressive benefit is consistent with evidence that individuals derive a highest satisfaction from living in environments giving them the opportunity of democratic self-expression (Frey and Stuzer 1999). More generally the predisposition to vote can incorporate all the

[11] With abuse of notation, such beliefs are not explicitly included in (2). Notice also that the cost in (2) is defined for any possible beliefs induced by information status $(I_D, I_R)$.

[12] See, e.g., Aldrich (1997), Downs (1957), Fiorina (1976), Funk (2008), Riker and Ordeshook (1968).

[13] The objective of the paper is to characterize how the term $d$ affects, in order, political advertising, information, turnout and voting decisions, and electoral outcomes. It is easier to work with a constant $d$. However, the analysis could be extended to heterogeneous civic duties, as long as they are independent of the citizens' ideological views, without changing the main results.

benefits related to the act of voting that are independent of the voting choice itself. For example, it can include a pure consumption value of voting consistent with the "warm-glow" theories of giving (Andreoni 1990), a psychological health benefit of participating in elections (Sanders 2001), or the benefits coming from the internalization of social norms (Funk 2008).

Conditional on information status $(I_D, I_R)$, the citizen's problem consists of choosing whether to vote and whom to vote for in order to maximize her net benefits of voting:

$$U_i(t_i, v_i; I_D, I_R) = t_i(d - c_i(v_i; I_D, I_R)), \tag{3}$$

where $t_i \in \{0, 1\}$ is an indicator variable denoting whether citizen $i$ votes, and $v_i \in \{D, R\}$ is her voting choice. Notice that, due to the continuum of voters no vote is pivotal and, therefore, there is no instrumental value of voting in expression (3). In other words, although a citizen cares about the electoral outcome per-se, as from equation (1), this is not affected by her participation and voting decisions. Since going to vote also involves some costs that are independent of the voting choice, such as the opportunity cost of time and some cost of elaborating information, one could think of $d$ as the exogenous net benefit of voting, which in the basic model is assumed to be positive. Equation (3) is consistent with this interpretation of $d$ if citizens are not allowed to cast a blank ballot. Allowing for this possibility would only require more notation without changing the main results.

The proposed model of voting can be considered as an *expressive-voting* model where the total value of self-expression is composed of two components: an exogenous component, represented by the term $d$, and a component related to the specific vote choice, represented by the psychological impact of possibly voting for the wrong candidate.

The decomposition of the expressive value of voting into an exogenous and an endogenous component is in line with the standard expressive-voting model (see, e.g., Aldrich 1997 and Fiorina 1976). In such a model, the endogenous component is represented by how much a voter prefers a candidate to the other. In a context with uncertainty this would be typically modeled as the expected relative payoff of voting for the preferred candidate.

However, how much a voter prefers a candidate to the other might be directly affected by how confident the voter is about the correctness of his vote choice. For example, in the spirit of Kahneman and Tversky (1982) and of research on counterfactual thinking and regret, which provide evidence that individuals pay more attention to negative outcomes than to positive ones, individuals could weight differently the payoff loss of voting for the wrong candidate and the payoff gain of voting for the right candidate. Following Degan (2006) and Degan and Merlo (2008) and to simplify the exposition, the basic model takes the above evidence to the extreme and assumes that voters consider only negative outcomes.[14] However, we show in Section 6 that the interesting results of the model hinge on the asymmetry in weighting the cost of voting for the wrong candidate and the benefit of voting for the right candidate and not on our extreme assumption. In that section we consider what we call a "generalized" expressive-voting model where losses from making voting mistakes are weighted more heavily than the benefits from voting correctly and where the exogenous net benefit of voting $d$ is allowed to be negative.

We now move to the description of the setting for the candidates. It is assumed that candidates are *partisans* who, like other citizens, care about the policy and quality of the elected politician as well as the net benefit of voting. In our context (where policy is exogenous and there is no room for political distortions), assuming office-motivated candidates instead would deliver qualitatively the same results without simplifying the analysis.

Campaign spending is introduced by allowing candidates to spend money or, alter-

[14] For psycological theories of regret and counterfactual thinking see, for example, Gilovich and Medvec (1995), and Connolly and Zeelenberg (2002). For further justifications of the basic model and its relation to existing theories of regret see Degan and Merlo (2008). Notice also that in our model the "regret" from abstaining is represented by the foregone utility from fulfilling one's civic duty. This asymmetric treatment of voting and abstaining is in line with evidence that the more an individual is in conflict when he has to chose between two actions, the more he tends to chose the default option (see, e.g., Tversky and Shafir 1992) and that individuals perceive differently regret from action and from inaction. Gilovich and Medvec (1995) show evidence that regret from action is stronger than regret from inaction in the short run, while the opposite is true in the long-run. This could explain why when deciding to vote, undecided people may prefer to abstain but long after the election they might regret not having voted.

natively, effort in political advertising. In particular a candidate, who knows his quality but not the quality of the other candidate, can spend money or exert effort in order to communicate his type to voters. As in Coate (2004*a*, 2004*b*) and in Galeotti and Mattozzi (2007), in our model candidates can only advertise their characteristics and political ads are fully informative. That is, negative advertising is not allowed and information is "hard".[15]

We assume that candidates choose the probability that a generic voter can be reached by their ad, and we refer to such probability as "the intensity of information". We let $\lambda_j^H$ and $\lambda_j^L$ denote the intensity of information chosen by candidate $j$ when he has high and low quality, respectively. In order to concentrate on the joint determination of informative advertising and abstention, we abstract from where candidates obtain money and assume, as Martinelli, Herrera, and Levine (2008) and Galeotti and Mattozzi (2007), that candidates face a common cost function of political advertising. We let $\Psi(\lambda) = \alpha\lambda/(1-\lambda)$ be the cost of intensity of information $\lambda \in [0,1]$, where $\alpha > 0$ is an exogenous parameter characterizing the cost of advertising.[16]

## 3 The Citizen's Optimal Behavior

In this section we provide a simple characterization of a citizen's optimal behavior. In order to do so, we must first explain what the information status $(I_D, I_R)$ is and specify the induced beliefs about the candidates' qualities. The term $I_j$ is the information a citizen has on the quality of candidate $j$, where: $I_j = H$ if she has seen an advertisement from a high-quality candidate; $I_j = L$ if she has seen an advertisement from a low-quality

[15] For a justification of the assumption of informative advertising see, for example, Polborn and Yi (2006). For a discussion of introducing negative advertising in our setting see Section 7.

[16] Such a specification can be derived by assuming, as Coate (2004*a*, 200*b*), that when a candidate chooses the expenditure level $E$, his ad reaches each voter with probability $\lambda(E) = \frac{E}{E+\alpha}$. When the cost of expenditure $E$ is linear then the cost function in term of the intensity of information is given by $\alpha\lambda(E)/(1-\lambda(E))$. To save on notation, we therefore choose to define the problem directly in term of the intensity of information.

candidate; and $I_j = \emptyset$ otherwise.[17]

Let $\lambda^{Le}$ and $\lambda^{He}$ be the intensity of information that citizens expect from a low and a high-quality candidate, respectively.[18] These are used by a citizen to infer a candidate's type. When $I_j \in \{L, H\}$ the citizen observes candidate $j$'s quality and, therefore, her perceived probability (belief) that the candidate has quality $\theta_j = \theta^{I_j}$ is 1. When $I_j = \emptyset$, we assume that the citizen updates her belief about the candidate's quality using Bayes rule:

$$\rho^e = \frac{\sigma(1-\lambda^{He})}{\sigma(1-\lambda^{He}) + (1-\sigma)(1-\lambda^{Le})}, \tag{4}$$

where $\rho^e$ is the citizen's belief that a candidate has high quality when she does not observe any ad from him.[19] Throughout the paper when we refer to the citizens' belief $\rho^e$, we implicitly take as given the underlying expectations about the candidates' intensities of information $\left(\lambda^{Le}, \lambda^{He}\right)$.

Without loss of generality, the citizen's problem (maximization of (3)) can be considered as a two-stage problem, where first she decides whether to vote and then whom to vote for. Solving this problem backward, conditional on voting, a citizen's optimal voting rule is a cutoff rule characterized in Lemma 1, where it is implicitly assumed that in case of indifference the voter randomizes her vote between the two candidates with equal probability.

[17] The assumption that a candidate's advertisement fully transmits to voters all the relevant information about that candidate is common in the literature most closely related to this paper. The introduction of noisy signals, where campaign spending affects the probability that voters receive the correct signal, would non-trivially complicate the analysis. Alternatively, noisy signals could be introduced in this setting by allowing candidates to affect the precision of the signal. This last setting has not been much considered in the literature and is the main focus of a complementary work in progress by the author in a context with common value and no abstention.

[18] We are interested in symmetric equilibria and assume, without loss of generality, that such expectations as well as the derived beliefs are symmetric.

[19] A more general formulation would specify the belief in term of both $(I_D, I_R)$. Our assumption is common to Coate (2004*a*, 2004*b*) and Galeotti and Mattozzi (2007). It avoids dealing with the possibility that an out-of-equilibrium behavior about a candidate affects the belief about the other candidate.

**Lemma 1**: *Given belief $\rho^e$, conditional on voting, the optimal voting rule of a citizen with ideology $y_i$ and information status $(I_D, I_R)$ is characterized by the ideological cutoff $\tau_{I_D,I_R} = E[\theta_D - \theta_R \mid I_D, I_R]/2$, such that if $y_i < \tau_{I_D,I_R}$ then $v_i^* = D$, and if $y_i > \tau_{I_D,I_R}$ then $v_i^* = R$, where $v_i^*$ denotes citizen $i'$s optimal voting choice.*

The expressions of the *ideological cutoffs* in the different information status are $\tau_{\emptyset,\emptyset} = \tau_{L,L} = \tau_{H,H} = 0$, $\tau_{H,L} = -\tau_{L,H} = \theta^H/2$, $\tau_{\emptyset,L} = -\tau_{L,\emptyset} = \rho^e\theta^H/2$, and $\tau_{H,\emptyset} = -\tau_{\emptyset,H} = (1-\rho^e)\theta^H/2$. They imply that the more favorable (relative) information a citizen has on a candidate the more likely she is to vote for him. Interestingly, as showed in Degan and Merlo (2008) the optimal voting rule is the same as the one that would prevail in a model where citizens vote for the candidate that generates the highest expected payoff $Eu_i$, where $u_i$ is defined in (1).

Once we have, conditional on the information status, the optimal voting choice $v_i^*$ of citizen $i$, it is possible to calculate the associated (psychological) cost. We refer to this cost as "the cost of voting". The expression of the cost of voting as a function of the citizen's ideology $y_i$, conditional on belief $\rho^e$ and for any given information status $(I_D, I_R)$, can be easily derived (see the Appendix) using expression (2), the corresponding expression for the cost of voting for $R$, and the voting rule in Lemma 1.

Clearly, when a citizen knows the qualities of both candidates she experiences zero cost of voting, independent of her ideological position. The shape of the cost of voting in the other information status is depicted in Figure 1[20]. Four properties of this cost are worth noticing. First, it is weakly increasing(decreasing) to the left(right) of the *ideological cutoff* $\tau_{I_D,I_R}$. In fact, the farther away a citizen's ideological position is from the *ideological cutoff*, the lower is the probability of voting for the wrong candidate and the payoff loss associated with this event.

Second, the cost of voting reaches a maximum of $\theta^H\rho^e(1-\rho^e)$. That is, the maximum cost of voting is proportional to the posterior variance of quality and it is the same for each information status.[21] Third, conditional on information status, the interval of ideological

[20] For clarity, Figure 1 omits the cost of voting in information status $(L\emptyset)$ and $(\emptyset L)$, as they will not occur in equilibrium.

[21] This would not hold in an asymmetric context, where after observing no ads from a candidate the

positions where the cost of voting is positive does not depend on the belief $\rho^e$.[22]

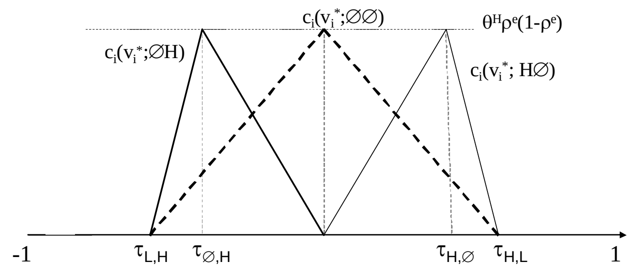
Forth and most important, the cost of voting is symmetric around the *ideological cutoff* only in the symmetric information status ($\emptyset\emptyset$), where the *voting cutoff* is 0, or when $\rho^e = 1/2$. This is because in information status ($\emptyset\emptyset$) the event of voting for the wrong candidate (state $LH$) for voter $i$ with ideology $y_i \in (\tau_{LH}, 0]$, who optimally votes for $D$, is equally likely ($\rho^e(1-\rho^e)$) and equally costly ($|2y_i| + \theta^H$) than the event of voting for the wrong candidate (state $HL$) for voter $k$ with ideology $y_k = -y_i$, who optimally votes for $R$. In this information status the rate at which the cost of making voting mistakes decreases is symmetric around the *ideological cutoff*. However, this is in general not the case in the asymmetric information status, where only one advertisement is observed.

Take for example information status ($H\emptyset$), where the interval in which the cost of voting is positive is always $[0, \tau_{HL}]$. As one can see in Figure 1, when $\rho^e < 1/2$ the ideological cutoff $\tau_{H,\emptyset} = (1- \rho^e)\theta/2$ is closer to $\tau_{HL}$ than to zero, implying that the slope of the cost of voting is steeper to the right of the cutoff than to the left. To understand why this is the case it must be noticed that a voter with ideology $y_i \in [\tau_{H,\emptyset}, \tau_{HL}]$ who votes for $R$ makes a voting mistake in state $HL$, which happens with probability $(1-\rho^e)$ and induces a payoff loss of $(-2y_i + \theta^H) > 0$. Conversely a voter with ideology $y_i \in [0, \tau_{H,\emptyset}]$ who votes for $D$ makes a voting mistake in state $HH$, which happens with probability $\rho^e$ and generates a payoff loss of $2y_i$. The slope at which the cost of voting decreases as we move away to the left of the ideological cutoff is therefore lower than the corresponding slope when we move away to the right of the ideological cutoff. The opposite is true when $\rho^e > 1/2$, while when $\rho^e = 1/2$ using the same argument it follows that the cost of voting is symmetric.

voter's belief that he has high quality would be different for the two candidates. It would not hold also in a context with noisy signals.

[22] We will see in Section 6 that this is not true in a model where voters also care about voting for the right candidate.

Figure 1: The cost of voting




Given the optimal voting choice $v_i^*$ and the associated cost of voting $c_i(v_i^*; I_D, I_R)$, maximization of (3) implies that the optimal participation rule specifies to vote (abstain) if and only if the net benefit of (optimally) voting is positive, i.e. $d - c_i(v_i^*; I_D, I_R) > (<) 0$. Combining the optimal voting rule, the induced cost of voting, and the optimal participation rule, we provide in Proposition 1 a useful characterization of a citizen's optimal behavior. This determines on aggregate which candidate wins the election for any given realization of the median voter and the state of the world.

**Proposition 1:** *Given belief $\rho^e$, conditional on information status $(I_D, I_R)$, a citizen's optimal behavior is characterized by a left and right voting cutoff, $\tau^-_{I_D,I_R}$ and $\tau^+_{I_D,I_R}$, such that:*

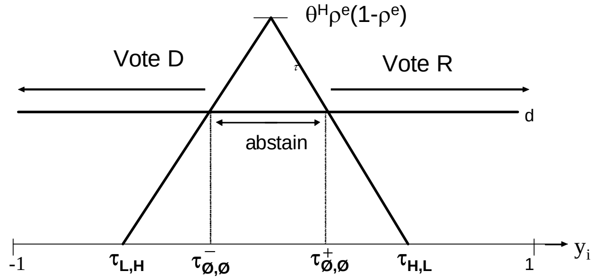
$$\begin{cases} t_i^* = 1 \text{ and } v_i^* = D & \text{iff} \quad y_i \leq \tau^-_{I_D,I_R} \\ t_i^* = 1 \text{ and } v_i^* = R & \text{iff} \quad y_i \geq \tau^+_{I_D,I_R} \\ t_i^* = 0 & \text{iff} \quad \tau^-_{I_D,I_R} < y_i < \tau^+_{I_D,I_R}, \end{cases}$$

*where, $\tau^-_{I_D,I_R} = \tau^+_{I_D,I_R} = \tau_{I_D,I_R}$ when $(I_D \neq \emptyset$ and $I_R \neq \emptyset)$ or $(d \geq \theta^H \rho^e(1-\rho^e))$, and $\tau^-_{H,\emptyset} = -\tau^+_{\emptyset,H} = d/2\rho^e$, $\tau^+_{H,\emptyset} = -\tau^-_{\emptyset,H} = (\theta^H - d/(1-\rho^e))/2$, $\tau^-_{\emptyset,L} = -\tau^+_{L,\emptyset} = d/2(1-\rho^e)$, $\tau^-_{L,\emptyset} = \tau^+_{\emptyset,L} = -(\theta^H - d/\rho^e)/2$, and $\tau^+_{\emptyset,\emptyset} = -\tau^-_{\emptyset,\emptyset} = (\theta^H - d/\rho^e(1-\rho^e))/2$ otherwise.*

In other words, the *voting cutoffs* $(\tau^-_{I_D,I_R}, \tau^+_{I_D,I_R})$ characterizing a citizen's optimal behavior are given by the intersection between the cost of voting and civic duty when such an intersection exists and by the *ideological cutoffs* otherwise. Figure 2 provides an illustration of a citizen's optimal behavior in information status $(\emptyset, \emptyset)$ when civic duty is smaller than the maximum cost of voting $(d < \theta^H \rho^e(1-\rho^e))$. Citizens with ideology to the left of $\tau^-_{\emptyset,\emptyset}$ will vote for $D$, citizens with ideology to the right of $\tau^+_{\emptyset,\emptyset}$ will vote for $R$, and citizens with intermediate ideologies will abstain, as their cost of voting is greater than the utility they obtain from fulfilling their civic duty.[23]

Since, for given belief $\rho^e$, the maximum cost of voting, $\theta^H \rho^e(1-\rho^e)$, is the same for each information status in which the cost of voting is strictly positive, we find that all citizens vote when civic duty is higher than the maximum cost of voting. Otherwise, in all information status where the advertising of some candidate is not observed ($I_D = \emptyset$ or $I_R = \emptyset$) a proportion of citizens abstain.

Figure 2: Voting cutoffs when $(I_D, I_R) = (\emptyset, \emptyset)$




Throughout the paper we impose three assumptions:[24]

[A.1] $\theta^H/2 < 1$.

[A.2] (i) $h \geq \varepsilon + \theta^H/2$ and (ii) $\varepsilon \geq \theta^H/2$.

[A.3] $d < \theta^H \sigma(1-\sigma)$.

Assumption [A.1] guarantees that *partisans* always prefer the candidate whose position is closer to their own, independent of his quality. Assumption [A.2] part (i) guarantees that there is always a positive mass of *Independents* in any ideological interval in which

[23] When $d$ is interpreted as the net exogenous benefit of voting, it can be written as $d = d' - c'$, where $d' > 0$ and $c' > 0$ are the exogenous benefit and cost of voting respectively. When blank votes are allowed, equations (3) describes the problem of whether to vote and whom to vote for conditional on going to the voting booths, provided that the term $d$ is replaced by $d'$. It follows that although, conditional on going to the voting booths, all individuals with $d' > c(v_i^*)$ would want to vote, only those with $d - c(v_i^*) > 0$ will actually turn out to vote. Proposition 1 would still characterize the citizen's optimal behavior.

[24] The first two are common to Coate (2004$a$).

individuals may optimally decide to abstain.[25] Part (ii) guarantees that the expressions for the expected probabilities of winning, provided in the Appendix and used throughout the paper, are always between zero and one. Lastly, assumption [A.3] imposes civic duty to be lower than the maximum cost of voting associated to the situation where advertising is not allowed. This assumption allows us to focus on the reasonable situation where without advertising a positive proportion of the population would abstain. It also allows keeping the analysis and exposition simple. We will discuss the relaxation of this assumption at the end of the next section.

## 4 The Candidate's Problem and Political Equilibrium

Unlike other citizens, a candidate can affect, through his advertising decision, the part of utility derived from the electoral outcome and also pays the cost of advertising.[26] In order to characterize the political equilibrium, we need to determine the optimal advertising strategy, given voters' behavior induced by the belief $\rho^e$ (see Proposition 1).

The high-quality democratic candidate must chose $\lambda_D^H$ in order to maximize the expected utility from the outcome of the election net of the cost of advertising:

$$\begin{aligned} V_D^H = & \left[\pi^{HL}\theta^H - 2(1-\pi^{HL})\right](1-\sigma) + \\ & \left[\pi^{HH}\theta^H + (1-\pi^{HH})(-2+\theta^H)\right]\sigma - \Psi(\lambda_D^H), \end{aligned} \tag{5}$$

where $\pi^{HL}$ and $\pi^{HH}$ are the probabilities (derived in the Appendix) that candidate $D$ wins the election when he has high quality and the other candidate has, respectively, low and high quality. These probabilities depend on the republican candidate's strategy $(\lambda_R^L, \lambda_R^H)$ and on citizen's belief $\rho^e$. The best response of the high-quality democratic candidate to the republican candidates' strategy, given voters' belief $\rho^e$, $\lambda_D^H\left(\left(\lambda_R^L, \lambda_R^H\right); \rho^e\right)$, is obtained from the maximization of (6). The problem of a low-quality democratic candidate is analogous.

[25] Recall that $\varepsilon$ delimits the support of the median voter's ideology and $h$ delimits the support of the *Indepenents*' ideologies, given the median voter.

[26] Because of assumption [A.1] candidates in their role as citizens experience zero cost of voting and therefore always vote. Whether a candidate votes or not is inconsequential.

We now have all the elements needed to provide a definition of an equilibrium in this context and to proceed with its characterization.

**Definition:** *A Symmetric Political Equilibrium with advertising consists of: (i) a symmetric candidate strategy* $\left(\lambda^{L*}, \lambda^{H*}\right)$*; (ii) citizens' belief* $\rho^*$*; (iii) a pair of voting cutoffs* $(\tau^{*-}_{I_D,I_R}, \tau^{*+}_{I_D,I_R})$ *for each information status* $(I_D, I_R)$*. Candidates' strategies must be mutual best responses given voters' behavior induced by their cutoffs. Voters' behavior must be optimal given their beliefs. Voters' beliefs must be consistent with candidates' strategies.*

It is easy to show (see the Appendix) that the optimal strategy of a low-quality candidate is not to advertise, independent of the opponent's strategy and of voter's belief, that is, $\lambda^{L*} = 0$. Intuitively, since citizens do not like low-quality candidates, the best path for a low-quality candidate is not to advertise and, hence, hide his low quality. The equilibrium belief then satisfies

$$\rho^* = \frac{(1-\lambda^{H*})\sigma}{(1-\lambda^{H*})\sigma + (1-\sigma)}. \tag{6}$$

To complete the characterization of a Political Equilibrium we are left with the determination of $\lambda^{H*}$, which we refer to as "the equilibrium intensity of information," and that must satisfy the following condition:

$$\lambda^H_D((0,\lambda^{H*});\rho^*) = \lambda^H_R((0,\lambda^{H*});\rho^*) = \lambda^*. \tag{7}$$

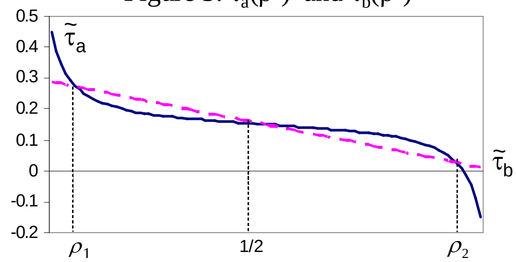
Condition (7) simply states that the equilibrium intensity of information $\lambda^{H*}$ is a high-quality candidate's best response when the opponent uses the strategy $(0, \lambda^{H*})$ and voters' cutoffs are calculated according to Proposition 1 when $\rho^e = \rho^*$.

Before providing a more explicit characterization of the equilibrium condition (7) it is useful to introduce some additional notation and to provide some intermediate results. Let $\rho_1$ and $\rho_2$ be the solutions to $d = \theta^H \rho^e(1-\rho^e)$, i.e. $\rho_{1,2} = \frac{1}{2} \mp \frac{1}{2}\sqrt{1-4d/\theta^H}$. These two values correspond to the beliefs needed for the maximum cost of voting to be equal to civic duty. Only for $\rho^e \in (\rho_1, \rho_2)$ civic duty is smaller than the maximum cost of voting.

Let $\widetilde{\tau}(\rho^e)$ be the *average voting cutoff* corresponding to information status $(H, \emptyset)$ expressed as a function of the belief $\rho^e$. That is, $\widetilde{\tau}(\rho^e) = (\tau^-_{H,\emptyset} + \tau^+_{H,\emptyset})/2$, where $\tau^-_{H,\emptyset}$ and

$\tau^{+}_{H,\emptyset}$ have been defined in Proposition 1. As it is explained in detail in the Appendix, its expression is given by two branches whose behavior on the domain $\rho^e \in [0,1]$ are depicted in Figure 3.

Figure 3: $\widetilde{\tau}_a(\rho^e)$ and $\widetilde{\tau}_b(\rho^e)$




The first branch $\widetilde{\tau}_a(\rho^e)$ is the average *voting cutoff* in information status $(H, \emptyset)$ when civic duty is lower than the maximum cost of voting and, therefore, corresponds to a situation where there is partial turnout. The second branch $\widetilde{\tau}_b(\rho^e)$ is the *average voting cutoff* in information status $(H, \emptyset)$ when civic duty is greater than the maximum cost of voting and, therefore, corresponds to a situation where there is full turnout.

It turns out that the two branches always intersect at values of the belief equal to 1/2, $\rho_1$, or $\rho_2$. Notice also that, given $d$, [A.3] implies that $\sigma \in (\rho_1, \rho_2)$. Finally, the assumption of citizens' rationality in forming beliefs implies $\rho^e \leq \sigma$. The relevant expression for our *voting cutoff* is therefore $\widetilde{\tau}_b(\rho^e)$ when $\rho^e \leq \rho_1$ and $\widetilde{\tau}_a(\rho^e)$ when $\rho^e \in (\rho_1, \sigma]$.

A characterization of the equilibrium intensity of information that allows studying the properties of $\lambda^{H*}$ and of the corresponding equilibrium will be based on $\overline{\tau}(\lambda^e_H)$, the *average voting cutoff* in information status $(H, \emptyset)$ as a function of the expected intensity of information by the high-type candidate $\lambda^e_H$, when citizens expect (as it happens in equilibrium) the low type not to advertise. That is $\overline{\tau}(\lambda^e_H) \equiv \widetilde{\tau}(\rho^e)$, where $\rho^e = \frac{(1-\lambda^e_H)\sigma}{(1-\lambda^e_H)\sigma+(1-\sigma)}$. It follows that the function $\overline{\tau}(\cdot)$ is also composed of two branches. When $\sigma \in [1/2, \rho_2)$, the two branches intersect at $\lambda_1 = (\sigma - \rho_1)/(\sigma(1-\rho_1))$ and at $\lambda_o = (2\sigma - 1)/\sigma$, $\lambda_o < \lambda_1$ and when $\sigma \in (\rho_1, 1/2)$ they intersect on the interval [0,1] only at $\lambda_1$ (in this case $\lambda_o$ is negative). The two branches are both increasing and convex in $\lambda^e_H \in [0,1]$ and $\overline{\tau}_a(\lambda^e_H) < \overline{\tau}_b(\lambda^e_H)$ if and only if $\lambda^e_H \in (\max\{0, \lambda_0\}, \lambda_1)$. When $\lambda^e_H$ goes to 1, while $\overline{\tau}_b(\cdot)$ converges to a finite value, $\overline{\tau}_a(\cdot)$ converges to infinity.

**Lemma 2:** *In an interior Symmetric Political Equilibrium with advertising (if it exists), the intensity of information is implicitly characterized by*

$$\overline{\tau}(\lambda^{H*})A = \alpha/(1-\lambda^{H*})^2, \tag{8}$$

*where the function* $\overline{\tau}(\lambda)$ *is*

$$\overline{\tau}(\lambda) = \begin{cases} \overline{\tau}_a(\lambda) = \frac{1}{4}[\theta^H + d\frac{(1-\sigma\lambda)(1-2\sigma+\lambda\sigma)}{(1-\lambda)\sigma(1-\sigma)}] & \text{if } \lambda \in [0, \lambda_1) \\ \\ \overline{\tau}_b(\lambda) = (1-\sigma)\theta^H/2(1-\lambda\sigma) & \text{if } \lambda \in [\lambda_1, 1] \end{cases}, \tag{9}$$

*and* $A = \left[1 + \theta^H(1-\sigma)/2\right]/\varepsilon$, $\rho_1 = \frac{1}{2}(1 - \sqrt{1 - 4d/\theta^H})$, and $\lambda_1 = (\sigma - \rho_1)/(\sigma(1-\rho_1)$.

Equation (8) is the first order condition of the maximization problem of the high-quality candidate evaluated at the equilibrium intensity of information and belief. It states that in equilibrium the marginal benefit of advertising (the left-hand side of (8)) must equal the marginal cost (right-hand side of (8)). As we explain in detail in the Appendix, the marginal benefit of advertising depends on the *average voting cutoff* in information status $(H,\emptyset)$, which we have defined above, but does not depend on the intensity of information of the high-quality opponent.[27] It is useful to remind that its two branches correspond to the case with partial and full turnout, respectively. When an equilibrium has full turnout, it must be that $\rho^* \leq \rho_1 < \sigma$. This case is possible only if high-quality candidates in equilibrium advertise enough to lower the belief below $\rho_1$. Analogously, in an equilibrium with partial turnout it must be that $\rho_1 < \rho^* < \sigma$. Using (6) these two cases correspond to $\lambda^{H*} \in [\lambda_1, 1]$ and $\lambda^{H*} \in [0, \lambda_1)$, respectively.

So far we haven't discussed existence or uniqueness of a Political Equilibrium. Let $\overline{\alpha} = \overline{\tau}(0)A$, where $\overline{\tau}(0)$ is the *average voting cutoff* in information status $(H,\emptyset)$ when citizens expect candidates not to advertise. In addition let $\alpha_1 = \frac{A\theta^H}{4}\frac{(1-\sigma)^2}{\sigma^2}\frac{\left(1-\sqrt{x}\right)^2}{1+\sqrt{x}}$, where $x = 1 - 4d/\theta^H$ and $\alpha_1 < \overline{\alpha}$, be the cost of advertising needed for the right-hand side of

[27] The first order condition also depends on the voting cutoffs in information status $(\emptyset, H)$ and $(\emptyset,\emptyset)$. However, due to the symmetry of the setting, it turns out that the effect of state $(\emptyset,\emptyset)$ cancels out and everything can be expressed in terms of the cutoffs in one of the two remaining states only.

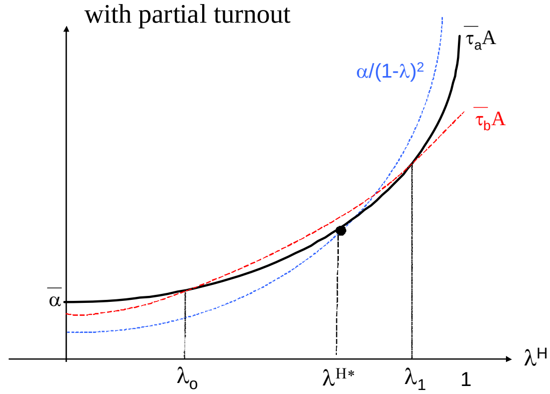
(8) to cross the left-hand side at $\lambda_1$. In order to guarantee existence of a unique interior equilibrium we impose the following assumption.

[A.4] $\alpha < \overline{\alpha}$.

**Proposition 2:** *Assume [A.1]-[A.4] hold. There exists a unique Political Equilibrium with (positive) advertising, and it exhibits full turnout if the cost of advertising is relatively low ($\alpha \leq \alpha_1$) and partial turnout if the cost of advertising is relatively high ($\alpha > \alpha_1$).*

Clearly a necessary condition for high-quality candidates to advertise is that advertising not be too costly (condition [A.4]). It turns out that under our assumptions such a condition is also sufficient for the existence of a unique interior equilibrium. Although both branches of the marginal benefit of advertising as well as the marginal cost are increasing and convex, we show in the Appendix that there exists a unique intersection between $\overline{\tau}_a(\cdot)A$ and the right-hand-side of (8). When advertising is costly ($\alpha > \alpha_1$) such intersection lies on the interval $[0, \lambda_1]$. In addition, when advertising is not too costly ($\alpha \leq \alpha_1$) there is a unique intersection on the interval $[\lambda_1, 1]$ between the marginal cost of advertising and $\overline{\tau}_b(\cdot)A$. Figure 4 provides a graphical illustration when $\sigma > 1/2$ of an equilibrium with partial turnout, where the two sides of (8) intersect at a value of $\lambda_H^*$ lower than $\lambda_1$.

Figure 4: The function $\underline{\tau}(\cdot)$ and an equilibrium with partial turnout




We could relax assumption [A.3], which implies that $\sigma \in (\rho_1, \rho_2)$, and consider values of $d < \theta^H/4$. This is equivalent to assuming that there exist, not necessarily in equilibrium, symmetric beliefs such that a positive proportion of citizens would want to abstain. When the ex-ante probability of having high-quality candidates $\sigma$ is relatively low, $\sigma < \rho_1 < 1/2$, the only relevant branch is $\overline{\tau}_b(\cdot)$ and, therefore, there exists a unique equilibrium with full turnout. This is because without advertising there would be full turnout and, no matter how much candidates advertise, by Bayes' rule the equilibrium belief remains relatively low, and so does the maximum cost of voting relative to civic duty. When $\sigma > \rho_2 > 1/2$, full turnout emerges if either candidates advertise a little or they advertise a lot. Branch $\overline{\tau}_a(\lambda)$ is relevant for $\lambda \in (\lambda_2, \lambda_1)$, where $\lambda_2 = (\sigma - \rho_2)/(\sigma(1-\rho_2)) > 0$ corresponds to the belief $\rho_2$, and branch $\overline{\tau}_b(\lambda)$ is relevant for $\lambda \notin (\lambda_2, \lambda_1)$. In this case assumption [A.4] is no longer sufficient for uniqueness. In fact multiple equilibria could emerge for high cost of advertising. It can be showed that imposing an additional upper bound $\alpha_a$ on the cost of advertising, $\alpha_a = \overline{\tau}_a(0)A$ , is sufficient to guarantee uniqueness. If we let $\alpha_2$ denote the cost of advertising required for (8) to be satisfied at $\lambda^{*H} = \lambda_2$, we have that $\alpha_1 < \alpha_2 < \alpha_a < \overline{\alpha}$. By restricting to $\alpha < \alpha_a$ a necessary and sufficient condition for the unique equilibrium to have partial turnout is that the cost of advertising takes intermediate levels, $\alpha \in (\alpha_1, \alpha_2)$.

## 5 Results

We use the characterization of the political equilibrium discussed above to analyze the effect of civic duty on the equilibrium intensity of information, turnout, and the information aggregation properties of the equilibrium electoral outcome.

Most implications of the model will depend on the value of $\rho^*$ relative to 1/2. Let $\alpha_o = \frac{A\theta^H}{4}\frac{(1-\sigma)^2}{\sigma^2}$ be the level of $\alpha$ such that the right-hand side of (8) equals the left-hand side at $\lambda_o$. The following Lemma links the relative value of the equilibrium belief $\rho^*$ and the model's fundamental parameters.

**Lemma 3:** *Assume [A.1]-[A.4] hold. The equilibrium belief is relatively low ($\rho^* \leq 1/2$), or equivalently the equilibrium intensity of information is relatively high ($\lambda^{H*} \geq \lambda_o$), if and only if the cost of advertising is relatively low ($\alpha \leq \alpha_o$).*

When $\sigma > 1/2$, $\alpha_1 < \alpha_o < \overline{\alpha}$, and $\alpha_o$ corresponds to the cost of advertising needed for the equilibrium intensity of information and belief to be $\lambda_o$ and $1/2$ respectively. When $\sigma < 1/2$, $\lambda_o < 0$ and $\alpha_o > \overline{\alpha}$, implying, as we already know from Bayes's rule, that the equilibrium belief is less than $1/2$. In what follows when a result is stated in terms of the parameter $\alpha$ relative to $\alpha_o$, the reader must keep in mind that the driving force lies on the corresponding value of $\rho^*$ relative to $1/2$.

Since civic duty affects the equilibrium intensity of information only when the initial equilibrium has partial turnout, to address our main question we impose the following condition, which under assumption [A.3] is necessary and sufficient for the initial equilibrium to have partial turnout.

[A.5] $\alpha \in (\alpha_1, \overline{\alpha})$.

## 5.1 Equilibrium Intensity of Information

We first consider the effect of civic duty on the equilibrium intensity of information.

**Proposition 3:** *Assume [A.1]-[A.5] hold. Following an increase in civic duty, the equilibrium intensity of information $\lambda^{H*}$ increases(decreases) if the cost of advertising is relatively low(high), that is if $\alpha < \alpha_o (\alpha > \alpha_o)$.*

The intuition behind Proposition 3 is the following. When $\overline{\alpha} > \alpha > \alpha_o$, from Lemma 3 we have that voters assign a relatively high probability that a candidate from whom they did not observe any ad has high quality ($\rho^* > 1/2$). In this situation the *ideological cutoffs* in information status $(H, \emptyset)$ and $(\emptyset, H)$ are relatively tilted towards the center and, therefore, while the cost of voting in status $(H, \emptyset)$ is steeper in its increasing part, the cost of voting in status $(\emptyset, H)$ is steeper in its decreasing part.

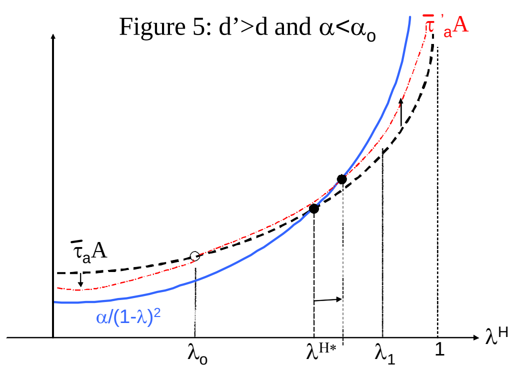
Consider the perspective of a high-quality candidate $D$ when $d$ increases. Among citizens with information status $(H, \emptyset)$, he gains fewer votes than his opponent. Analogously, among citizens with information status $(\emptyset, H)$, he gains more votes than his opponent. It follows that by decreasing $\lambda_D^H$ he can increase(decrease) the probability of the event granting him a net vote-gain(loss). By unilaterally doing so he increases his chances of winning while paying a lower cost of advertising. The analogous holds for the other candidate.

The opposite incentives are present when $\alpha < \alpha_o$, and hence $\rho^* < 1/2$, where an increase in civic duty leads to a higher equilibrium intensity of information. Conversely, when $\alpha = \alpha_o < \overline{\alpha}$ we have that $\rho^* = 1/2$ and $\lambda^{H*} = \lambda_o$. In this situation the cost of voting and, in turn the *voting cutoffs*, are symmetric around all the *ideological cutoffs* including those in information status $(H, \emptyset)$ and $(\emptyset, H)$. An increase in civic duty does not create any incentive to deviate from the initial equilibrium because the extra voters voting for a candidate are of the same size as the extra voters voting against him. Notice that Proposition 3 implies that when $\sigma < 1/2$ an increase in civic duty always leads to an increase in the equilibrium intensity of information, as in this case $\overline{\alpha} < \alpha_o$.

In other words, the result of Proposition 3 hinges on the fact that, when civic duty increases, everything else constant, the set of people who vote increases. Depending on the initial equilibrium belief, this will have a differential effect on the votes received by a candidate which will drive his equilibrium response.

The result of Proposition 3 when $\alpha < \alpha_o$ and $\sigma \in (1/2, \rho_2)$ is illustrated in Figure 5. Here the relevant branch of the marginal benefit of the intensity of information is represented before $(\overline{\tau}_a A)$ and after $(\overline{\tau}'_a A)$ the change in civic duty and the initial equilibrium intensity of information is greater than $\lambda_o$. Following an increase in civic duty, while the the marginal cost of advertising curve does not change, the marginal benefit of advertising curve tilts around $\lambda_o$ and the new equilibrium presents a higher intensity of information.

Figure 5: d'>d and α<α$_o$

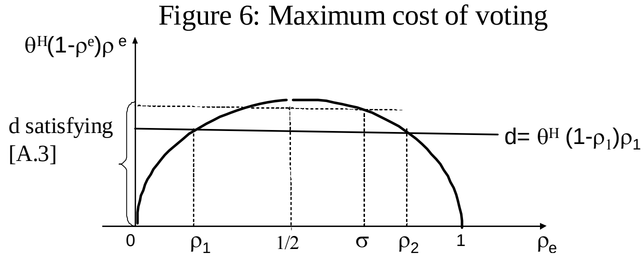


## 5.2 Turnout

In this section we analyze the implications of the model on the equilibrium turnout in the different states of the world. Since *partisans* always vote, we focus on turnout of *Independents.* Simple calculations reveal that for any given parameter configuration, the proportion of *Independents* who abstain in information status $(\emptyset, \emptyset)$ is twice as much as the corresponding proportions in information status $(H, \emptyset)$ or $(\emptyset, H)$. Therefore, taking into consideration the symmetry of the *voting cutoffs* in information status $(\emptyset, \emptyset)$, we have that turnout of *Independents* can be expressed as a function of the right *voting cutoff* when no advertisement is observed, $\tau^+_{\emptyset,\emptyset}$. Let $T^{z,w}_D$ denote total turnout of *Independents* in state $(z, w)$, where $z, w \in \{L, H\}$. After straightforward calculations we have that: $T^{LL} = 1 - \frac{1}{h}\tau^+_{\emptyset,\emptyset}$, $T^{HL} = T^{LH} = 1 - \frac{(2-\lambda^{H*})}{2h}\tau^+_{\emptyset,\emptyset}$, $T^{HH} = 1 - \frac{(1-\lambda^{H*})}{h}\tau^+_{\emptyset,\emptyset}$.[28] It is easy to verify that $T^{HH} > T^{HL} = T^{LH} > T^{LL}$. That is, *ceteris paribus*, high-quality candidates mobilize voters.

An important driving force of turnout is the variance of the candidates' qualities, $\rho^e(1 - \rho^e)$, which determines the cost of voting in information status $(\emptyset, \emptyset)$ as well as the maximum cost of voting in all information status. Recall that, for given belief $\rho^e$, the maximum cost of voting is $\theta^H \rho^e(1 - \rho^e)$. Figure 6 illustrates its pattern as a function of $\rho^e$. Such a maximum cost is zero for $\rho^e$ equal 0 or 1 and it is increasing (decreasing) for $\rho^e<(>)1/2$. Given $\sigma$ and $\theta^H$, we can calculate the values of civic duty satisfying [A.3]. In addition, for any given $d$ satisfying such assumption we can obtain the corresponding value of $\rho_1$, which ranges from zero to $\min\{1/2, \sigma\}$ and is increasing in $d$.

Figure 6: Maximum cost of voting




[28] Since we have assumed that there is a positive proportion of *Independents* in any subinterval of $[-\theta^H/2, \theta^H/2]$ where the cost of voting can potentially be positive, turnout does not depend on the median voter.

Under [A.5] the initial equilibrium is such that $\rho^* \epsilon(\rho_1, \sigma)$. A marginal increase in civic duty always leads to a smaller equilibrium variance of the candidate's qualities. This is because when $\rho^* < 1/2$ an increase in $d$ leads to a higher equilibrium intensity of information (Proposition 3), which in turn means a lower equilibrium belief. As we can see from Figure 6 the corresponding maximum cost of voting diminishes. Similarly, when $\rho^* > 1/2$ an increase in $d$ leads to a lower equilibrium intensity of information (Proposition 3), which in turn means a higher equilibrium belief and a lower maximum cost of voting.

The next Proposition considers the effect of civic duty on turnout starting from an equilibrium with partial turnout.

**Proposition 4:** *Assume [A.1]-[A.5] hold. Following an increase in civic duty turnout increases.*

In order to understand the result of Proposition 4, it should be noticed that an increase in civic duty generates three partial effects. First, holding the cost of voting constant, it decreases the cutoff $\tau^+_{\emptyset,\emptyset}$. This effect always leads to a higher turnout. Second, as discussed above, it always decreases the equilibrium variance of the candidates' qualities. Holding constant the probabilities of the different information status, and recalling that turnout in information status $(\emptyset, \emptyset)$ is twice as much as the one in information status $(H, \emptyset)$ and $(\emptyset, H)$, this effect also always leads to a higher turnout. Third, it changes the probability distribution of citizens' information status. Specifically, when $\rho^* < (>)1/2$ an increase in civic duty leads to a lower (higher) probability of information status $(\emptyset, \emptyset)$ in favor of the others. The sign of this effect therefore depends on the initial equilibrium.

The result of Proposition 4 is therefore straightforward when $\rho^* < 1/2$ or when the state is $LL$, where all citizens have information status $(\emptyset, \emptyset)$. However, the result is not trivial in the other states when $\rho^* > 1/2$. Proposition 4 states that even when a higher $d$ leads to a higher probability of information status $(\emptyset, \emptyset)$, where abstention is the highest, the effects of the greater propensity to vote and of the lower variance always dominate.

## 5.3 Information Aggregation

An interesting question emerging from our analysis is whether information is aggregated efficiently in an equilibrium with political advertising. In other words,"Is the outcome of the election the one that a majority of citizens would prefer were they all informed about both candidates' qualities?" As one would expect, since in any equilibrium low-quality candidates do not advertise their quality and voters always have a positive probability of not being reached by a high-quality candidate's ad, this is not always the case. We can therefore study the probability that the outcome of the election is "efficient" in the sense of information aggregation.[29]

To study this problem let's consider the margins of victory in the different states of the world. These margins are proportional to (up to the proportion of *Independents*): $M^{HH} = M^{LL} = -m/h$, and $M^{HL} = -\frac{m}{h} + \frac{\lambda^{H*}}{h}\overline{\tau}(\lambda^{H*})$, where $M^{HH}$ denotes the vote margin (up to scale) for the democratic candidate when the state is $HH$, etc. In the symmetric states the margins of victory are the same and are centered around the median voter. In the asymmetric states the high-quality candidate receives a bonus proportional to $\lambda^{H*}\overline{\tau}(\lambda^{H*})$.

It is easy to see that when both candidates have low or high quality, information is aggregated efficiently. In fact candidate $D$ is elected if and only if the median voter's ideology is to the left of zero ($m < 0$), which, since the *ideological cutoffs* of informed voters are at zero ($\tau_{HH} = \tau_{LL} = 0$), is what an informed majority of citizens would want. However, information is not efficiently aggregated in states $HL$ and $LH$. In state $HL$ (state $LH$ is analogous) candidate $D$ is elected whenever the median voter's ideology $m$ is to the left of the threshold $\lambda^{H*}\overline{\tau}(\lambda^{H*})$. However, a majority of (all informed) voters would want to elect him only when the median voter's ideology $m$ is to the left of the *ideological cutoff* $\tau_{HL}$, where $\lambda^{H*}\overline{\tau}(\lambda^{H*}) < \tau_{HL}$, $\forall\lambda^{H*} < 1$. Therefore the "wrong" candidate is

[29] The emphasis of our analysis is on information aggregation rather than on welfare. If we were to conduct (utilitarian) welfare analysis of the proposed policies and to care only about the utility that citizens derive from the electoral outcome, we would obtain the same implications. The reader is referred to the earlier version of this paper, Degan (2008), for some considerations about conducting welfare analysis in our framework.

elected whenever the median voter's ideology is between $\lambda^{H*}\overline{\tau}(\lambda^{H*})$ and $\tau_{HL}$. It follows that in states $HL$ and $LH$ the probability that the "right" candidate is elected is increasing in $\lambda^{H*}\overline{\tau}(\lambda^{H*})$.

We now study the effect of an exogenous increase in civic duty on information aggregation.

**Proposition 5:** *Assume [A.1]-[A.5] hold. The probability that the candidate preferred by a majority of citizens (were they all informed) is elected is increasing(decreasing) in civic duty if the cost of advertising is relatively low(high), i.e.* $\alpha < (>)\alpha_o$.

Intuitively, the above result follows from the fact that when the initial equilibrium has partial turnout, the intensity of information $\lambda^{H*}$ is increasing in civic duty $d$ depending on the cost of advertising relative to $\alpha_o$. Notice that Proposition 5 implies that when $\sigma < 1/2$ a higher civic duty always leads to a "better" electoral outcome, because $\alpha_o > \overline{\alpha}$. We delay further discussions of the result of Proposition 5 to Section 7.[30]

# 6 The Generalized Model

As we anticipated in Section 2, our basic model can be cast into a more general setting where the endogenous value of expressing one's vote is a weighted sum of the benefit from voting for the right candidate and the loss from voting for the wrong candidate and the exogenous net benefit of voting can possibly be negative. We refer to this general setting as the "generalized" expressive-voting model.

Let $b_i(D|I_D, I_R)$ and $b_i(R|I_D, I_R)$ be the expressive value of voting for candidate $D$ and $R$ respectively, conditional on information $(I_D, I_R)$:

[30] One question that may emerge at this point and that has received attention in the literature is "what is the effect of a binding limit on spending on political advertisement?" Unfortunately, our setting, where there are no interest groups and no policy distortions, is not the most appropriate to address this question. Such a policy would unambiguously worsen the information aggregated by the election because, when binding, such a constraint would decrease $\lambda_H^*$.

$$b_i(D|I_D, I_R) = \\ (1-w)E_{I_D,I_R}[(u_D - u_R) \cdot 1\{u_D > u_R\}] + wE_{I_D,I_R}[[(u_D - u_R) \cdot 1\{u_D < u_R\}] \tag{10}$$

$$b_i(R|I_D, I_R) = \\ (1-w)E_{I_D,I_R}[(u_R - u_D) \cdot 1\{u_R > u_D\}] + wE_{I_D,I_R}[[(u_R - u_D) \cdot 1\{u_R < u_D\}] \tag{11}$$

We let $V_i(t_i, v_i; |I_D, I_R)$ denote the net benefits of voting in this "generalized" expressive-voting model:

$$V_i(t_i, v_i|I_D, I_R) = t_i(b_i(v_i|I_D, I_R) - c), \tag{12}$$

where $c$ is the exogenous net cost of voting. In the spirit of Kahneman and Tversky (1982) we restrict attention to $w \geq 1/2$. However, equations (10)-(12) can also be used to analyze the case with $w < 1/2$.

In this general formulation both $b_i(\cdot)$ and $c$ can be positive or negative. Expression (3), representing the basic model, is a special case of (12) where $c = -d$ and $w = 1$, so that the exogenous net cost of voting and the endogenous expressive value are both negative. Similarly, the standard expressive-voting model corresponds to the special case of (12) where $w = 1/2$, so that the expressive utility of voting for the right candidate and the expressive disutility of voting for the wrong candidate are weighted equally, and the exogenous net cost of voting is positive, $c > 0$.

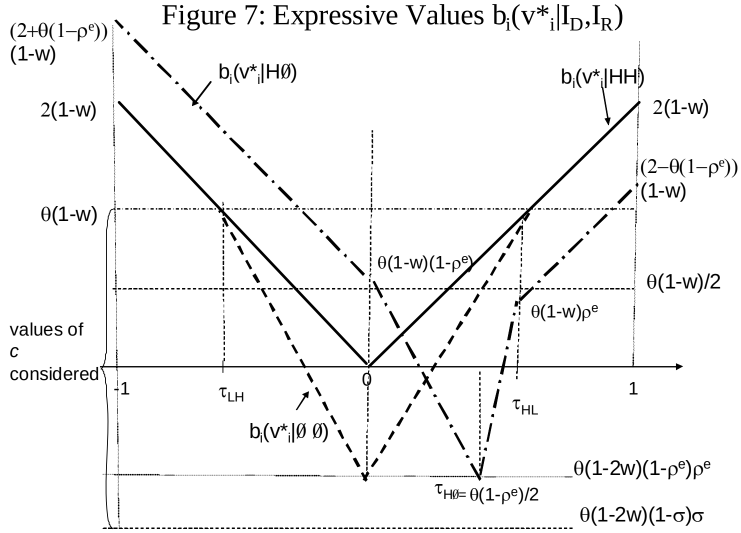
As in Section 3, conditional on information status $(I_D, I_R)$, the citizens's problem consists of choosing whether to vote and whom to vote for in order to maximize her net benefits of voting. As before, conditional on voting citizen $i$ will vote for the candidate that gives her the highest expressive value. It is easy to show that the *ideological cutoffs* for this general specification are the same as in Lemma 1 and are therefore independent of $w$. Let $v_i^*$ be the optimal voting choice and $b_i(v_i^*|I_D, I_R)$ the associated expressive value. Then a citizen will go to vote if and only if $b_i(v_i^*|I_D, I_R) - c \geq 0$.

The analytical expressions of the expressive values in the different information status can be found in the Appendix. Such values in information status $(H, H)$ , $(\emptyset, \emptyset)$, and $(H, \emptyset)$ are depicted in Figure 7 for a value of $\rho^e < 1/2$.[31]

[31] Figure 7 omits the expressive value in status $(\emptyset, H)$, which is symmetric to the one in status $(H, \emptyset)$,

Some observations about the expressive values are in order. First, as in the basic model $b_i(v_i^*|\emptyset,\emptyset)$ and $b_i(v_i^*|H,H)$ are symmetric around zero. Second, while for values of $b_i(v_i^*|H,\emptyset)$ between $\theta(1-2w)(1-\rho^e)\rho^e$ and $\min\{\theta(1-w)\rho^e, \theta(1-w)(1-\rho^e)\}$, the decreasing part of $b_i(v_i^*|H\emptyset)$ is flatter(steeper) than the increasing part for $\rho^e < (>) 1/2$, the opposite is true for values in between the minimum and the maximum of $\{\theta(1-w)\rho^e, \theta(1-w)(1-\rho^e)\}$. Third, for values of $b_i(v_i^*|H,\emptyset)$ between the maximum of $\{\theta(1-w)\rho^e, \theta(1-w)(1-\rho^e)\}$ and $(2-\theta(1-\rho^e))(1-w)$ the increasing and decreasing parts of the expressive value have the same slope (in absolute value). Fourth, for any $w \in (1/2, 1)$ the interval in which $b_i(v_i^*|H,\emptyset)$ is negative depends on $\rho^e$ and is strictly contained in $[0, \tau_{HL}]$.

Figure 7: Expressive Values $b_i(v^*_i|I_D,I_R)$




Given the expressive values and the exogenous net cost of voting, a citizen's behavior is characterized, as in Proposition 1, by a left and a right *voting cutoff* whose expressions can be found in the Appendix.

The analysis of the generalized model is more complex but follows the same steps and rationales as in the basic model. It is straightforward to show that if an interior equilibrium exists it is characterized by (8), where $\overline{\tau}(\lambda_H^e)$ is now the *average voting cutoff* in information status $(H,\emptyset)$ in the generalized model. In fact, each time the *average*

as well as those in information status $(L,L)$, $(\emptyset,L)$, and $(L,\emptyset)$, as they never occur in equilibrium.

*voting cuotff* is mentioned in this section, it is meant to be the one for the generalized model and, as in the previous analysis, we will denote by $\overline{\tau}(\cdot)$ and $\widetilde{\tau}(\cdot)$ this voting cutoff expressed in terms of the intensity of information and of the belief respectively. These are composed of different branches, whose expressions can be found in the Appendix, depending on the value of the exogenous net cost of voting.

When, as in the basic model $c$ is negative, but individuals also care about the benefit of voting for the right candidate ($w < 1$), there are two possible branches of the *average voting cutoff.* With slight abuse of notation we continue denoting them by $\widetilde{\tau}_a(\cdot)$ and $\widetilde{\tau}_b(\cdot)$. In fact, the expressions introduced in Section 4, are derived by imposing $w = 1$ in the expressions for the generalized case. For $c \leq (1-2w)\theta\rho^e(1-\rho^e)$, the relevant branch is $\widetilde{\tau}_b(\cdot)$. The *average voting cutoff* corresponds to the *ideological cutoff,* and there is full turnout. For $c \in ((1-2w)\theta\rho^e(1-\rho^e), 0]$, the relevant branch is $\widetilde{\tau}_a(\cdot)$. There is partial turnout and all the citizens who abstain would face the possibility of voting for the wrong candidate, were they to vote.

When $c$ is positive, the analysis becomes more complicated because there are more branches to consider, as also citizens who do not face the possibility of voting for the wrong candidate might choose to abstain. In fact, the relevant branch of $\widetilde{\tau}(\cdot)$ depends on which voters (if any), at the different levels of $c$, face the possibility of voting for the wrong candidate.

When considering positive values of $c$ we will restrict attention to the interval $[0, \theta(1-w)]$. For values of $c$ in $[0, \min\{(1-w)\theta\rho^e, (1-w)\theta(1-\rho^e)\}]$ both $D'$s and $R'$s voters could make voting mistakes and the relevant *average voting cutoff* is $\widetilde{\tau}_a(\cdot)$. When $\rho^e < 1/2$ and $c \in [(1-w)\theta\rho^e, (1-w)\theta(1-\rho^e)]$ only $D'$s voters could make voting mistakes and we let $\widetilde{\tau}_{c-}(\cdot)$ denote the relevant *cutoff.* When $\rho^e > 1/2$ and $c \in [(1-w)\theta(1-\rho^e), (1-w)\theta\rho^e]$ only $R'$s voters could make voting mistakes and we let $\widetilde{\tau}_{c+}(\cdot)$ denote the relevant *cutoff.* Finally when $c > \max\{(1-w)\theta\rho^e, (1-w)\theta(1-\rho^e)\}$ no voter is making voting mistakes and the *average voting cutoff* consists of the *ideological cutoff* and, therefore, the relevant branch is $\widetilde{\tau}_b(\cdot)$.

As stated in the following proposition, under analogous assumptions made for the basic model, it can be showed that an equilibrium exists and that additional conditions on the cost of advertising can be made to guarantee uniqueness. When $w < 1$, assumption [A.3] becomes $d < (2w-1)\theta^H(1-\sigma)\sigma$ and assumption [A.4] remains the same but with the caveat that, in the definition of $\overline{\alpha}$, $\overline{\tau}(0)$ is the cutoff for the generalized model.[32]

We let $\alpha_b = \overline{\tau}_b(0)A$ and, $\alpha_c = \overline{\tau}_{c-}(0)A$. To save space, in what follows we summarize the main results and reserve the details to the Appendix.

**Proposition 6**

*Assume [A.1]-[A.4] hold. There exists a Political Equilibrium with (positive) advertising. In addition, the equilibrium is unique when $c < 0$, when $c \in [0, \theta(1-w)/2]$ if $\alpha < \alpha_c$ and, when $c \in [\theta(1-w)/2, \theta(1-w)]$ if $\alpha < \alpha_b$.*

Now that we have established existence and uniqueness of the generalized model, we are ready to extend the most important results of the comparative statics. We first show that when, as in the basic model, the equilibrium branch of the *average voting cutoff* is $\overline{\tau}_a(\cdot)$, the effect of the exogenous net cost of voting on the equilibrium intensity of information depends on the value of the cost of advertising $\alpha$ relative to $\alpha_o$.

**Proposition 7**

*Assume [A.1]-[A.4] hold and that the unique equilibrium branch of the average voting cutoff is $\overline{\tau}_a(\cdot)$. A decrease in the exogenous net cost of voting $c$ leads to an increase(decrease) in the equilibrium intensity of information $\lambda^{H*}$ if the cost of advertising is relatively low(high), $\alpha < (>)\alpha_o$.*

Proposition 7 generalizes the results of Proposition 3. Once again the results are driven by the initial relative level of the equilibrium belief $\rho^*$ induced by the fundamental parameters. For $\rho^* < (>)1/2$ a decrease in the exogenous net cost of voting leads to a higher(lower) equilibrium intensity of information.

[32] When $c \geq 0$, assumption [A.3] does not imposes any restriction on $\sigma$ and additional sufficient conditions for uniqueness are needed. A detailed characterization of the equilibrium as a function of the cost of advertising $\alpha$ and of the ex-ante probability of having a high-quality candidate $\sigma$ can be found in the Appendix.

The mechanism behind this result is the same as in the basic model and hinges on the different slopes of the expressive values around the *ideological cutoff* in information status *(*$H\emptyset$) (and its mirror image in status ($\emptyset H$)). When $\rho^* < 1/2$ the decreasing part is flatter (in absolute value) than the increasing one. When $\widetilde{\tau}(\rho^*) = \widetilde{\tau}_a(\rho^*)$ and $\rho^* < 1/2$, the event of voting for the wrong candidate for somebody voting for $R$ happens with higher probability than for somebody voting for $D$. Therefore, since voting for the wrong candidate is weighted more than voting for the right candidate, the benefit of moving closer to the candidate that the individual voted for is increasing faster for an $R$ voter. It follows that once $c$ diminishes, $D$ would want to increase the probability of status ($H\emptyset$) and decrease the probability of status ($\emptyset H$) for the same reasons we have discussed in Section 5.1. The opposite is true when $\rho^* > 1/2$.

In the generalized model, when $c < 0$, the equilibrium branch of the average voting cutoff is $\overline{\tau}_a(\cdot)$ under analogous conditions than for the basic model. When $c > 0$, the equilibrium branch of the average voting cutoff $\overline{\tau}(\cdot)$ is $\overline{\tau}_a(\cdot)$ only when $c < (1-w)\theta/2$ and either the ex-ante probability of having high-quality candidate $\sigma$ takes intermediate values and the cost of advertising $\alpha$ is relatively high, or $\sigma$ is high and $\alpha$ takes intermediate values (the details can be found in the Appendix).

Recall from Section 4 that in the basic model, where $w = 1$, the branch $\overline{\tau}_a$ emerges in equilibrium for intermediate values of $\sigma$, $\sigma \in (\rho_1, \rho_2)$, when the cost of advertising is relatively high, $\alpha \in (\alpha_1, \overline{\alpha})$. When assumption [A.3] is relaxed and higher levels of $\sigma$, $\sigma > \rho_2$, are considered, such a branch emerges for intermediate levels of the cost of advertising, $\alpha \in (\alpha_1, \alpha_2)$. It follows that the results of Proposition 3 are robust to the extension considered in this section provided that $c$ is not too high.

We summarize in Proposition 8 the effect of a decrease in $c$ when the equilibrium branch of the *average voting cutoff* consists of branches other than $\overline{\tau}_a(\cdot)$. The reader can find the conditions in terms of the fundamental parameters under which the different branches emerge in equilibrium in the Appendix.

**Proposition 8**

*Assume [A.1]-[A.4] as well as the sufficient conditions for uniqueness of the Political*

*Equilibrium hold. (i) When* $\overline{\tau}(\lambda^{H*}) = \overline{\tau}_b(\lambda^{H*})$*, the exogenous net cost of voting* $c$ *does not affect the equilibrium intensity of information. (ii) When* $\overline{\tau}(\lambda^{H*}) = \overline{\tau}_{c-}(\lambda^{H*})$*, a decrease in* $c$ *leads to a decrease in the equilibrium intensity of information. (iii) When* $\overline{\tau}\left(\lambda^{H*}\right) = \overline{\tau}_{c+}(\lambda^{H*})$*, a decrease in* $c$ *leads to an increase in the equilibrium intensity of information.*

Figure 7 can help us to understand Proposition 8. When the revelant branch of the *average voting cutoff* is $\widetilde{\tau}_b(\cdot)$, we are in a situation where either the net cost of voting is positive and crosses the expressive value above the maximum between $\theta(1-w)(1-\rho^*)$ and $\theta(1-w)\rho^*$ or the net cost of voting is negative and lower than the minimum expressive value, $c < (1-2w)\theta(1-\rho^*)\rho^*$. In both cases the *average voting cutoff* is a constant independent of $c$. This implies that when $c$ decreases, no candidate has an incentive to change his advertising strategy because the number of votes in favor of $D$ and of $R$ either increase by the same size or remain consant.

When the relevant branch is $\widetilde{\tau}_{c-}(\cdot)$, the net cost of voting crosses the expressive value between $\theta(1-w)\rho^*$ and $\theta(1-w)(1-\rho^*)$. While $D$ voters with ideology greater that 0 face a probability $\rho^*$ of voting for the wrong candidate, $R$ voters always vote for the right one. This implies that the benefit of moving closer to the candidate that the individual voted for is increasing faster for a $D$ voter. It follows that once $c$ diminishes, everything else constant, the number of $D$ voters increases less than the number of $R$ voters and, therefore, $D$ would want to decrease the probability of status $(H\emptyset)$ and increase the probability of status $(\emptyset H)$. The exact opposite holds when the relevant branch is $\widetilde{\tau}_{c+}(\cdot)$.

We now turn attention to the effect of $c$ on information aggregation. It is easy to show that, as in the basic model, the probability that the "right" candidate is elected is increasing in $\lambda^{H*}\overline{\tau}(\lambda^{H*})$. It follows that the results of Proposition 5 can be extended as a direct implication of Propositions 7 and 8 as follows.

**Proposition 9:** *Assume [A.1]-[A.4] as well as the sufficient conditions for uniqueness of the Political Equilibrium hold. When* $c$ decreases, *the probability that the candidate preferred by a majority of citizens (were they all informed) is elected: (i) increases if the equilibrium average voting cutoff is* $\overline{\tau}_{c+}(\lambda^{H*})$*, or if it is* $\overline{\tau}_a(\lambda^{H*})$ *and the cost of advertising* *is relatively low,* $\alpha < \alpha_o$*; (ii) decreases if the equilibrium average voting cutoff is* $\overline{\tau}_{c-}(\lambda^{H*})$*, or if it is* $\overline{\tau}_a(\lambda^{H*})$ *and the cost of advertising is relatively high,* $\alpha > \alpha_o$*; and (iii) it is not affected by* $c$ *if equilibrium average voting cutoff is* $\overline{\tau}_b(\lambda^{H*})$*.*

Before moving to the concluding remarks, some considerations are in order regarding the different implications of the standard expressive-voting model and the more general formulation. Although all models that fit within equation (12) share the same *ideological cutoffs,* which determine how people vote conditional on voting, there are some subtle differences between the different settings. These differences can be inferred after substituting the appropriate value of $w$ in the expressions for the expressive values and the *voting cutoffs.*

In the standard expressive-voting model the expressive benefit of voting in information status $(HH)$ and $(\emptyset\emptyset)$ are the same, and the ones in information status $(H\emptyset)$ and $(\emptyset H)$ are just their right and left translation respectively. In addition, in all information status the minimum expressive value is zero. Therefore, in order to have voter abstention the model needs a positive exogenous net cost of voting. Similarly, to have voter participation, the basic model where citizens care only about voting for the wrong candidate and the maximum expressive value is zero, requires a negative exogenous net cost of voting. The generalized model when $w \in (1/2, 1)$ provides insights for a wider range of values for the parameter $c$.

When we compare the formulations with $w = 1/2$ (the standard expressive-voting model) and with $w > 1/2$, we have the following potentially testable implications: (i) there is a different attitude towards uncertainty. In the standard expressive-voting model, due to the complete symmetry, the belief $\rho^e$ enters linearly in both participation and voting decisions. Conversely, when $w \neq 1/2$ it enters non-linearly in the *voting cutoffs* and, hence, in the participation decision; (ii) in the standard expressive-voting model any pair of *voting cutoffs* associated with a certain information status is symmetric around the corresponding *ideological cutoff.* In addition, given $c$, the distance between any pair of *voting cutoffs* is independent of the specific information. Under the maintained assumption, common to many models of political campaign, that "swing" voters are uniformly distributed along the ideological space, this has two important consequences. First and most importantly, the exogenous net cost of voting has no effect on the equilibrium intensity of information and the electoral outcome. Second, the proportion of citizens who abstain is independent of the particular information on candidates. Conversely, in the generalized model with $w > 1/2$, the proportion of citizens who abstain conditional on having observed no ad from any candidate is higher than the proportion of citizens who abstain conditional on having observed ads from one or both candidates. Similarly, the proportion who abstain conditional on having observed only one ad is weakly higher than the proportion who abstain after observing ads from both candidates.

An important testable implication concerning more specifically the standard expressive-voting model and the basic model is the rationale behind abstention. Both specifications, being special cases of the generalized model, imply that those who abstain are the individuals with ideological positions around their *voting cutoff*. However, while in the basic model, the citizens who are informed about both candidates' qualities go to vote even when they are indifferent between the two candidates, in the standard expressive-voting model indifferent voters always abstain independent of their information.

In this section we have extended the results of the basic model considering a generalization where citizens weight the benefit of voting for the right candidate less than the cost of voting for the wrong one, $w > 1/2$. The alternative formulation with $w < 1/2$ would lead to the exactly opposite policy implications but it seems less empirically plausible. It implies that completely uninformed voters have a higher benefit of voting than perfectly informed voters and that when the exogenous net cost of voting is low only informed voters would abstain.[33] However, the general conclusions that the effect of voter awareness policies on the equilibrium intensity of information depend on the ex-ante probability of having high-quality candidates and on the cost of advertising would still hold.

As noted by Aldrich (1997) policies aimed at increasing turnout can be directed to

[33] To obtain these implications one just have to substitute $w = 0$ in the expressions for the values of voting and of the different cutoffs. Notice also that when $w = 0$, while the minimum value of voting for informed voters is 0, for the other voters it is $\theta^H(1-\rho^e)\rho^e > 0$. So, the model has interesting implications only for $c > \theta^H(1-\rho^e)\rho^e$.

any element of (12). In fact, in addition to affecting the exogenous benefit or cost of voting, voter awareness policies could be directed at affecting the endogenous expressive values. For example one can think of awareness policies aimed at decreasing the voter negative feelings with respect to the possibility of voting for the wrong candidate, that is policies that decrease the weight $w$. We show in the Appendix that when the relevant branch of the *average voting cutoff* is $\widetilde{\tau}_a(\cdot)$, such a policy would have the same effect on the equilibrium intensity of information and the efficiency of the electoral outcome as an increase in civic duty or a reduction in the exogenous cost of voting. In particular, a reduction in $w$ will lead to a higher(lower) equilibrium intensity of information and better(worse) electoral outcome if the equilibrium belief is lower(higher) than $1/2$, which in turn depends on whether the cost of advertising is lower(higher) than $\alpha_o$.

## 7 Discussion and Conclusion

The objective of this paper is to provide an important first step for the study of the effect of voting awareness polices on voters' information, turnout, and electoral outcomes, in environments where political advertising affects both the decision to vote and whom to vote for.[34] To follow this purpose, the framework has been kept deliberately simple. Specifically, as standard in existing models of directly informative advertising, the analysis focuses on symmetric settings and it is assumed that advertising is fully informative, and cannot be targeted.[35] It can be shown that in ex-ante asymmetric settings, as it is the case, for example, when candidates face different costs of advertising, candidates will choose different intensities of information and therefore voters will have different beliefs about the quality of the two candidates. A formal analysis of the equilibrium and of the comparative statics in this setting adds different complications. Not only, differently from the ex-ante symmetric setting, the candidate's best response is now a function of the opponent's strategy but also the expressive value of voting is asymmetric

[34] Ashworth (2007) has contemporaneously developed a model with both effects, where abstention is driven by ambiguity aversion. His setting has no exogenous net benefits of voting and therefore cannot be used to address our policy question.

[35] Ashworth (2007) and Schultz (2007) consider settings where informative advertising can be targeted.

in all information status and its height differs across status. Similarly, to keep things simple, as other models of directly informative advertising do (see Coate $2004a, 2004b$ and Galeotti and Mattozzi 2007), we only consider positive advertising. Although it has been argued (see, for example, Polborn and Yi 2006) that negative advertising is an important component of recent political campaigns and that in some cases can be welfare improving, the introduction of negative advertising in the setting of this paper is not a simple extension. In our model candidates do not observe the quality of the opponent. If they were to observe it, the voters' beliefs about a candidate's quality for which no advertisement is observed would no longer depend only on what is observed about that candidate. This would considerably complicate the analysis in our model with heterogeneous voters, endogenous turnout, costly advertising, and where political ads do not reach all the citizens, and it is therefore left for future research.

As we mentioned in the introduction, the results of the comparative static analysis are relevant to the debate about whether measures should be taken to increase levels of voter turnout. The literature has taken two stands on this subject. The first, views increasing turnout *per-se* as the final policy objective because high levels of turnout are essential to the healthy functioning of democracies and voting is a civic duty similar to paying taxes. The second, posits that the electoral outcome should reflect the "actual" preferences of a majority of citizens and not only the "expected" preferences of those who go to vote. Therefore, high levels of turnout are of interest only insofar as they allow for electoral outcomes that better represent the will of the citizenry. Following the first argument, existing works in political science (see, e.g., Gerber and Green 2004) have used experimental data to analyze the effectiveness of *get-out-the-vote* drives at increasing levels of turnout. Following the second argument, existing theoretical works in economics (see, e.g., Borgers 2004, Ghosal and Lockwood 2009, Krasa and Polborn 2009, and Krishna and Morgan 2008) have used pivotal-voter models with costly voting to study the consequences on the electoral outcome and on voters' welfare of sanctioning non-voting or making voting compulsory. In particular, while Borgers (2004) in a context with private values finds that compulsory voting always dominates voluntary voting, Krasa and Polborn (2009) show that his results are peculiar to the assumption on the distribution of preferences and that there are situations where sanctioning non-voting is welfare improving. While in a context with private values and heterogeneous beliefs Ghosal and Lockwood (2009) also reach mixed conclusion on the desirability of compulsory voting, Krishna and Morgan (2008) find that in a context with common values voluntary voting is dominant.

The analysis conducted in this paper provides an interesting new perspective on the above debate, and allows studying within the same framework the effects on information, turnout, and electoral outcomes, of measures that increase the citizens' ex-ante predisposition to vote, such as, for example, *get-out-the-vote* movements or public awareness policies about the citizens' rights and duties to vote.[36]

If we assume that *get-out-the-vote* movements or other vote awareness policies successfully increase the citizens' ex-ante propensity to vote, our analysis implies that although they increase turnout, their effect on the "efficiency" of the electoral outcome can go in either direction, depending on the cost of advertising and the ex-ante probability of having high-quality candidates. In fact, our results imply that increasing the activities of non-partisan *get-out-the-vote* movements or introducing vote awareness policies can sometime have undesired effects, they may lead to a reduction in the information transmitted by political advertising and to an increase in turnout by uninformed voters. This combination translates into a worse electoral outcome for a majority of citizens.

[36] In our context the policies considered by the economic literature to increase turnout, such as sanctioning non-voting or making voting compulsory, would have the same effects as policies aimed at increasing civic-duty, provided that blank votes are not allowed. When blank votes are allowed and, using the notation of footnote 23, $d = d' - c'$, we have that making going to vote compulsory would have the same effect on the equilibrium intensity of information and on the electoral outcome as increasing $d$ by $c'$ in equation (3). Similar considerations apply when sanctioning non-voting is considered.

Appendix

**Proof of Lemma 1:** Conditional on voting, the optimal voting rule prescribes voting for the candidate that generates the highest expected payoff [see Proposition 1 of Degan and Merlo (2008)]. That is, it is optimal to vote for $D$ iff $-|y_i - y_D| + E[\theta_D \mid I_D] > -|y_i - y_R| + E[\theta_R \mid I_R]$ and to vote for $R$ in the opposite case. The results follows from the symmetry in the candidate's positions.■

THE COST OF VOTING

Conditional on the belief $\rho^e$ and for any possible information status $(I_D, I_R)$, the cost of voting as a function of a citizen's ideological position $y_i$ can be easily calculated using the expression for the cost of voting for $D$ (equation 2), the analogous expression for the cost of voting for $R$, and the optimal voting behavior characterized in Lemma 1. The cost of voting is zero when $(I_D, I_R) \in \{(L,L),(H,H),(H,L),(L,H)\}$ as well as in the other asymmetric states for policies sufficiently extremes, that is when $(I_D, I_R) \in \{(H,\emptyset),(\emptyset,L)\}$ and $y_i \geq \theta^H/2$ or $(I_D, I_R) \in \{(L,\emptyset),(\emptyset,H)\}$ and $y_i \leq -\theta^H/2$. For the other cases the cost of voting is as follows:

| $c_i(v_i^*; I_D, I_R)$ : | if $(I_D, I_R) \in$ | and $y_i$ : |
|---|---|---|
| $(-2y_i + \theta^H)(1-\rho^e)$ | $(H,\emptyset)$ | $\tau_{H,\emptyset} < y_i \leq \theta^H/2$ |
| $2y_i\rho^e$ | $(H,\emptyset)$ | $\tau_{H,\emptyset} \geq y_i > 0$ |
| $(-2y_i + \theta^H)\rho^e$ | $(\emptyset,L)$ | $\tau_{\emptyset,L} < y_i \leq \theta^H/2$ |
| $2y_i(1-\rho^e)$ | $(\emptyset,L)$ | $\tau_{\emptyset,L} \geq y_i > 0$ |
| $(2y_i + \theta^H)(1-\rho^e)$ | $(\emptyset,H)$ | $\tau_{\emptyset,H} > y_i \geq -\theta^H/2$ |
| $-2y_i\rho^e$ | $(\emptyset,H)$ | $\tau_{\emptyset,H} \leq y_i < 0$ |
| $(2y_i + \theta^H)\rho^e$ | $(L,\emptyset)$ | $\tau_{L,\emptyset} > y_i \geq -\theta^H/2$ |
| $-2y_i(1-\rho^e)$ | $(L,\emptyset)$ | $\tau_{L,\emptyset} \leq y_i < 0$ |
| $(-2y_i + \theta^H)\rho^e(1-\rho^e)$ | $(\emptyset,\emptyset)$ | $y_i \geq 0$ |
| $(2y_i + \theta^H)\rho^e(1-\rho^e)$ | $(\emptyset,\emptyset)$ | $y_i < 0$ |

TURNOUT AND PROBABILITIES OF WINNING

Let $(z, w)$ be the state of the world, where $z$ and $w \in \{L, H\}$. We first calculate, conditional on $m$, the mass of *Independents* who vote for $D$ and $R$ in state $(z, w)$, $T_D^{z,w}$ and $T_R^{z,w}$. Using the fact that *Independents* are uniformly distributed on $[m-h, m+h]$, we have:

$$T_D^{z,w} = \tfrac{1}{2} - \tfrac{m}{2h} + \tfrac{1}{2h}[\lambda_D^z \lambda_R^w \tau_{z,w} + \lambda_D^z(1-\lambda_R^w)\tau_{z,\emptyset}^- + (1-\lambda_D^z)\lambda_R^w \tau_{\emptyset,w}^- + (1-\lambda_D^z)(1-\lambda_R^w)\tau_{\emptyset,\emptyset}^-]$$

$$T_R^{z,w} = \tfrac{1}{2} + \tfrac{m}{2h} - \tfrac{1}{2h}[\lambda_D^z \lambda_R^w \tau_{z,w} + \lambda_D^z(1-\lambda_R^w)\tau_{z,\emptyset}^+ + (1-\lambda_D^z)\lambda_R^w \tau_{\emptyset,w}^+ + (1-\lambda_D^z)(1-\lambda_R^w)\tau_{\emptyset,\emptyset}^+]$$

Because all *partisans* vote and they are equally sized, the probability that candidate $D$ wins the election in state $(z, w)$ is the probability that $T_D^{z,w} > T_R^{z,w}$. In particular, using the fact that $\tau_{L,L} = \tau_{H,H} = 0$, $\tau_{\emptyset,\emptyset}^- = -\tau_{\emptyset,\emptyset}^+$, $(\tau_{L,\emptyset}^- + \tau_{L,\emptyset}^+) = -(\tau_{\emptyset,L}^- + \tau_{\emptyset,L}^+)$, and $(\tau_{H,\emptyset}^- + \tau_{H,\emptyset}^+) = -(\tau_{\emptyset,H}^- + \tau_{\emptyset,H}^+)$, we have

$$\pi^{LL} = \Pr[T^{LL} > T^{LL}] = \tfrac{1}{2} + \tfrac{1}{2\varepsilon}[(\lambda_D^L - \lambda_R^L)(\tau_{L,\emptyset}^- + \tau_{L,\emptyset}^+)/2],$$

$$\pi^{HH} = \Pr[T^{HH} > T^{HH}] = \tfrac{1}{2} + \tfrac{1}{2\varepsilon}[\left(\lambda_D^H - \lambda_R^H\right)(\tau_{H,\emptyset}^- + \tau_{H,\emptyset}^+)/2],$$

$$\pi^{LH} = \Pr[T^{LH} > T^{LH}] = \tfrac{1}{2} + \tfrac{1}{2\varepsilon}[\lambda_D^L \lambda_R^H \tau_{L,H} + \lambda_D^L(1-\lambda_R^H)(\tau_{L,\emptyset}^- + \tau_{L,\emptyset}^+)/2 + (1-\lambda_D^L)\lambda_R^H(\tau_{\emptyset,H}^- + \tau_{\emptyset,H}^+)/2],$$

$$\pi^{HL} = \Pr[T^{HL} > T^{HL}] = \tfrac{1}{2} + \tfrac{1}{2\varepsilon}[\lambda_D^H \lambda_R^L \tau_{H,L} + \lambda_D^H(1-\lambda_R^L)(\tau_{H,\emptyset}^- + \tau_{H,\emptyset}^+)/2 + (1-\lambda_D^H)\lambda_R^L(\tau_{\emptyset,L}^- + \tau_{\emptyset,L}^+)/2].$$

PROBLEM OF A LOW-QUALITY CANDIDATE

The objective function of a Democratic low-quality candidate (things are completely symmetric for the republican candidate) is $V_D^L = \left[-2(1-\pi^{LL})\right](1-\sigma) + \left[(1-\pi^{LH})(-2+\theta^H)\right]\sigma - \Psi(\lambda_D^L)$. The function $V_D^L$ is concave in $\lambda_D^L$. The first order condition is: $\frac{(2-\theta^H)\sigma}{2\varepsilon}[\lambda_R^H(\tau_{L,H} - \frac{\tau_{\emptyset,H}^- + \tau_{\emptyset,H}^+}{2}) + (1-\lambda_R^H)(\frac{\tau_{L,\emptyset}^- + \tau_{L,\emptyset}^+}{2})] + \frac{\tau_{L,\emptyset}^- + \tau_{L,\emptyset}^+}{2}\frac{2(1-\sigma)}{2\varepsilon} - \Psi'(\lambda_D^L) \leq 0$. Since both $(\tau_{L,\emptyset}^- + \tau_{L,\emptyset}^+)$ and $(\tau_{L,H} - \frac{\tau_{\emptyset,H}^- + \tau_{\emptyset,H}^+}{2})$ are negative and $\Psi' > 0$, we have that a low-quality democratic candidate always finds it optimal not to advertise, independent of voters' belief and of the strategy of the other candidate, i.e. $\lambda^{L*} = 0$.■

Average voting cutoff in state $(H,\emptyset)$

Let $\rho_1$ and $\rho_2$ be the solutions to $d = \theta^H \rho^e(1-\rho^e)$. That is, $\rho_{1,2} = \frac{1}{2} \mp \frac{1}{2}\sqrt{1-4d/\theta^H}$, where $0 \leq \rho_1 < 1/2 < \rho_2 \leq 1$, $\forall d < \theta^H/4$. These two values correspond to the belief needed for the maximum cost of voting to be equal to civic duty. Let $\widetilde{\tau}(\rho^e)$ be the *average voting cutoff* corresponding to information $(H,\emptyset)$ expressed as a function of the belief $\rho^e$, i.e. $\widetilde{\tau}(\rho^e) = (\tau^-_{H,\emptyset} + \tau^+_{H,\emptyset})/2$. Recalling that $\rho^e \leq \sigma$ and by assumption $\sigma < \rho_2$, its expression is given by

$$\widetilde{\tau}(\rho^e) = \begin{cases} \widetilde{\tau}_a(\rho^e) = \frac{1}{4}\left[\theta^H + d(1-2\rho^e)/\rho^e(1-\rho^e)\right] & \text{if} \quad \rho_1 < \rho^e < \sigma \\ \widetilde{\tau}_b(\rho^e) = (1-\rho^e)\theta^H/2 & \text{if} \quad 0 \leq \rho^e \leq \rho_1 \end{cases}.$$

The first branch, $\widetilde{\tau}_a(\rho^e)$, corresponds to the *average voting cutoff* when civic duty is lower than the maximum cost of voting and, therefore, from Proposition 1, $\tau^-_{H,\emptyset} = d/2\rho^e$ and $\tau^+_{H,\emptyset} = (\theta^H - d(1-\rho^e))/2$. The second branch, $\widetilde{\tau}_b(\rho^e)$, corresponds to the *average voting cutoff* when civic duty is higher than the maximum cost of voting and, therefore, from Lemma 1 and Proposition 1, $\tau^-_{H,\emptyset} = \tau^+_{H,\emptyset} = \tau_{H,\emptyset} = \theta^H(1-\rho^e)/2$.

The function $\widetilde{\tau}_a(\cdot)$ is decreasing in $\rho^e \in [0,1]$, it approaches infinity when $\rho^e = 0$ and minus infinity when $\rho^e = 1$, it has an inflection point at $\rho^e = 1/2$, before which it is convex and after which it is concave. The function $\widetilde{\tau}_b(\cdot)$ is decreasing in $\rho^e$ at a constant slope, it has value $\theta^H/2$ when $\rho^e = 0$ and reaches 0 when $\rho^e = 1$. The two functions always intersect at $\rho_1$, $\rho_2$, and at $1/2$. The function $\widetilde{\tau}_a(\cdot)$ is greater than $\widetilde{\tau}_b(\cdot)$ for $\rho^e \in [0,\rho_1) \cup (1/2,\rho_2)$. The function $\widetilde{\tau}(\cdot)$ is continuous and decreasing in all its domain.

As explained in the text, using the relationship between $\rho^e$ and $\lambda^{He}$ that must hold when citizens expect the low-quality candidate not to advertise, we can express the *average voting cutoff* as a function of $\lambda^{He}$. We let $\overline{\tau}_a(\lambda^{He}) \equiv \widetilde{\tau}_a(\rho^e)$, $\overline{\tau}_b(\lambda^{He}) \equiv \widetilde{\tau}_b(\rho^e)$ and $\overline{\tau}(\lambda^{He}) \equiv \widetilde{\tau}(\rho^e)$. The function $\overline{\tau}(\lambda^{He})$ is at the basis of the characterization of the Political Equilibrium. Similarly to $\widetilde{\tau}(\rho^e)$, it is composed of two branches: a first branch $\overline{\tau}_a(\lambda^{He}) \equiv \widetilde{\tau}_a(\rho^e)$ if $\lambda^{He} \in [0,\lambda_1)$ and a second branch $\overline{\tau}_b(\lambda^{He}) \equiv \widetilde{\tau}_b(\rho^e)$ if $\lambda^{He} \in [\lambda_1, 1)$. We also recall that when $1/2 \leq \sigma < \rho_2$, the two branches intersect at $\lambda_1 = (\sigma - \rho_1)/(\sigma(1-\rho_1))$ and at $\lambda_o = (2\sigma - 1)/\sigma$, $\lambda_o < \lambda_1$ and when $1/2 > \sigma > \rho_1$ they intersect on the interval [0,1] only at $\lambda_1$ (in this case their intersection point $\lambda_o$ is negative). The two branches are both increasing and convex in $\lambda_H^e \in [0,1]$ and $\overline{\tau}_a(\lambda_H^e) < \overline{\tau}_b(\lambda_H^e)$ if and only if $\lambda_H^e \in (\max\{0, \lambda_0\}, \lambda_1)$. When $\lambda_H^e$ goes to 1, $\overline{\tau}_b(\cdot)$ converges to a finite value and $\overline{\tau}_a(\cdot)$ converges to infinity.

**Proof of Lemma 2:**

Consider the problem of a high-quality democratic candidate (the problem of a high-quality republican candidate is symmetric). The function $V_D^H$ is concave in $\lambda_D^H$. The first order condition at an interior solution is: $[\frac{\tau^-_{H,\emptyset}+\tau^+_{H,\emptyset}}{2} \cdot \frac{2\sigma}{2\varepsilon}] + \frac{(2+\theta^H)(1-\sigma)}{2\varepsilon}\ [\lambda_R^L \frac{\tau_{H,L}-(\tau^-_{\emptyset,L}+\tau^+_{\emptyset,L})}{2} + (1-\lambda_R^L)\frac{(\tau^-_{H,\emptyset}+\tau^+_{H,\emptyset})}{2}] - \Psi'(\lambda_D^H) = 0$. At the (symmetric) equilibrium, where $\lambda_R^{L*} = \lambda_D^{L*} = 0$ and the *voting cutoffs* are evaluated at the equilibrium belief $\rho^*$, this condition reduces to $\widetilde{\tau}(\rho^*)A = \Psi'(\lambda^{H*})$, where $A = \left[1 + \theta^H(1-\sigma)/2\right]/\varepsilon$ and the party subscripts have been dropped due to the symmetry. Using the properties of $\widetilde{\tau}(\rho^e)$, (6), and the identity $\widetilde{\tau}(\rho^*) \equiv \overline{\tau}(\lambda^{H*})$ the result follows.■

**Proof of Proposition 2:**

Consider the equilibrium equation (8). The behavior of the LHS of (8) depends on the two branches of $\overline{\tau}(\lambda)$ characterized in (9). Let $r(\lambda) = \alpha/(1-\lambda)^2$, $l_a(\lambda) = \overline{\tau}_a(\lambda)A$, $l_b(\lambda) = \overline{\tau}_b(\lambda)A$, $g_a(\lambda) = l_a(\lambda) - r(\lambda)$, and $g_b(\lambda) = l_b(\lambda) - r(\lambda)$. The function $r(\lambda)$ is continuous, increasing, and convex in $\lambda$. It is equal to $\alpha$ for $\lambda = 0$ and goes to infinity as $\lambda$ tends to 1. Both $l_a(\lambda)$ and $l_b(\lambda)$ are also increasing and convex in $\lambda$. However, as $\lambda$ goes to 1, while $l_b(\lambda)$ converges to the finite value $A\theta^H/2$, $l_a(\lambda)$ converges to infinity but at a slower rate than $r(\lambda)$. Recall that, under our assumptions, $l_a(\cdot)$ and $l_b(\cdot)$ always intersect at $\lambda_1$, and that on the interval $[0,1]$ $l_a(\cdot) < l_b(\cdot)$ $\forall \lambda \in (\max\{0, \lambda_o\}, \lambda_1)$.

A first step consists of showing that both $g_a(\lambda) = l_a(\lambda) - r(\lambda)$ and $g_b(\lambda) = l_b(\lambda) - r(\lambda)$ are either always decreasing or first increasing and then decreasing in $\lambda$. Consider the function $g_b(\lambda)$. From the limiting behavior analyzed above, we know that $g_b(\lambda)$ cannot be always increasing. To establish our result it is therefore sufficient to show that once $g_b'(\cdot)$ is negative, $g_b''(\cdot)$ is also negative. Take any $\overline{\lambda} \in [0,1]$ such that $g_b'(\overline{\lambda}) \leq 0$, where $g_b'(\overline{\lambda}) = \frac{\theta^H \sigma(1-\sigma)A}{2(1-\overline{\lambda}\sigma)^2} - \frac{2\alpha}{(1-\overline{\lambda})^3}$. By construction, $\alpha \geq \frac{\theta^H \sigma(1-\sigma)(1-\overline{\lambda})^3 A}{4(1-\overline{\lambda}\sigma)^2}$. Consider now $g_b''(\overline{\lambda}) = \frac{\theta^H \sigma^2(1-\sigma)A}{(1-\overline{\lambda}\sigma)^3} - \frac{6\alpha}{(1-\overline{\lambda})^4}$. This is smaller than $\frac{\theta^H \sigma^2(1-\sigma)A}{(1-\overline{\lambda}\sigma)^3} - \frac{6}{(1-\overline{\lambda})^4}\frac{\theta^H \sigma(1-\sigma)(1-\overline{\lambda})^3 A}{4(1-\overline{\lambda}\sigma)^2} = \frac{\theta^H \sigma(1-\sigma)A\left[2(1-\overline{\lambda})\sigma - 3(1-\overline{\lambda}\sigma)\right]}{2(1-\overline{\lambda}\sigma)^3(1-\overline{\lambda})} < 0,\ \forall \sigma, \overline{\lambda} \in [0,1]$.

The result of this first step assures that when $g_b(0) > 0$ there exists only one solution to $g_b(\lambda) = 0$ and that there exist at most two solutions otherwise. The same result can be proven for $g_a(\lambda)$.

By [A.4] we have $g_a(0) > 0$. From the result of step 1, it follows that there exists a unique solution to $l_a(\lambda^a) = r(\lambda^a)$ for some $\lambda^a \in (0,1)$. In order for $\lambda^a$ to be part of an equilibrium with partial turnout, it must be also that $\lambda^a < \lambda_1$. To establish this result it is necessary and sufficient to show (Figure A.1) that $l_a(\lambda_1) < r(\lambda_1)$. Using the fact that $\overline{\tau}_a(\lambda_1) = \overline{\tau}_b(\lambda_1)$, the condition can be written as $(1-\sigma)\theta^H A/2(1-\lambda_1\sigma) < \alpha/(1-\lambda_1)^2$. Using the expressions for $\rho_1$and $\lambda_1$, it follows that $\lambda^a$ is part of an equilibrium with partial turnout iff $\alpha > \alpha_1 = \frac{A\theta^H}{4}\frac{(1-\sigma)^2}{\sigma^2}\frac{\left(1-\sqrt{x}\right)^2}{1+\sqrt{x}}$, where, $x = 1 - 4d/\theta^H$ and $\alpha_1 < \overline{\alpha}$.

Figure A.1: Partial Turnout

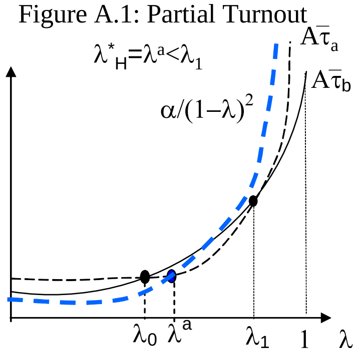
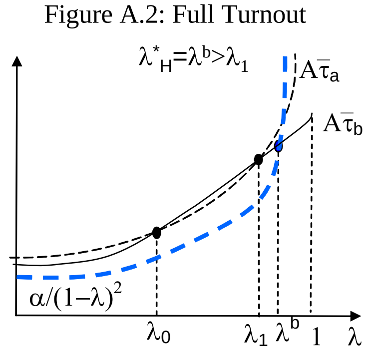



Figure A.2: Full Turnout




When $\alpha > \alpha_1$, $g_b(\lambda_1) < 0$ and there does not exist any equilibrium with full turnout. This is because, for values of $\lambda$ greater than $\lambda_1$ the curves $l_b(\lambda)$ and $r(\lambda)$ either do not intersect or intersect twice. This last case would imply that also $l_a(\lambda)$ and $r(\lambda)$ intersect twice on the interval $[\lambda_1, 1]$, as in this interval $l_a(\lambda) > l_b(\lambda)$. However, this would contradict what we have proven earlier, namely that under [A.4] $l_a(\lambda)$ intersects $r(\lambda)$ only once. It follows that when $\alpha > \alpha_1$ there exists a unique political equilibrium and it exhibits partial turnout.

When $\alpha \leq \alpha_1$ we have that $g_b(\lambda_1) \geq 0$. A unique $\lambda^b \geq \lambda_1$ such that $l_b(\lambda^b) = r(\lambda^b)$ therefore exists (Figure A.2) while, from the considerations above, an equilibrium with partial turnout does not exist.■

**Proof of Lemma 3:** When $\sigma > 1/2$ necessary and sufficient condition for $\lambda^{H*} < \lambda_o$ $[\rho^* > 1/2]$ is that $l_a(\lambda_o) = l_b(\lambda_o) = A\theta^H/4 < r(\lambda_o) = \alpha/(1-\lambda_o)^2$. This condition is satisfied for $\alpha > \alpha_o$, where $\alpha_o = \frac{\theta^H A}{4}\frac{(1-\sigma)^2}{\sigma^2}$, $\alpha_1 < \alpha_o < \overline{\alpha}$. When $\sigma < 1/2$ it must be that $\rho^* < \sigma < 1/2$ and $\lambda^{H*} > 0 > \lambda_o$. The statement holds by default because $\alpha_o > \overline{\alpha}$.■

COMPARATIVE STATICS AND INTENSITY OF INFORMATION

### Proof of Proposition 3

Take the equilibrium equation (8) when $\overline{\tau}(\cdot) = \overline{\tau}_a(\cdot)$. While both the right-hand side and the term $A$ are independent of $d$, $\overline{\tau}(\cdot)$ is affected by it. In particular: $\frac{\partial \overline{\tau}(\cdot)}{\partial d} = \frac{(1-\sigma\lambda^*_H)(1-2\sigma+\lambda^{H*}\sigma)}{4(1-\lambda^{H*})\sigma(1-\sigma)}$. If follows that sign$(\partial\overline{\tau}(\cdot)/\partial d)$=sign$(1-2\sigma+\lambda^{H*}\sigma)$, which is positive (negative) for $\lambda^{H*} > (<)\lambda_o$. Therefore, when $\frac{\partial \overline{\tau}(\cdot)}{\partial d} > (<)0$ the two sides of (8) intersect at a higher (lower) level of $\lambda^{H*}$ (see Figure 5). When $\lambda^{H*} = \lambda_o$, $\frac{\partial \overline{\tau}(\cdot)}{\partial d} = 0$ and the equilibrium intensity of information does not change. The equivalence between the conditions on $\lambda^{H*}$ and $\lambda_o$ versus the conditions on $\alpha$ and $\alpha_o$ follows from Lemma 3. ■

COMPARATIVE STATICS AND TURNOUT

In the basic model, all the expressions of the equilibrium level of turnout depend on the voting cutoff $\tau^+_{\emptyset\emptyset}$. We use (6) to re-express this cutoff as a function of the equilibrium intensity of information. That is: $\tau^+_{\emptyset\emptyset}(\lambda^{H*}) \equiv \frac{\theta^H}{2} - \frac{d}{2}(1-\lambda^{H*}\sigma)^2/((1-\lambda^{H*})\sigma(1-\sigma))$. The results of the comparative statics on turnout will use the properties of the function $\tau^+_{\emptyset\emptyset}(\lambda) = \frac{\theta^H}{2} - \frac{d}{2}(1-\lambda\sigma)^2/((1-\lambda)\sigma(1-\sigma))$. Its first derivative is $\frac{\partial \tau^+_{\emptyset\emptyset}(\lambda)}{\partial \lambda} = -\frac{d(1-\sigma\lambda)(1+\sigma\lambda-2\sigma)}{2(1-\lambda)^2\sigma(1-\sigma)}$. It is positive(negative) when $(1+\sigma\lambda-2\sigma) < (>)0$, that is, iff $\lambda < (>)\lambda_o$, and it is zero otherwise. Its second derivative, $\frac{\partial^2 \tau^+_{\emptyset\emptyset}(\lambda)}{\partial \lambda} = -\frac{(1-\sigma)d}{\sigma(1-\lambda)^3}$, is always negative.

### Proof of Proposition 4

Consider the parameter $d$. In state $LL$ we have $\frac{d(T^{LL})}{d(d)} = -\frac{1}{\tau}\frac{d(\tau^+_{\emptyset\emptyset})}{d(d)}$, where $\frac{d(\tau^+_{\emptyset\emptyset})}{d(d)} = \frac{\partial \tau^+_{\emptyset\emptyset}}{\partial d} + \frac{\partial \tau^+_{\emptyset\emptyset}}{\partial \lambda^{H*}}\frac{\partial \lambda^{H*}}{\partial d}$. Since $sign(\frac{\partial \lambda^{H*}}{\partial d}) = -sign(\frac{\partial \tau^+_{\emptyset\emptyset}}{\partial \lambda^{H*}})$ and $\frac{\partial \tau^+_{\emptyset\emptyset}}{\partial d} < 0$, it follows that $\frac{d(\tau^+_{\emptyset\emptyset})}{d(d)} < 0$ and $\frac{d(T^{LL})}{d(d)} > 0$, $\forall \lambda^{H*}$.

Consider now state $HH$. We have that $\frac{dT^{HH}}{d(d)} = -\frac{1}{h}\ [-\tau^{+}_{\emptyset\emptyset}\frac{\partial\lambda^{H*}}{\partial d}\ +(1-\lambda^{H*})\frac{d\tau^{+}_{\emptyset\emptyset}}{d(d)}]$. By letting $k(\lambda) = [\tau^{+}_{\emptyset\emptyset} - (1-\lambda)\frac{\partial\tau^{+}_{\emptyset\emptyset}}{\partial\lambda}] = [\frac{\theta^{H}}{2} - d\frac{(1-\lambda\sigma)}{(1-\sigma)}]$, this expression can be rewritten as $\frac{dT^{HH}}{d(d)}{=}\frac{1}{h}[k(\lambda^{H*})\frac{\partial\lambda^{H*}}{\partial d} + \frac{(1-\sigma\lambda^{*}_{H})^{2}}{2\sigma(1-\sigma)}]$. When $\lambda^{H*} \geq \lambda_{o}$ ($\alpha \leq \alpha_{o}$), $\frac{\partial\tau^{+}_{\emptyset\emptyset}}{\partial\lambda^{H*}} \leq 0$ and, hence $k(\lambda^{H*}) > 0$, which in turn implies $\frac{d(T^{HH})}{d(d)} > 0$. To analyze the case where $\lambda^{H*} < \lambda_{o}$ ($\alpha > \alpha_{o}$), we compute the explicit expression of $\frac{\partial\lambda^{H*}}{\partial d}$ using the implicit function theorem and equation (8), $\frac{\partial\lambda^{H*}}{\partial d} = \frac{(1-\sigma\lambda^{*}_{H})(1-2\sigma+\sigma\lambda^{*}_{H})(1-\lambda^{H*})}{d[(1-\sigma)^{2}-3\sigma^{2}(1-\lambda^{H*})^{2}]+2\theta^{H}\sigma(1-\sigma)(1-\lambda^{H*})}$. We have that $\frac{dT_{HH}}{d(d)} > 0$ iff $\frac{\partial\lambda^{H*}}{\partial d}k(\lambda^{H*}) + \frac{(1-\sigma\lambda^{*}_{H})^{2}}{2\sigma(1-\sigma)} > 0$. After some substitutions and simplifications, this is equivalent to $(1-\lambda^{H*})\theta^{H}\sigma(1-\sigma)[-3+\sigma\lambda^{*}_{H}+2\sigma] < d(1-\sigma\lambda^{*}_{H})[(1-\sigma)^{2}-(1-\lambda^{H*})\sigma(2-\sigma-\sigma\lambda^{*}_{H})]$. Given $[A.3]$, a sufficient condition for this is $(1-\lambda^{H*})d[3-\sigma\lambda^{*}_{H}-2\sigma]+d(1-\sigma\lambda^{*}_{H})(1-\sigma)^{2} > d(1-\sigma\lambda^{*}_{H})[(1-\lambda^{H*})\sigma(2-\sigma-\sigma\lambda^{*}_{H})]$. A stricter sufficient condition is $[3-\sigma\lambda^{*}_{H}-2\sigma] > (2-\sigma-\sigma\lambda^{*}_{H})$, which is satisfied $\forall\sigma < 1$.

Finally, consider state $HL$. We have that $\frac{dT^{HL}}{d(d)} = -\frac{1}{2h}\ [-\tau^{+}_{\emptyset\emptyset}\frac{\partial\lambda^{H*}}{\partial d}\ +(2-\lambda^{H*})\frac{d\tau^{+}_{\emptyset\emptyset}}{d(d)}]$. Rearranging terms, this expression can be written as $\frac{dT^{HL}}{d(d)} = \frac{1}{2}\frac{dT^{HH}}{d(d)} - \frac{1}{2h}\frac{d(\tau^{+}_{\emptyset\emptyset})}{d(d)}$. Since $\frac{dT^{HH}}{d(d)} > 0$ and $\frac{d(\tau^{+}_{\emptyset\emptyset})}{d(d)} < 0$ the result follows.■

COMPARATIVE STATICS AND INFORMATION AGGREGATION

**Proof of Proposition 5**

The differential of the term $\lambda^{H*}\overline{\tau}(\lambda^{H*})$ with respect to $d$ is $[\frac{\partial\lambda^{H*}}{\partial d}\ (\overline{\tau}_{a}(\cdot) + \lambda^{H*}\frac{\partial\overline{\tau}_{a}}{\partial\lambda^{H*}}) + \lambda^{H*}\frac{\partial\overline{\tau}_{a}}{\partial d}]$. Using Proposition 3 and Lemma 3, plus the facts that $\frac{\partial\overline{\tau}_{a}}{\partial\lambda^{H*}} > 0$ and $sign(\frac{\partial\overline{\tau}_{a}}{\partial d}) = sign(\frac{\partial\lambda^{H*}}{\partial d})$, the result follows.■

ANALYSIS OF THE GENERALIZED EXPRESSIVE-VOTING MODEL

We first show that, as in the basic model and in the standard expressive-voting model, conditional on voting, citizens vote for the candidate who delivers then highest expected payoff (1). For any given information status and belief about the two candidates, given (10) and (11), conditional on voting a citizen will vote for $D$ if and only if $(1-w)E_{I_D,I_R}[(u_D-u_R)\cdot 1\{u_D > u_R\}] + wE_{I_D,I_R}[[(u_D-u_R)\cdot 1\{u_D < u_R\}] > (1-w)E_{I_D,I_R}[(u_R-u_D)\cdot 1\{u_D < u_R\}] + wE_{I_D,I_R}[[(u_R-u_D)\cdot 1\{u_D > u_R\}]$, that is if and only if $E_{I_D,I_R}[(u_D-u_R)] > 0$. This implies that the *ideological cutoffs* are the same for all model specifications that fit within equations (10) and (11).

Using the expressions for the *ideological cutoffs* and (10)-(11), the analytical expressions of the expressive values in the different information status are given below, where status ($LL$, $L\emptyset$, and $\emptyset L$) are omitted as they do not occur in equilibrium.

| $b_i(v_i^*; I_D, I_R)$ : | if $(I_D, I_R)$ : | and $y_i$ : |
|---|---|---|
| $(1-w)2\|y_i\|$ | $(H,H)$ | $\forall y_i \in [0,1]$ |
| $(1-w)2\|y_i\|$ | $(\emptyset,\emptyset)$ | $y_i \notin [\tau_{L,H}, \tau_{H,L}]$ |
| $\|2y_i\|[(1-w)+(2w-1)\rho^e(1-\rho^e)] - (2w-1)\theta\rho^e(1-\rho^e)$ | $(\emptyset,\emptyset)$ | $y_i \in [\tau_{L,H}, \tau_{H,L}]$ |
| $(1-w)\|-2y_i+(1-\rho^e)\theta\|$ | $(H,\emptyset)$ | $y_i \notin [0,\tau_{H,L}]$ |
| $-2y_i[(1-w)(1-\rho^e)+w\rho^e]+(1-w)\theta(1-\rho^e)$ | $(H,\emptyset)$ | $y_i \in [0,\tau_{H,\emptyset})$ |
| $2y_i[(1-w)\rho^e+w(1-\rho^e)] - w\theta(1-\rho^e)$ | $(H,\emptyset)$ | $y_i \in [\tau_{H,\emptyset}, \tau_{H,L})$ |
| $(1-w)\|-2y_i-(1-\rho^e)\theta\|$ | $(\emptyset,H)$ | $y_i \notin [\tau_{L,H}, 0]$ |
| $2y_i[(1-w)(1-\rho^e)+w\rho^e]+(1-w)\theta(1-\rho^e)$ | $(\emptyset,H)$ | $y_i \in (\tau_{\emptyset,H}, 0]$ |
| -$2y_i[(1-w)\rho^e+w(1-\rho^e)] - w\theta(1-\rho^e)$ | $(\emptyset,H)$ | $y_i \in (\tau_{L,H}, \tau_{\emptyset,H}]$ |

As it can be inferred from Figure 7 and as in Section 3, for any given $c < (1-w)\theta^H$ and belief $\rho^e$, the optimal behavior of a citizen in each information status is characterized by a left and a right *voting cutoff.* These are respectively the left and right intersection between $c$ and $b_i(\cdot)$ if such intersection exists, and they coincide with the *ideological cutoff* otherwise (this case can happens only when $c < 0$).

The candidate's problem as well as the expressions of the probabilities of winning, as a function of the citizens' *voting cutoffs,* are the same as in the basic model. In particular, due to symmetry, an interior equilibrium (if it exists) is characterized by (8), where $\overline{\tau}(\lambda^{H*})$ is now the *average voting cutoff* for the generalized setting in information status ($H\emptyset$) expressed in terms of $\lambda^{H*}$, according to (6). In information status ($H\emptyset$) we let $\tau^-_{H\emptyset} = \frac{-c+\theta(1-\rho)(1-w)}{2[(1-w)(1-\rho)+\rho w]}$ and $\tau^{o-}_{H\emptyset} = \tau_{H\emptyset} - \frac{c}{2(1-w)}$ be the left cutoffs when $c$ intersects the expressive value in the interval $[0, \tau_{H\emptyset}]$ and $[-1, 0]$ respectively. Similarly we let $\tau^+_{H\emptyset} = \frac{c+\theta(1-\rho)w}{2[(1-w)\rho+(1-\rho)w]}$ and $\tau^{o+}_{H\emptyset} = \tau_{H\emptyset} + \frac{c}{2(1-w)}$ be the right cutoffs when the $c$ intersects the expressive value in the interval $[\tau_{H\emptyset}, \tau_{HL}]$ and $[\tau_{HL}, 1]$ respectively.[37]

[37] The *voting cutoffs* in information status $(H,H)$ are: $\tau^+_{HH} = -\tau^-_{HH} = \frac{c}{2(1-w)}$. In information status $(\emptyset,\emptyset)$, $\forall c < (1-w)\theta^H$, they are $\tau^+_{\emptyset\emptyset} = -\tau^-_{\emptyset\emptyset} = \frac{c+\theta\rho^e(1-\rho^e)(2w-1)}{2[(1-w)+(2w-1)\rho^e(1-\rho^e)]}$.

We consider values of $c < (1-w)\theta^H$. It is clear from the Figure 7 that the relevant *average voting cutoff* for any given belief is $\widetilde{\tau}_b = (\tau^{o-}_{H\emptyset} + \tau^{o+}_{H\emptyset})/2$ if $c > \max\{(1-w)\theta^H\rho^e, (1-w)\theta^H(1-\rho^e)\}$; $\widetilde{\tau}_{c-} = (\tau^{-}_{H\emptyset} + \tau^{o+}_{H\emptyset})/2$ if $c \in [(1-w)\theta^H\rho^e, (1-w)\theta(1-\rho^e)]$ and $\rho^e < 1/2$; $\widetilde{\tau}_{c+} = (\tau^{o-}_{H\emptyset} + \tau^{+}_{H\emptyset})/2$ if $c \in [(1-w)\theta^H(1-\rho^e), (1-w)\theta\rho^e]$ and $\rho^e > 1/2$ ; and $\widetilde{\tau}_a = (\tau^{-}_{H\emptyset} + \tau^{+}_{H\emptyset})/2$ if $c \in [(1-2w)\theta^H\rho^e(1-\rho^e), \min\{(1-w)\theta^H\rho^e, (1-w)\theta^H(1-\rho^e)\}]$. It can be showed that all the $\widetilde{\tau}_s(\rho)$ are decreasing in $\rho$.

It is easy but tedious to show that the analysis for negative values of $c$ is completely equivalent to the one of the basic model. The characterization of the equilibrium as well as the more important results of the comparative statics go through, under the caveat that in all the statements and definitions the average voting cutoffs are the ones of the generalized case and that [A.3] is replaced by its generalized version, $d < (1-2w)\theta^H\sigma(1-\sigma)$.

Therefore, in what follows we restrict attention to values of $c \in [0, \theta^H(1-w)]$. For the characterization of the relevant branches of $\widetilde{\tau}(\rho)$ we need to consider two cases. In case 1, $c \in [0, (1-w)\theta^H/2]$ and in case 2, $c \in ((1-w)\theta^H/2, \theta^H(1-w)]$. In both cases two values of the beliefs will be important. Let $\widehat{\rho}_1 = 1 - c/(\theta^H(1-w))$ and $\widehat{\rho}_2 = c/(\theta^H(1-w))$ be the values of the belief such that $c$ equals the expressive value at $y_i = 0$ and at $y_i = \tau_{HL}$ respectively. We have that $\widetilde{\tau}_a(\widehat{\rho}_2) = \widetilde{\tau}_{c-}(\widehat{\rho}_2)$; $\widetilde{\tau}_a(\widehat{\rho}_1) = \widetilde{\tau}_{c+}(\widehat{\rho}_1)$; $\widetilde{\tau}_b(\widehat{\rho}_1) = \widetilde{\tau}_{c-}(\widehat{\rho}_1)$ and $\widetilde{\tau}_b(\widehat{\rho}_2) = \widetilde{\tau}_{c+}(\widehat{\rho}_2)$. In addition, $\widetilde{\tau}_a(0) = \widetilde{\tau}_{c+}(0) < \widetilde{\tau}_b(0) = \widetilde{\tau}_{c-}(0)$, and $\widetilde{\tau}_a(1) = \widetilde{\tau}_{c-}(1) > \widetilde{\tau}_b(1) = \widetilde{\tau}_{c+}(1)$.

In case 1, $\widehat{\rho}_1 \geq \widehat{\rho}_2$ (with equality only when $c = (1-w)\theta^H/2$) and $\widetilde{\tau}_{c-}$ intersects $\widetilde{\tau}_{c+}$ at some values $\underline{\rho}_c \in [0, \widehat{\rho}_2]$ and $\overline{\rho}_c \in [\widehat{\rho}_1, 1]$. In this case, depicted in Figure A.3, only three branches potentially matters, $\widetilde{\tau}_{c-}$ for $\rho^e \leq \widehat{\rho}_2$; $\widetilde{\tau}_a$ for values of the belief in the interval $(\widehat{\rho}_2, \widehat{\rho}_1)$; and $\widetilde{\tau}_{c+}$ for $\rho^e \geq \widehat{\rho}_1$.

In case 2, $\widehat{\rho}_1 < \widehat{\rho}_2$ and $\widetilde{\tau}_{c-}$ and $\widetilde{\tau}_{c+}$ never intersects. In this case, depicted in Figure A.4, only three branches potentially matter, $\widetilde{\tau}_{c-}$ for $\rho^e \leq \widehat{\rho}_1$; $\widetilde{\tau}_b$ for $\rho^e \in (\widehat{\rho}_1, \widehat{\rho}_2)$; and $\widetilde{\tau}_{c+}$ for $\rho^e \geq \widehat{\rho}_2$.

Figure A.3: c<θ(1-w)/2

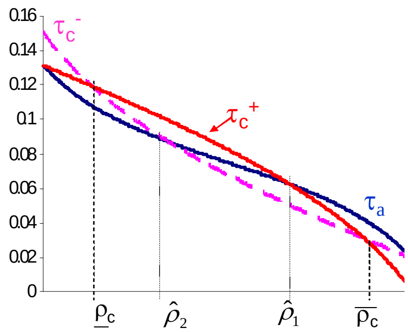
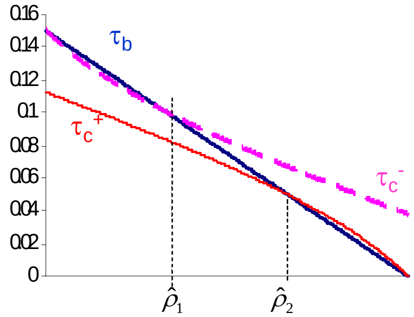



Figure A.4: c>θ(1-w)/2




**Proof of Proposition 6**

The proof proceeds as in Proposition 2. It can be shown that the difference between each possible branch of $\overline{\tau}(\lambda)$ and $\alpha/A(1-\lambda)^2$ is either always decreasing or first increasing and then decreasing. The proof of existence and uniqueness of the equilibrium as well as its characterization for $c<0$ is anologous to the proof of Proposition 2 and is therefore omitted. In order to characterize the equilibrium for $c>0$ we let $\widehat{\lambda}_1$ and $\widehat{\lambda}_2$ be the intensity of information corresponding to $\widehat{\rho}_1$ and $\widehat{\rho}_2$, respectively.

Consider first Case 1. Figure A.5 depicts the patterns of the three possible branches of the *average voting cutoff* as a function of $\lambda$. The position of the vertical axes ($\lambda=0$, corresponding to $\rho=\sigma$) will depend on the value of $\sigma$. Let $\alpha_c = A\overline{\tau}_{c-}(0)$, $\alpha_{2a}$ be the value of $\alpha$ such that $\overline{\tau}_a(\widehat{\lambda}_2)A = \alpha_{2a}/(1-\widehat{\lambda}_2)^2$, and $\alpha_{1a}$ be the value of $\alpha$ such that $\overline{\tau}_a(\widehat{\lambda}_1)A = \alpha_{1a}/(1-\widehat{\lambda}_1)^2$. We have that $\alpha_{2a} = \frac{Ac^2(1-\sigma)^2\theta^H[2\theta^H(1-w)^2+c(4w-3)]}{4\sigma^2[\theta^H(1-w)^2+c(2w-1)][\theta^H(1-w)-c]^2}$ and $\alpha_{1a} = \frac{A(1-\sigma)^2\theta^H[\theta^H(1-w)-c]^2}{4c\sigma^2[\theta^H(1-w)^2+c(2w-1)]}$, where $\alpha_{2a} \leq \alpha_o \leq \alpha_{1a}$.

• When $\sigma \leq \widehat{\rho}_2$, $\overline{\tau}(\lambda) = \overline{\tau}_{c-}(\lambda)\ \forall\lambda \in [0,1]$. Assumption [A.4] is sufficient to guarantee the existence of a unique intensity of information $\lambda^{H*}$ satisfying (8).

• When $\sigma \in (\widehat{\rho}_2, \widehat{\rho}_1)$ : $\overline{\tau}(\lambda) = \overline{\tau}_{c-}(\lambda)$ for $\lambda \geq \widehat{\lambda}_2$, $\overline{\tau}(\lambda) = \overline{\tau}_a(\lambda)$ for $\lambda < \widehat{\lambda}_2$, and $\alpha_{2a} < \alpha_c < \overline{\alpha}$. It follows that when $\alpha \leq \alpha_{2a}$ there exists a unique equilibrium intensity of information $\lambda^{H*} \in [\widehat{\lambda}_2, 1)$ and it satisfies $\overline{\tau}_{c-}(\lambda^{*H})A = \alpha/(1-\lambda^{*H})^2$. When $\alpha > \alpha_{2a}$ the additional assumption that $\alpha < \alpha_c$ guarantees that a unique equilibrium intensity of information $\lambda^{H*} \in (0, \widehat{\lambda}_2)$ exists and it satisfies $\overline{\tau}_a(\lambda^{*H})A = \alpha/(1-\lambda^{*H})^2$.

• When $\sigma > \widehat{\rho}_1$ : $\overline{\tau}(\lambda) = \overline{\tau}_{c-}(\lambda)$ for $\lambda \geq \widehat{\lambda}_2$, $\overline{\tau}(\lambda) = \overline{\tau}_a(\lambda)$ for $\lambda \in (\widehat{\lambda}_1, \widehat{\lambda}_2)$, $\overline{\tau}(\lambda) = \overline{\tau}_{c+}(\lambda)$ for $\lambda \leq \widehat{\lambda}_1$. For $\sigma > \overline{\rho}_c$, $\alpha_c > \overline{\alpha}$ and, for $\sigma < \overline{\rho}_c$, $\alpha_c < \overline{\alpha}$. When $\alpha \leq \alpha_{2a}$ a unique equilibrium intensity of information exists $\lambda^{H*} \in [\widehat{\lambda}_2, 1)$ and it satisfies $\overline{\tau}_{c-}(\lambda^{*H})A = \alpha/(1-\lambda^{*H})^2$. Under the additional assumption that $\alpha < \alpha_c$, when $\alpha \in (\alpha_{2a}, \alpha_{1a})$ a unique equilibrium intensity of information exists $\lambda^{H*} \in (\widehat{\lambda}_1, \widehat{\lambda}_2)$ and it satisfies $\overline{\tau}_a(\lambda^{*H})A = \alpha/(1-\lambda^{*H})^2$, and when $\alpha \geq \alpha_{1a}$ a unique equilibrium intensity of information exists $\lambda^{H*} \in (0, \widehat{\lambda}_1]$ and it satisfies $\overline{\tau}_{c+}(\lambda^{*H})A = \alpha/(1-\lambda^{*H})^2$. Note that when $\sigma < \overline{\rho}_c$ it could be that $\alpha_{1a} > \alpha_c$ and therefore, by default, this last case would not apply.

Consider now Case 2. Figure A.6 depicts the patterns of the three possible branches of the *average voting cutoff* as a function of $\lambda$. As before, the position of the vertical axes will depend on the value of $\sigma$. Let $\alpha_b = A\overline{\tau}_b(0)$, $\alpha_{2b}$ be the value of $\alpha$ such that $\overline{\tau}_b(\widehat{\lambda}_2)A = \alpha_{2b}/(1-\widehat{\lambda}_2)^2$, and $\alpha_{1b}$ be the value of $\alpha$ such that $\overline{\tau}_b(\widehat{\lambda}_1)A = \alpha_{1b}/(1-\widehat{\lambda}_1)^2$. We have that $\alpha_{1b} = \frac{A(1-\sigma)^2[\theta^H(1-w)-c]^2}{2c\sigma^2(1-w)}$ and $\alpha_{2b} = \frac{c^2(1-\sigma)^2}{2\sigma^2(1-w)[\theta^H(1-w)-c]^2}$, where $\alpha_{1b} < \alpha_{2b}$.

• When $\sigma \leq \widehat{\rho}_1$, $\overline{\tau}(\lambda) = \overline{\tau}_{c-}(\lambda)$ $\forall \lambda \in [0,1]$. Assumption [A.4] is sufficient to guarantee the existence of a unique intensity of information $\lambda^{H*}$ satisfying (8).

• When $\sigma \in (\widehat{\rho}_1, \widehat{\rho}_2)$ : $\overline{\tau}(\lambda) = \overline{\tau}_{c-}(\lambda)$ for $\lambda \geq \widehat{\lambda}_1$ and $\overline{\tau}(\lambda) = \overline{\tau}_b(\lambda)$ for $\lambda < \widehat{\lambda}_1$, and $\alpha_{1a} < \overline{\alpha} = \alpha_b < A\overline{\tau}_{c-}(0)$. It follows that when $\alpha \leq \alpha_{1b}$ there exists a unique equilibrium intensity of information $\lambda^{H*} \in [\widehat{\lambda}_1, 1)$ and it satisfies $\overline{\tau}_{c-}(\lambda^{*H})A = \alpha/(1-\lambda^{*H})^2$. When $\alpha > \alpha_{1b}$ there exists a unique equilibrium intensity of information $\lambda^{H*} \in (0, \widehat{\lambda}_1)$ and it satisfies $\overline{\tau}_b(\lambda^{*H})A = \alpha/(1-\lambda^{*H})^2$.

• When $\sigma > \widehat{\rho}_2$ : $\overline{\tau}(\lambda) = \overline{\tau}_{c-}(\lambda)$ for $\lambda \geq \widehat{\lambda}_1$, $\overline{\tau}(\lambda) = \overline{\tau}_b(\lambda)$ for $\lambda \in (\widehat{\lambda}_2, \widehat{\lambda}_1)$, and $\overline{\tau}(\lambda) = \overline{\tau}_{c+}(\lambda)$ for $\lambda \leq \widehat{\lambda}_2$. It is also the case that $\alpha_{1b} < \alpha_o < \alpha_{2b}$, and that $\alpha_b < \overline{\alpha} = A\overline{\tau}_{c+}(0) < A\overline{\tau}_{c-}(0)$. When $\alpha \leq \alpha_{1b}$ a unique equilibrium intensity of information exists $\lambda^{H*} \in [\widehat{\lambda}_1, 1)$ and it satisfies $\overline{\tau}_{c-}(\lambda^{*H})A = \alpha/(1-\lambda^{*H})^2$. When $\alpha \in (\alpha_{1b}, \alpha_{2b})$ a unique equilibrium intensity of information exists $\lambda^{H*} \in (\widehat{\lambda}_2, \widehat{\lambda}_1)$ and it satisfies $\overline{\tau}_b(\lambda^{*H})A = \alpha/(1-\lambda^{*H})^2$. When $\alpha \geq \alpha_{2b}$, under the additional assumption that $\alpha < \alpha_b$ a unique equilibrium intensity of information exists $\lambda^{H*} \in (0, \widehat{\lambda}_2]$ and it satisfies $\overline{\tau}_{c+}(\lambda^{*H})A = \alpha/(1-\lambda^{*H})^2$.

Figure A.5 $c<\theta\ (1\text{-}w)/2$

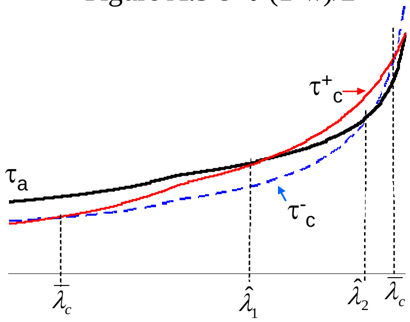
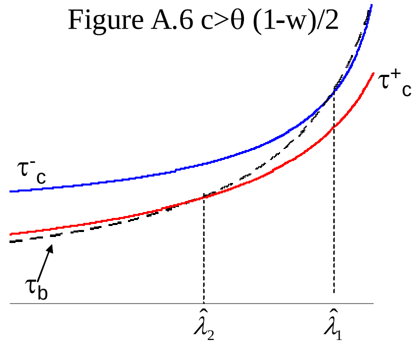



Figure A.6 $c>\theta\ (1\text{-}w)/2$




**Proof of Proposition 7 and 8**

The equilibrium intensity of information is defined by (8), where $\overline{\tau}(\lambda)$ can take one of four branches: $\overline{\tau}_a(\lambda) = \frac{-c(1-\lambda\sigma)+\theta^H(1-\sigma)(1-w)}{4[(1-w)(1-\sigma)+(1-\lambda)\sigma w]} + \frac{c(1-\lambda\sigma)+\theta^H(1-\sigma)w}{4[(1-w)(1-\lambda)\sigma+(1-\sigma)w]}$; $\overline{\tau}_b(\lambda) = \frac{\theta^H(1-\sigma)}{(1-\lambda\sigma)}$; $\overline{\tau}^-_c(\lambda) = \frac{-c(1-\lambda\sigma)+\theta^H(1-\sigma)(1-w)}{4[(1-w)(1-\sigma)+(1-\lambda)\sigma w]} + \frac{c}{4(1-w)} + \frac{\theta^H(1-\sigma)}{4(1-\lambda\sigma)}$; and $\overline{\tau}^+_c(\lambda) = \frac{c(1-\lambda\sigma)+\theta^H(1-\sigma)w}{4[(1-w)(1-\lambda)\sigma+(1-\sigma)w]} - \frac{c}{4(1-w)} + \frac{\theta^H(1-\sigma)}{4(1-\lambda\sigma)}$. Since neither the RHS of (8) nor the term $A$ depend on $c$. For the effect of $c$ on the equilibrium intensity of information what matters is $\partial\overline{\tau}(\lambda)/\partial c$ in its different branches. We have that: $\frac{\partial\overline{\tau}_a(\lambda)}{\partial c} = \frac{-(1-\lambda\sigma)(2w-1)(1-2\sigma+\lambda\sigma)}{4[(1-w)(1-\sigma)+(1-\lambda)\sigma w][(1-w)(1-\lambda)\sigma+(1-\sigma)w]} < 0$ iff $\lambda > \lambda_o$; $\frac{\partial\overline{\tau}_b(\lambda)}{\partial c} = 0$; $\frac{\partial\overline{\tau}_{c-}(\lambda)}{\partial c} = \frac{\sigma(1-\lambda)(2w-1)}{4[(1-w)(1-\sigma)+(1-\lambda)\sigma w](1-w)} > 0$; $\frac{\partial\overline{\tau}_{c+}(\lambda)}{\partial c} = \frac{-\sigma(1-\lambda)(2w-1)}{4[(1-w)(1-\lambda)\sigma+(1-\sigma)w(1-w)} < 0$. The reader can link the results expressed in term of the branhces of $\overline{\tau}(\lambda)$ to the fundamentals parameters using the detailed characterization of the unique equilibrium in the proof of Proposition 6.

**Proof of Proposition 9**

The differential of the term $\lambda^{H*}\overline{\tau}(\lambda^{H*})$ with respect to $c$ is $[\frac{\partial\lambda^{H*}}{\partial c}\ (\overline{\tau}(\cdot) + \lambda^{H*}\frac{\partial\overline{\tau}(\cdot)}{\partial\lambda^{H*}}) + \lambda^{H*}\frac{\partial\overline{\tau}(\cdot)}{\partial c}]$. Using Proposition 7 and 8 plus the facts that $\frac{\partial\overline{\tau}(\cdot)}{\partial\lambda^{H*}} \geq 0$ and $sign(\frac{\partial\overline{\tau}(\cdot)}{\partial c}) = sign(\frac{\partial\lambda^{H*}}{\partial c})$, the result follows.

COMPARATIVE STATICS WITH RESPECT TO THE WEIGHT W

Consider the generalized model with $w \in (1/2, 1)$ and restrict attention to an initial equilibrium where the relevant branch for the *average voting cutoff* is $\widetilde{\tau}_a(\cdot)$, where $\widetilde{\tau}_a(\rho^e) = (\tau^-_{H\emptyset}(\rho^e) + \tau^+_{H\emptyset}(\rho^e))$. We have that $\frac{\partial\widetilde{\tau}_a(\rho^e)}{\partial w} = \theta^H(1-\rho^e)\rho^e[X^2 - Z^2] - c(1-2\rho^e)[X^2 + Z^2]$, where $X = (1-\rho^e) - w(1-2\rho^e)$ and $Z = \rho^e + w(1-2\rho^e)$. It is easy to verify that,

$\forall c \in ((1-2w)\theta^H(1-\rho^e)\rho^e, \max\left\{\theta^H(1-w)\rho^e, \theta^H(1-w)(1-\rho^e)\right\}, \frac{\partial \widetilde{\tau}_a(\rho^e)}{\partial w} > (<) 0$ if $\rho^e >$ $(<) 1/2$. Since among the elements of (8) $w$ affects only $\widetilde{\tau}_a(\cdot)$,and taking into consideration the negative relation between $\rho^*$ and $\lambda^{H*}$, it follows that a decrease in $w$ will lead to a higher equilibrium intensity of information when $\rho^* < 1/2$ and to a lower equilibrium intensity of information if $\rho^* > 1/2$.

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