Reference Dependence and Politicians' Credibility

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Abstract

We consider a model of electoral competition in which two politicians compete to get elected. Each politician is characterized by a valence, which is unobservable to voters and can take one of two values: high or low. The electorate prefers politicians with high valence, but random shocks may lead to the victory of low-valence ones. Candidates make statements concerning their valence. We show that if voters are standard expected utility maximizers, politicians’ statements lack any credibility and no information transmission takes place. By introducing reference-dependent preferences and loss aversion a la Köszegi and Rabin, we show that full revelation is possible. Indeed, if the electorate believes to candidates’ announcements, such announcements will affect its reference point. As a result, if voters find out that a candidate lied, pretending to be high valence when she is not, they may decide to support the opponent in order to avoid the loss associated with appointing a candidate worse than expected.

JEL CODES: D03, D72, D82

1 Introduction

"We must not promise what we ought not, lest we be called on to perform what we cannot."

Abraham Lincoln

Electoral announcements and candidates’ promises concerning their ability to perform if elected are key aspects of electoral competitions: they polarize voters’ attention, attract media’s scrutiny and lead to heated debates about their feasibility and truthfulness.

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Interestingly, conventional wisdom makes two, partially contradictory, statements about these announcements: on the one hand, it is claimed that they have no informational content and should be ignored as politicians are ready to promise everything in order to be elected; on the other hand, it is often suggested that excessive electoral promises may turn against the politician if the electorate realizes that the candidate is unable to deliver what she promised; the opening quote by Abraham Lincoln supports this latter view.

In this paper, we rationalize this second view building a model of electoral competition in which the electorate exhibits reference dependence and loss aversion a là Kőszegi and Rabin.

In our setting, two candidates (A and B) compete for a public office; each candidate is characterized by one of two possible valences, high ($\theta_H$) or low ($\theta_L$). Coeteris paribus, voters prefer candidates with higher valence. Although valences are candidates’ private information, they can make a public announcement about them. Furthermore, after candidates’ announcements, voters may learn candidates’ true valence with some probability $p$. This probability can be interpreted as the degree of media’s scrutiny or as the candidates’ propensity to commit actions that may reveal their type.

Electoral competition is modelled with probabilistic voting; thus, although voters prefer high-valence candidates to low-valence ones, ideological biases and a random shock to candidates’ popularity may lead a low-valence candidate to win elections.

If voters are standard expected utility maximizer, the only equilibrium entails no information transmission. Indeed, since both candidates are ready to claim to be high-valence in order to maximize their probability of winning, they lose any credibility and, in equilibrium, voters ignore their announcements.

We depart from the literature assuming that voters have reference-dependent preferences a là Kőszegi and Rabin, namely they evaluate outcomes with respect to a reference point determined through a rational expectation approach. Thus, whenever the utility they experience exceeds (respectively, falls short of) the reference utility determined according to equilibrium analysis, they incur a gain (respectively, a loss). We further assume that voters are loss averse, namely they dislike losses more than what they like equal-size gains.

Under these assumptions, we prove that a fully revealing equilibrium is possible and we characterize it. This enables us to highlight the forces behind its existence and to identify the circumstances under which truth-telling is more likely to arise. The mechanism behind this result can be described as follows. Candidates’ announcements, if credible, modify voters’ reference points. Then, if the electorate were to find out that candidate $j$ pretended to be high valence when she is not, it may decide to support candidate $i \neq j$ in order to avoid the loss associated with appointing a candidate worse than anticipated. Remarkably, this mechanism leads to the election of $i$ even for realizations of the popularity shock that would have determined the victory of $j$, were she had been sincere from the beginning. As a result, the interaction of electoral announcements with reference dependence and loss aversion introduces a cost of lying which can push candidates to reveal their valence in the first place.
Intuitively, if the electorate exhibits reference dependence and loss aversion, a low-valence candidate who is deciding whether to announce her valence truthfully or to lie, faces a trade-off. If she lies and her lie goes undetected, her probability of winning increases with respect to the truth-telling strategy. If instead the lie is detected, such probability may decrease as voters may decide to support the other candidate to avoid harmful losses. In the paper we identify a range of realization of the popularity shock for which the electorate is willing to support a low-valence candidate against a high-valence one only if the former told the truth from the beginning.

Our main result shows that a fully revealing equilibrium exists if the cost of lying introduced by reference dependence and loss aversion is sufficiently large. This, in turn, requires a sufficiently high probability of learning the true type of the candidate.

We want to stress that the cost of lying is determined by the joint effect of reference dependence and loss aversion. Indeed, if the electorate were loss-neutral, gains and losses would receive the same weight and the incremental utility associated with electing a high-valence candidate as opposed to a low-valence one would be independent of the initial announcements. As a result, full revelation would not be an equilibrium.

Furthermore, we show that the cost of lying varies non-monotonically with loss aversion. This is a consequence of the two-sided effect that this behavioral bias plays in our model. On the one hand, as we described above, it makes voters unwilling to accept unexpected losses leading to an increase in the cost of lying. On the other hand, it makes voters unwilling to accept expected losses and pushes them to formulate equilibrium strategies which induce little volatility in payoffs. As a result, high degrees of loss aversion will result in equilibrium strategies that pick a high-valence candidate over a low-valence one for most realizations of the popularity shock lowering candidates’ expected utility from announcing to be low-valence. Since the former effect dominates when loss aversion is low, while the latter prevails when it is high, the cost of lying first increases and then decreases with the degree of loss aversion. Thus, full revelation will be most likely when the electorate is moderately loss averse.

Furthermore, we also show that an increase in the uncertainty of the electoral outcomes (as measured by the support of the popularity shock that determines the electoral outcome) may increase the likelihood of a fully revealing equilibrium. Indeed, as the range of popularity shocks grows bigger, the electorate will be relatively more likely to support the low-valence candidate when the opponent is high-valence. This will, in turn, decrease the disadvantage associated with the announcement of being low-valence.

In addition to the characterization of fully revealing equilibria, we show that other equilibria are possible. In particular, uninformative equilibria exist for every profile of parameters, while partially revealing equilibria arise when the probability of detecting a lie takes intermediate values. We deal with such equilibrium multiplicity by providing conditions under which the fully revealing equilibrium is the only one satisfying standard equilibrium refinements proposed for communication games.

The paper is organized as follows. In the remaining of the Introduction, we review the relevant
literature. Section 2 describes the model and highlights the interaction between candidates’ announcements and the formation of the reference point. In Section 3, we characterize the equilibria of the game and we provide a comparison among them. Section 4 discusses the assumptions of our model. Section 5 concludes. The Appendix collects all the proofs.

1.1 Related Literature

This paper focuses on strategic information transmission between candidates and voters. In this respect our paper is related to the literature on strategic information transmission pioneered by Crawford and Sobel, 1982 and Green and Stokey, 2007.\(^1\) We depart from this literature assuming that the uninformed party (in our model, voters) exhibits reference dependence and loss aversion and we show how these assumptions can lead to credible information transmission.\(^2,3\)

The political science literature has studied extensively how discrepancies between candidates’ promises and actual performance can affect the electoral competition. A fruitful line of research started by Farejohn, 1986 addresses the conflict of interest between voters and politicians lacking any commitment power; in this context voters can discipline the incumbent politician by conditioning their electoral behavior on her performance while in office.\(^4\) In this paper, we assume that candidates have an incentive to lie and lack any instrument to commit themselves to truth telling; nevertheless credible information transmission can be attained thanks to the endogenous effect that announcements have on the reference point of the electorate.

In our model voters evaluate their actions based not only on the final outcome they induce, but also on the comparison between these outcomes and a reference point. This idea dates back at least to Kahneman and Tversky, 1979 and, since then, an extensive experimental evidence has confirmed the importance of reference points and loss aversion in determining agents’ behavior.\(^5\) In this paper, we follow Kőszegi and Rabin, 2006, 2007, 2009 and assume that the reference point is endogenously determined through a rational expectation approach;\(^6\) however, we further embed the formation of the reference point into a communication game between informed and uninformed players (respectively, politicians and voters).\(^7\) The relevance of players’ behavior in the formation of reference points has been studied both theoretically and experimentally by Gill and Stone, 2010 and Gill and Prowse, 2012, who investigate tournament settings.

Our work is also related to Kőszegi, 2006 as it studies the role that communication and anticipatory utilities\(^8\) can play in an agency problem; however, whereas Kőszegi, 2006 focuses on

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\(^1\)Farrell and Rabin, 1996 and Krishna and Morgan, 2008 provide a review of this literature.
\(^2\)In a similar vein, Grillo, 2012 shows how reference dependence and loss aversion can yield to truth telling through a change in the risk attitudes of players.
\(^3\)In doing so, we assume that the the content of communication is verifiable with some probability. In this respect, our work is related to Dziuda, 2011, Ottaviani and Sorensen, 2006, Seidmann and Winter, 1997.
\(^5\)See, for instance Kahneman et al., 1990, Kahneman et al., 1991, van Dijk and van Knippenberg, 1996 and Fehr et al., 2011.
\(^6\)Alternatively, the literature has also identified the reference point as the status quo. On this approach, see Kahneman and Tversky, 1991 and Sugden, 2003.
\(^7\)For a different approach, see Shalev, 2000.
\(^8\)On anticipatory utilities see Loewenstein, 1987, Loewenstein and Prelec, 1992. For an axiomatic treatment see
environments in which the interests of the two parties are perfectly aligned, our paper assumes conflicting interests and tackles the issue of credible information transmission when two informed parties compete against each others.

Insofar we model a situation in which voters’ beliefs concerning their own electoral behavior affect their preferences over final outcomes, our paper belongs to the literature on psychological games started by Geanakoplos et al., 1989 and extended to dynamic environments by Battigalli and Dufwenberg, 2009.9 In particular, Battigalli et al., 2013 shows how guilt aversion can help attaining credible information transmission. The difference with our setting is not only semantic: our approach could be labelled as "independent of opponents’ intentions", as voters’ strategies do not depend on candidates’ intentions. On the contrary, guilt aversion requires modelling players’ higher-order belief about opponents’ intentions.

Political scientists have long recognized the role played by expectations management in electoral competitions. In particular, Kimball and Patterson, 1997 show that the gap between expectations and politicians’ real performance play an important role in determining voters’ attitude toward Congress.10 Waterman et al., 1999 extend this analysis by showing that this expectation gap is important in explaining voters’ electoral behavior.11 On a similar note, a growing literature has documented the role played by expectations in the evaluation of public services.12 Nevertheless, to the best of our knowledge, there has been little theoretical work on the role played by reference points in determining electoral outcomes and affecting political equilibria. Some noticeable exceptions are Banks, 1990, Lindstadt and Staton, 2010 and Passarelli and Tabellini, 2013. Banks, 1990 builds a model in which candidates’ valence is unknown and candidates incur a cost from delivering an outcome different from what announced; in our paper, we explicitly model the channel through which false announcements can generate such a cost. In Lindstadt and Staton, 2010 candidates are explicitly involved in expectations’ manipulation and the paper shows how downward management of expectations can increase candidates’ electoral prospects. By characterizing the actual channel through which expectations can affect electoral behavior, our model endogenizes the formation of the reference point and shows how upward management of expectations can be counterproductive. Finally, Passarelli and Tabellini, 2013 build a model in which losses with respect to the citizens’ reference point may generate political unrest and use this channel to explain distortions in the level of public expenditure with respect to the Benthamite benchmark and excessive debt accumulation. Besides obvious differences in the research question, our model differs from Passarelli and Tabellini, 2013 also in the choice of the reference point. Whereas they assume that the reference point of a citizen is given by what a utilitarian social planner biased in favor of that citizen would choose, we assume that the reference point is determined in equilibrium by the strategic interaction between candidates and voters.

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10 See also G.R. Boynton and Patterson, 1969.
11 See also Sigelman and Knight, 1983.
12 See, for instance, James, 2009 and the references therein.
2 The Model

Two candidates, A and B, compete to get elected. Each candidate can be high or low valence. Formally, a candidate’s valence is represented by her type $\theta \in \{\theta_L, \theta_H\}$: if type $\theta_k$ is elected, the electorate experiences a consumption utility equal to $g_{k}$, $k \in \{L, H\}$. We assume that $g_H > g_L$ and we refer to $g_H$ (respectively, $g_L$) as to the level of consumption utility yielded by the high (respectively, low) valence candidate. To simplify notation, we define $G = g_H - g_L$. We can interpret valences as the amount of public good that candidates can provide per unit of taxation.\(^{13}\)

Candidates’ types are determined independently according to the same distribution: each candidate has a probability $q$ (respectively, $1 - q$) to be high (respectively, low) valence. The type of a candidate is her own private information. At the beginning of the electoral competition, candidates can make simultaneous and public announcements concerning their types. We assume that communication is costless: candidates do not incur any direct cost from making these announcements. A candidate is elected if she gets 50% + 1 of the votes and in this case she gets a payoff equal to 1; otherwise her payoff is normalized to 0.

The electorate is made by a unit mass of voters; each voter is identified by an ideological bias in favor of candidate B, $f^j$, which is assumed to be uniformly distributed in the interval $\left[ -\frac{1}{2\tau^v}, \frac{1}{2\tau^v} \right]$. Voters vote sincerely based on their beliefs about candidates’ valences, on their ideological bias $f^j$ and on the realization of a random variable $\delta$ distributed uniformly in the interval $\left[ -\frac{1}{2\tau^v}, \frac{1}{2\tau^v} \right]$. $\delta$ can be thought as a popularity shock that hits voters’ preferences after candidates made their announcements and affects electorate’s willingness to vote for candidate B. Distributions are assumed to be uniform about 0 for analytical tractability, but the main results of the paper can be generalized to other absolutely continuous distributions. We will assume that voters interpret messages in the same way and that there is common knowledge of this and of the fact that they vote sincerely.

Timing is as follows. In period 0, each candidate makes a statement concerning her own valence. In period 1, three random variables are independently realized: each candidate $i$ generates a signal $t^i$, that may reveal her true valence to the electorate and the random variable $\delta$ is also realized. In period 2, elections take place and utilities are realized.

\(^{13}\)For instance, assume that voters have a constant income level $y$ and that their utility is given by:

\[
(1 - \tau) \cdot y + H(h), \quad \text{with } H'(\cdot) > 0 \text{ and } H''(\cdot) < 0,
\]

where $\tau$ is a proportional tax rate and $h$ is the level of public good provided by the politician in office. Assume further that the pair $(\tau, h)$ is chosen by the elected politician in order to maximize voters’ payoff subject to the budget constraint $\tau \cdot y = \frac{h}{\theta}$. Candidates’ type are given by $\theta \in \{\theta_L, \theta_H\}$ with $\theta_L < \theta_H$; thus a high-valence candidate is able to provide higher levels of public good, $h$, for a given level of taxation, $\tau$.

Then, we can define:

\[
\begin{align*}
g_L &= (1 - \tau^* (\theta_L)) y + H(h^* (\theta_L)) \\
g_H &= (1 - \tau^* (\theta_H)) y + H(h^* (\theta_H))
\end{align*}
\]

where $(\tau^*(\theta), h^*(\theta))$ is the solution to the problem:

\[
\arg \max_{(\tau, h)} (1 - \tau) y + H(h) \quad \text{s.t. } \tau \cdot y = \frac{h}{\theta}.
\]

It is immediate to verify that in this setting $g_L < g_H$. \(\)
We want to stress that, whereas signals \( t^i \) \( (i \in \{A, B\}) \) may reveal something about the valence of a candidate, \( \delta \) is independent of candidates’ actual types. For instance, \( \delta \) could represent some personal trait of the candidate that is uncorrelated with her ability to provide the public good (e.g., her empathy or her ability to communicate effectively), some external event that makes the platform of one of the candidates more appealing to the electorate, or some scandal that hits the party to which candidate \( i \) belongs without directly affecting the candidate. Figure 1 summarizes the timing.

Signals \( t^i \) are generated according to the following technology:

\[
\Pr \{ t_k \mid \theta_\ell \} = \begin{cases} 
  p & k = \ell \\
  1 - p & k = 0 \\
  0 & \text{otherwise}
\end{cases}
\]

In words, if a candidate has type \( \theta_k \), she will send signal \( t_k \) with probability \( p \) and an uninformative signal, \( t_0 \), with probability \( 1 - p \). Thus, the set of signals is given by \( T = \{t_L, t_0, t_H\} \) and \( p \) captures the probability with which candidates’ true type is revealed to the voter. In this setting, \( p \) can be interpreted as a measure of the media’s scrutiny (e.g., fact checking activity) and/or as the propensity of candidates’ to make blunders, which can reveal their true valence.\(^\text{14}\) For simplicity, we assume that \( p \) is exogenously given; Section 4.4 discusses how to generalize this assumption.

A pure communication strategy for candidate \( i \in \{A, B\} \) is a function \( s^i : \{\theta_L, \theta_H\} \rightarrow M \), where \( M \) is a finite set of messages. The set of pure strategies is denoted with \( S \), while the set of mixed strategies is given by \( \Sigma = \Delta(S) \) and its generic element is denoted with \( \sigma^i \).

Departing from the previous literature, we assume that voters have reference dependent preferences a lâ Kőszegi and Rabin. In particular, for any pair \( (g, r) \in \{g_L, g_H\} \times \{g_L, g_H\} \) the utility

\(^{14}\)As it will become clear, the choice of the actual signaling technology is irrelevant as long as, in equilibrium, there exists a positive probability, say \( p \), of detecting the lies of low-valence candidates.
function of the electorate is given by:
\[
v(g \mid r) = g + \mu(g - r)
\]  
where:
\[
\mu(x) = \eta \cdot \max \{0, x\} + \eta \lambda \min \{0, x\} \quad \forall x \in \mathbb{R}
\]
with \( \eta \in [0, 1) \), and \( \lambda > 1 \). Thus, the electorate’s preferences are described by the function \( v(\cdot \mid \cdot) : \{(gL, gH)\}^2 \rightarrow \mathbb{R} \), in which the first argument, \( g \), represents the actual level of public good experienced by the electorate and the second argument, \( r \), is its reference level. We refer to \( v(\cdot \mid \cdot) \) as to the total utility. Electorate’s total utility can be separated in two components: the consumption utility, represented by \( g \), and the gain/loss utility, represented by \( \mu(g - r) \). Intuitively, whenever the actual level of public good experienced by the electorate, \( g \), exceeds (respectively, falls short of) the reference valence, \( r \), the agent experiences a gain (respectively, a loss). In this setting \( \eta \) measures the relative weight of the gain/loss utility compared to the consumption utility, while \( \lambda > 1 \) captures loss aversion, namely the fact that voters dislike losses more than they like equal-size gains. Following Kőszegi and Rabin, 2007, we extend the utility function to random outcomes and random reference points as follows. For every \( (\tilde{g}, \tilde{r}) \in \Delta((gL, gH)) \times \Delta((gL, gH)) \):
\[
V(\tilde{g} \mid \tilde{r}) = \sum_{g \in \{gL, gH\}} \sum_{r \in \{gL, gH\}} v(g \mid r) \cdot \tilde{g}[g] \cdot \tilde{r}[r].
\]
Obviously, if \( \eta = 0 \), the electorate behaves as a standard expected utility maximizer with linear vNM utility indexes. The assumption that deviations from the reference point are evaluated according to a piecewise linear function can be relaxed at the cost of an increase in analytical complexity.

Let \( (\sigma^A, \sigma^B) \in \Sigma^2 \) be the (independent) conjecture concerning the communication strategy followed by candidates. By Bayes rule, the probability the electorate assigns to candidate \( i \in \{A,B\} \) being high-valence after announcement pair \((m^A, m^B)\) is given by:
\[
\pi^i_1(m^i \mid \sigma^i) = \frac{q \cdot \sum_{s_i \in S_i} \sigma^i[s_i] \cdot s_i(\theta_H)[m^i]}{q \cdot \sum_{s_i \in S_i} \sigma^i[s_i] \cdot s_i(\theta_H)[m^i] + (1 - q) \sum_{s_i \in S_i} \sigma^i[s_i] \cdot s_i(\theta_L)[m^i]}.
\]
if \( m^i \) has positive probability under \( \sigma^i \) and by \( \pi^i_1(m^i \mid \sigma^i) \in [0, 1] \) if \( q \cdot \sum_{s_i \in S_i} \sigma^i[s_i] \cdot s_i(\theta_H)[m^i] + (1 - q) \sum_{s_i \in S_i} \sigma^i[s_i] \cdot s_i(\theta_L)[m^i] = 0 \).

Similarly, \( \pi^j_2(m^i, t^i \mid \sigma^j) \) is the probability that the electorate assigns to the candidate of party \( i \) being high valence after announcements \( m^j \) and signal \( t^i \) given conjecture \( \sigma^i \). This can be written

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15 In what follows, we will sometimes abuse notation writing \( V(g \mid r) \) and \( V(\tilde{g} \mid r) \) to denote the utility associated with a degenerate distribution over outcome \( g \) or reference outcome \( r \).

17 In our analysis, we take the shortcut of defining beliefs when players hold independent conjectures about their opponents’ behavior. This approach is sufficient in the equilibrium analysis and simplifies the notation. However, it is straightforward to extend the notation to allow for correlated conjectures.

18 Since the probability associated with candidate \( i \) depends neither on \( m^j \), nor on \( \sigma^j, j \neq i \), we write \( \pi^i_1(m^i \mid \sigma^i) \) instead of \( \pi^i_1(m^A, m^B \mid \sigma^A, \sigma^B) \).
equilibrium in which all information sets arise with positive provability.

A candidate is given by

\[ \pi^A_{2} (m^A, t^A | \sigma^A) = \begin{cases} 
0 & \text{if } t^i = t_L \\
\pi^A_1 (m^A | \sigma^A) & \text{if } t^i = t_0 \\
1 & \text{if } t^i = t_H 
\end{cases} . \]  \hspace{1cm} (5)

In words, if the signal reveals the candidate’s type, the electorate will update its belief accordingly; otherwise it will maintain the belief generated by the announcement.\(^{19}\)

Finally, given \( (\pi^A_1 (m^A | \sigma^A), \pi^B_1 (m^B | \sigma^B)) \), let \( \hat{\pi} (t^A, t^B | m^A, m^B, \sigma^A, \sigma^B) \) be the probability voters assign to signals \( (t^A, t^B) \) being generated when they holds conjectures \( (\sigma^A, \sigma^B) \) and they received announcements \( (m^A, m^B) \). \( \hat{\pi} (t^A, t^B | m^A, m^B, \sigma^A, \sigma^B) \) is summarized in the following table:\(^{20}\)

<table>
<thead>
<tr>
<th></th>
<th>( t_L )</th>
<th>( t_0 )</th>
<th>( t_H )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t_L )</td>
<td>( p^2 (1 - \pi^A_1) (1 - \pi^B_1) )</td>
<td>( p (1 - p) (1 - \pi^A_1) )</td>
<td>( p^2 (1 - \pi^A_1) \pi^B_1 )</td>
</tr>
<tr>
<td>( t_0 )</td>
<td>( (1 - p) p (1 - \pi^A_1) )</td>
<td>( (1 - p)^2 )</td>
<td>( (1 - p) p \pi^B_1 )</td>
</tr>
<tr>
<td>( t_H )</td>
<td>( p^2 \pi^A_1 (1 - \pi^B_1) )</td>
<td>( p (1 - p) \pi^A_1 )</td>
<td>( p^2 \pi^A_1 \pi^B_1 )</td>
</tr>
</tbody>
</table>

Since voters vote sincerely, a voter with ideological bias \( f_j \) who holds (independent) conjectures \( (\sigma^A, \sigma^B) \) on the candidates’ communication strategies and has reference point \( \bar{r} \) will vote for \( A \) (\( B \)) at information set \( (m^A, m^B, t^A, t^B, f^j, d) \) if:

\[ \pi^A_2 (m^A, t^A | \sigma^A) V (g_H | \bar{r}) + (1 - \pi^A_2 (m^A, t^A | \sigma^A)) V (g_L | \bar{r}) > ( < ) \]

\[ \pi^B_2 (m^B, t^B | \sigma^B) V (g_H | \bar{r}) + (1 - \pi^B_2 (m^B, t^B | \sigma^B)) V (g_L | \bar{r}) + f^j + d \]

or equivalently if:

\[ (\pi^A_2 (m^A, t^A | \sigma^A) - \pi^B_2 (m^B, t^B | \sigma^B)) \cdot \Gamma (\bar{r} | g_H) > ( < ) f^j + d, \]  \hspace{1cm} (6)

where \( \Gamma (x) = (1 + \eta + \eta (\lambda - 1) \cdot x) \cdot G \). Function \( \Gamma (\cdot) \) will play an important role in our analysis: it measures the electoral advantage enjoyed by the candidate with the highest expected valence.

We will further assume that if the two sides of (6) are equal, a voter will randomize between candidates with equal probability.\(^{21}\) As a result, for every realization \( d \), the vote share in favor of candidate \( A \) is given by

\[ Q (m^A, m^B, t^A, t^B | \sigma^A, \sigma^B) = \frac{1}{2} + \varphi \cdot (\pi^A_2 (m^A, t^A | \sigma^A) - \pi^B_2 (m^B, t^B | \sigma^B)) \cdot \Gamma (\bar{r} | g_H) - \varphi \cdot d \]

Thus, the probability with which candidate \( A \) is elected after message-signal profile \( (m^A, m^B, t^A, t^A) \)

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\(^{19}\)These beliefs will arise through equilibrium analysis, if we were to use an equilibrium concept similar to sequential equilibrium in which all information sets arise with positive provability.

\(^{20}\)To simplify notation we omit to specify the dependence of \( \pi^A_1 (\cdot) \) on \( m^A \) and \( \sigma^i \).

\(^{21}\)The actual tie-breaking rule does not play any role in the analysis.
is given by:

\[ W^A(m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) = \Pr \left\{ Q(m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) > \frac{1}{2} \right\} = \frac{1}{2} + \psi \cdot \left[ \pi_2^A(m^A, t^A \mid \sigma^A) - \pi_2^B(m^B, t^B \mid \sigma^B) \right] \cdot \Gamma \left( \tilde{r} [g_{H}] \right), \]

whereas the probability that voters assign to candidate A winning after message \((m^A, m^B)\) is given by:

\[ W^A(m^A, m^B \mid \sigma^A, \sigma^B) = \sum_{t^A, t^B} \tilde{\pi} (t^A, t^B \mid m^A, m^B, \sigma^A, \sigma^B) \cdot \left( \frac{1}{2} + \psi \cdot \left[ \pi_2^A(m^A, t^A \mid \sigma^A) - \pi_2^B(m^B, t^B \mid \sigma^B) \right] \cdot \Gamma \left( \tilde{r} [g_{H}] \right) \right) \]

Although election takes place at the end of period 2, the reference point of voters is determined after candidates make their announcements. This is a sensible assumption: if announcements have some informational content, voters will update their beliefs according to these announcements and such a mental process will modify their reference point. In line with Kószegi and Rabin, 2006, 2007, 2009, we endogenize the formation of the reference point assuming rational expectations: the reference point is determined by voters’ beliefs concerning the valence of the elected candidate under sincere voting. We say that sincere voting is reference-point consistent if voters behave according to 6 when \(\tilde{r}\) is determined through equilibrium analysis under the assumption that everybody vote sincerely.

In particular, let \((\sigma^A, \sigma^B)\) be the electorate’s (independent) conjecture about the candidates’ communication strategy. Then, after announcements \((m^A, m^B)\), each voter will assign probability \(\tilde{\pi} (t^A, t^B \mid m^A, m^B, \sigma^A, \sigma^B)\) to pair \((t^A, t^B)\) being generated. As a result, his reference point, \(\tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B)\) will be the probability measure that assigns probability

\[ \sum_{t^A, t^B} \left[ \tilde{\pi} (t^A, t^B \mid m^A, m^B, \sigma^A, \sigma^B) \cdot (W^A(m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) \cdot \pi_2^A(m^A, t^A \mid \sigma^A) + \left(1 - W^A(m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) \right) \cdot \pi_2^B(m^B, t^B \mid \sigma^B) \right] \]

to \(g_{H}\) and complementary probability to \(g_{L}\). Intuitively, for every pair \((t^A, t^B)\) (which arise with probability \(\tilde{\pi} (t^A, t^B \mid \cdot)\)) the electorate will get utility \(g_{H}\) either if candidate A is elected and turns out to be high-valence (which happens with probability \(W^A \cdot \pi_2^A\)) or if B is elected and turns out to be high-valence (which happens with probability \((1 - W^A) \cdot \pi_2^B\)).

**Definition 1** Sincere voting is reference point consistent at \((m^A, m^B)\) given \((\sigma^A, \sigma^B)\) if for every \((t^A, t^B, d)\), a voter with ideological bias \(f^j\) will vote for candidate A (B) if

\[ (\pi_2^A(m^A, t^A \mid \sigma^A) - \pi_2^B(m^B, t^B \mid \sigma^B)) \cdot \Gamma \left( \tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) \right) [g_{H}] > ( < ) f^j + d \]
and randomize with equal probability if
\[
\left(\pi_2 (m^A, t^A \mid \sigma^A) - \pi_2 (m^B, t^B \mid \sigma^B)\right) \cdot \Gamma(\tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_h]) = f^i + d
\]

Sincere voting is reference-point consistent given \((\sigma^A, \sigma^B)\) if it is reference-point consistent at \((m^A, m^B)\) given \((\sigma^A, \sigma^B)\) for every \((m^A, m^B)\).

We want to stress that the reference point of the electorate is determined through a forward looking approach: it is given by the distribution over outcomes induced by the electorate’s beliefs after announcements \((m^A, m^B)\). Nevertheless, once established, the reference point does not change and, in particular, does not adjust to the additional information conveyed by signals \((t^A, t^B)\); in this respect, the reference point at the electoral stage is inherited from the previous periods. This is not a contradictory feature of our model. Indeed, our paper characterizes a channel through which communication may affect the behavior of the uninformed party and modify the equilibrium communication strategy of the informed one. Thus, although it is true that our mechanism work insofar past announcements have some persisting saliency in the mind of the electorate, such persistency stems from the fact that the electorate updates its beliefs about the future in response to such announcements. Moreover, if we were to allow for a partial revision of the reference point upon receiving signals \((t^A, t^B)\), the main qualitative findings of our model would go through.\textsuperscript{22}

Furthermore, it is useful to point out that the electoral advantage \(\Gamma(\tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_h]) = G \cdot (1 + \eta + \eta (\lambda - 1)) \cdot \tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_h])\) depends on the messages sent by candidates \((m^A, m^B)\) only insofar \(\eta > 0\) and \(\lambda > 1\).

Candidates are modelled as standard expected utility maximizers.\textsuperscript{23} Thus, if candidate A has type \(\theta\) and sends message \(m\) and believes that the other candidate is following strategy \(\sigma^B\), her expected utility would be given by:
\[
U^A (m, \sigma^B \mid \theta) = \sum_{s \in S} \sigma^B [s] \left[ q \cdot W^A (m, s (\theta_H) \mid \sigma^A, \sigma^B) + (1 - q) \cdot W^A (m, s (\theta_L) \mid \sigma^A, \sigma^B) \right].
\]

\textsuperscript{22}For instance, we could assume that for each outcome \(g \in \{g_L, g_H\}\), the electorate’s reference point in period 2 is given by:
\[
\alpha \cdot \tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g] + (1 - \alpha) \cdot \tilde{r} (m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) [g]
\]
where \(\alpha \in (0, 1)\) and
\[
\tilde{r} (m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) [g] = W^A (m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) \cdot \pi_2 (m^A, t^A \mid \sigma^A) +
\]
\[
+ \left(1 - W^A (m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B)\right) \cdot \pi_2 (m^B, t^B \mid \sigma^B).
\]

In this context, parameter \(\alpha\) would measure the persisting saliency of candidates’ announcements on voters’ behavior.\textsuperscript{23}The model would deliver the same predictions if we were to impose reference dependence on the side of candidates as well.
Similarly, for candidate B:

\[
U^B (m, \sigma^A | \theta) = \sum_{s \in S} \sigma^A [s] \left[ q \cdot \left( 1 - W^A (s (\theta_H), m | \sigma^A, \sigma^B) \right) + (1 - q) \cdot \left( 1 - W^A (s (\theta_L), m | \sigma^A, \sigma^B) \right) \right].
\]

We are now ready to define the solution concept we will be using throughout the paper.\(^{24}\)

**Definition 2** A profile of communication strategies \((\sigma^A, \sigma^B)\) is an equilibrium if:

(i) for every \(i \in \{A, B\}\), if \(\sigma^i [s] > 0\) then

\[
\forall \theta \in \{\theta_L, \theta_H\}, \ s (\theta) \in \arg \max_{m \in M} U^i (m, \sigma^i | \theta), \ i \neq j;
\]

(ii) sincere voting is reference-point consistent given \((\sigma^A, \sigma^B)\).

In the paper, we will be particularly interested in two types of equilibria: uninformative equilibria and fully revealing ones. We give their formal definition below.

**Definition 3** Let \((\sigma^A, \sigma^B)\) be an equilibrium. Then:

(i) the equilibrium is uninformative if for every \(i \in \{A, B\}\) and every \(m \in M\),

\[
\sum_{s: s(\theta_L) = m} \sigma^i [s] = \sum_{s: s(\theta_H) = m} \sigma^i [s].
\]

(ii) the equilibrium is fully informative if for every player \(i\), every message \(m\) and every pair \(\theta, \theta' \in \{\theta_L, \theta_H\}\) with \(\theta \neq \theta'\), \(\sigma^i [s] > 0\) and \(s (\theta) = m\) imply that \(s' (\theta') \neq m\) for every \(s'\) such that \(\sigma^i [s'] > 0\).

In words, in an uninformative equilibrium, voters do not change their prior belief after any message \(m\) (namely, \(\pi^i (m^i | \sigma^i) = q\) for every \(i\) and every message \(m\)). In this case, we can assume \(M = \{\hat{m}\}\) and focus on uninformative communication strategies: \(s^i_U (\theta) \equiv \hat{m}.\(^{25}\) On the contrary, in a fully revealing equilibrium, message pair \((m^A, m^B)\) fully reveals candidates' type. In this case, we can assume \(M = \{m_L, m_H\}\), where \(m_k\) should be interpreted as "my type is \(\theta_k\)" and focus on fully revealing communication strategies: \(s^i_R (\theta_L) = m_L^i\) and \(s^i_R (\theta_H) = m_H^i\); obviously, \(\pi^i (m_H^i | s^i_R) = 1\) and \(\pi^i (m_L^i | s^i_R) = 0.\(^{26}\)

We conclude this section imposing an assumption that guarantees a sufficient degree of uncertainty in the electoral outcome: the support of the popularity shock must be sufficiently large to

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\(^{24}\)In the equilibrium definition, we omit to specify beliefs and to impose their consistency with Bayes rule as implied by (4) and (5).

\(^{25}\)To this goal, we will assume that any out-of-equilibrium message \(m \neq \hat{m}\) is interpreted by the electorate exactly as message \(\hat{m}\), namely that \(\pi^i (m | s^i_U) = q\) for every \(i \in \{A, B\}\).

\(^{26}\)In this case, we can assume that any out-of-equilibrium message \(m \notin \{m_L, m_H\}\) is interpreted by the electorate as message \(m_L\), namely that \(\pi^i (m | s^i_R) = 0\) for every \(i \in \{A, B\}\) and every message \(m \neq m_L, m_H\).
guarantee that a low-valence candidate can win against a high-valence one if the popularity shock \( \delta \) take sufficiently extreme values.

**Assumption 1** \( \frac{1}{2\psi} > G (1 + \eta \lambda) \).

Section 3 will discuss the role of this assumption in more details. For the time being, it is sufficient to notice that Assumption 1 puts an upper bound on the degree of loss aversion: \( \lambda < \frac{1}{\eta} \left( \frac{1}{2\psi G} - 1 \right) = \bar{\lambda} \). It is immediate to check that \( \bar{\lambda} > 1 \).

### 3 Equilibrium Analysis

In this section, we characterize the equilibria of the game. We start showing that without reference dependence the unique equilibrium is uninformative (Proposition 1). Then, we introduce reference dependence and we show that fully revealing equilibria may arise (Proposition 3). Obviously, under reference dependence, the uninformative equilibrium will still exists as the electorate is always free to ignore candidates’ announcements (Proposition 4). Finally, we characterize symmetric partially revealing equilibria in which low-valence candidates randomize between a message that reveals them as such and a message that is sent by high-valence candidates (Proposition 5).

#### 3.1 Equilibrium without Reference Dependence

First consider the special case in which the electorate does not exhibit reference dependence \( (\eta = 0) \). Under this assumption, the benefit \( \Gamma(x) \equiv G \) and does not depend on candidates’ announcements. As a result, such announcements will lack any credibility. The intuition is straightforward: without reference dependence, claiming to be high-valence increases the probability of being elected if the lie is not detected. On the other hand, even if the electorate realizes that candidate \( i \) lied (by receiving a signal \( t^i \) that contradicts the initial announcement \( m^i \)), the candidate would not be worse off than if he had been sincere from the beginning. Consequently, if a message \( m^i \) could increase \( \pi^i (\cdot | \cdot) \), both types of candidate \( i \) would send it and the announcement would not be credible. The next proposition formalizes this result.

**Proposition 1** Let \( \eta = 0 \). Then the unique equilibria of the game are uninformative. Thus, (i) all equilibria are equivalent to \( (s^A_U, s^B_U) \), \(^{27}\) and (ii) \( W^A (\cdot | s^A_U, s^B_U) \) can be summarized in the following table:\(^{28}\)

<table>
<thead>
<tr>
<th>((\bar{m}, \bar{m}))</th>
<th>(t_L)</th>
<th>(t_0)</th>
<th>(t_H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(t_L)</td>
<td>(\frac{1}{2})</td>
<td>(\frac{1}{2} - \psi q G)</td>
<td>(\frac{1}{2} - \psi G)</td>
</tr>
<tr>
<td>(t_0)</td>
<td>(\frac{1}{2} + \psi q G)</td>
<td>(\frac{1}{2})</td>
<td>(\frac{1}{2} - \psi (1 - q) G)</td>
</tr>
<tr>
<td>(t_H)</td>
<td>(\frac{1}{2} + \psi G)</td>
<td>(\frac{1}{2} + \psi (1 - q) G)</td>
<td>(\frac{1}{2})</td>
</tr>
</tbody>
</table>

\(^{27}\)Strategies \( s^U \) have been defined after Definition 3.

\(^{28}\)The \( t_j \)-th row and \( t_j \)-th column in matrix \( (m^A, m^B) \) represents \( W^A (m^A, m^B, \cdot | s^A_U, s^B_U) \). A similar notation is used in the following propositions.
3.2 Full Revelation under Reference Dependence

Now, suppose that voters exhibit reference dependence, namely suppose \( \eta > 0 \). Assume further that they believe candidates are following strategy \((s^A_R, s^B_R)\), namely that each candidate is announcing her valence truthfully. The following proposition characterizes the probability with which candidates will win given \((s^A_R, s^B_R)\).

**Proposition 2** Suppose Assumption 1 holds. Define

\[
W^+ = W^+ (\eta, \lambda, G) = \frac{1}{2} + \psi (1 + \eta \lambda) G
\]

\[
W^- = W^- (\eta, G) = \frac{1}{2} + \psi (1 + \eta) G
\]

\[
W_R = W_R (\eta, \lambda, G, \psi) = \frac{1}{2} + \psi (1 + \eta) G (1 - \psi \cdot \eta (\lambda - 1) \cdot G)
\]

Then if sincere voting is reference-point consistent, \( W^A (\cdot | s^A_R, s^B_R) \) can be summarized as follows:

<table>
<thead>
<tr>
<th>((m_H, m_H))</th>
<th>(t_L)</th>
<th>(t_0)</th>
<th>(t_H)</th>
<th>((m_H, m_L))</th>
<th>(t_L)</th>
<th>(t_0)</th>
<th>(t_H)</th>
<th>((m_L, m_H))</th>
<th>(t_L)</th>
<th>(t_0)</th>
<th>(t_H)</th>
<th>((m_L, m_L))</th>
<th>(t_L)</th>
<th>(t_0)</th>
<th>(t_H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(t_L)</td>
<td>(\frac{1}{2})</td>
<td>(1 - W^+)</td>
<td>(1 - W^+)</td>
<td>(t_L)</td>
<td>(\frac{1}{2})</td>
<td>(\frac{1}{2})</td>
<td>(1 - W_R)</td>
<td>(t_0)</td>
<td>(W^+)</td>
<td>(W^+)</td>
<td>(t_0)</td>
<td>(W_R)</td>
<td>(W_R)</td>
<td>(\frac{1}{2})</td>
<td></td>
</tr>
<tr>
<td>(t_0)</td>
<td>(W^+)</td>
<td>(\frac{1}{2})</td>
<td>(\frac{1}{2})</td>
<td>(t_L)</td>
<td>(\frac{1}{2})</td>
<td>(\frac{1}{2})</td>
<td>(1 - W_R)</td>
<td>(t_0)</td>
<td>(W_R)</td>
<td>(W_R)</td>
<td>(t_0)</td>
<td>(W_R)</td>
<td>(W_R)</td>
<td>(\frac{1}{2})</td>
<td></td>
</tr>
<tr>
<td>(t_H)</td>
<td>(W^+)</td>
<td>(\frac{1}{2})</td>
<td>(\frac{1}{2})</td>
<td>(t_L)</td>
<td>(\frac{1}{2})</td>
<td>(\frac{1}{2})</td>
<td>(1 - W_R)</td>
<td>(t_0)</td>
<td>(W_R)</td>
<td>(W_R)</td>
<td>(t_0)</td>
<td>(W_R)</td>
<td>(W_R)</td>
<td>(\frac{1}{2})</td>
<td></td>
</tr>
</tbody>
</table>

Furthermore, \(W_R (\eta, \lambda, G, \psi) \in (W^- (\eta, G), W^+ (\eta, \lambda, G))\) for every \(\lambda \in (1, \bar{\lambda})\).

Proposition 2 has some interesting properties. First of all, it is easy to see that initial announcements may have a long-lasting effect on electoral outcomes. Indeed, \( W^A (m_H, m_H, t_L, t_H | s^A_R, s^B_R) \neq W^A (m_L, m_H, t_L, t_H | s^A_R, s^B_R) \) for every \(\lambda \in (1, \bar{\lambda})\) even though \( \pi^i_2 (\cdot) = \pi^i_2 (\cdot) \) for every \(i \in \{A, B\}\).

Intuitively, initial announcements modify not only voters’ belief, but also their reference points and this latter channel has a persistent effect on voters’ electoral behavior through benefit function \( \Gamma (\cdot) \).

Moreover, lies may hurt candidate’s electoral prospects. More precisely, if a candidate lies, her probability of winning the election may fall below the one she could have guaranteed to herself by revealing her valence truthfully. To see this, suppose candidate A has low valence and believes B is following strategy \( s^B_R (\cdot) \). Then, if she reveals her type truthfully, she wins either with probability \(1 - W_R (\eta, \lambda, G, \psi)\) (if B has high valence) or with probability \(\frac{1}{2}\) (if B has low valence). Instead, if she lies, her probability of winning depends both on the opponent’s valence (recall that the opponent is ...

\[\text{Indeed} \ \mathcal{T} (\tilde{r} (m_H, m_H | s^A_R, s^B_R | g_H)) = (1 + \eta \lambda) \cdot G > (1 + \eta + \eta (\lambda - 1) W_R) = \mathcal{Y} (\tilde{r} (m_H, m_L | s^A_R, s^B_R | g_H)).\]
believed to play a truthful communication strategy) and on the signal she generates. In particular, if the lie is detected (that is, if she generates signal $t_L$), her probability of winning is either equal to $1 - W^+(\eta, \lambda, G)$ (if the opponent has high valence) or to $\frac{1}{2}$ (if the opponent is low valence). Since $W_R (\eta, \lambda, G, \psi) < W^+(\eta, \lambda, G)$, lies may indeed lower the probability of winning the election. Let $S (\eta, \lambda, G, \psi) = W^+(\eta, \lambda, G) - W_R (\eta, \lambda, G, \psi)$; we will refer to it as to the cost of lying.

Notice that lying is costly ($S (\eta, \lambda, G, \psi) > 0$) if and only if voters exhibit both reference dependence ($\eta > 0$) and loss aversion ($\lambda > 1$). To understand why, observe that with loss-neutral voters ($\lambda = 1$), $S (\eta, 1, G, \psi) = 0$ and $W^+(\eta, \lambda, G) = W_R (\eta, \lambda, G, \psi) = W^-(\eta, G) = (1 + \eta) \cdot G$. Thus, even if the lie were detected, the low-valence candidate would not be worse off than under a truth-telling strategy. Consequently, lies would have no downsides. Intuitively, without loss aversion the gain voters get by supporting an high-valence candidate and the loss they incur by supporting a low-valence one have the same magnitude; thus, the net effect in favor of the high valence candidate will be the same independently of the reference point and its actual position would not play any role. To put it differently, if $\lambda = 1$, then the benefit function $\Gamma (\cdot)$ is independent of candidates’ messages. Instead, if the agent is loss averse ($\lambda > 1$), the actual reference point matters and affects $\Gamma (\cdot)$. In particular, the higher the probability put on $g_H$ (for instance, because a low-valence candidate lied and, by doing so, she raised voters reference point), the higher the advantage in favor of high-valence candidates. Thus, the detection of a lie could significantly decrease the electoral prospects of low-valence candidates.

Furthermore, the cost of lying is largest for intermediate values of loss aversion. Indeed, $S (\eta, 1, G, \psi) = S (\eta, \lambda, G, \psi) = 0$, $\frac{\partial S (\eta, \lambda, G, \psi)}{\partial \lambda} \bigg|_{\lambda = 1} > 0$ and $\frac{\partial S (\eta, \lambda, G, \psi)}{\partial \lambda} \bigg|_{\lambda = \hat{\lambda}} < 0$. Thus, $S (\eta, \lambda, G, \psi)$ is maximized for some value of $\lambda \in (1, \hat{\lambda})$. In other words, the cost of lying first increases and then decreases in $\lambda$ reaching a maximum for some intermediate value $\lambda \in (1, \hat{\lambda})$. The intuition behind this result hinges on the double role played by loss aversion. On the one hand, a high level of loss aversion makes voters less willing to accept unexpected losses; thus, if they find out that a candidate overstated her valence, they will be more willing to vote for the opponent as long as she can reduce such losses. On the other hand, an increase in loss aversion makes the electorate less willing to formulate strategies that can yield expected losses; as a result, when loss aversion is maximal ($\lambda = \hat{\lambda}$), the electorate will never support low-valence candidates when they believe a high-valence candidate is available. This will raise the benefit function $\Gamma (\cdot)$ and increase the disadvantage of declaring to be low-valence. In particular, $W^+(\eta, \lambda, G) = W_R (\eta, \lambda, G, \psi) = 1$ and $S (\eta, \lambda, G, \psi) = 0$.

Finally, it is useful to point out that voters do not decrease their willingness to support a candidate just because she lied. Indeed, if the candidate turns out to be better than what initially announced, such willingness could even increase. Instead, lying is costly if (i) the lie is detected, (ii) the lie would generate a loss for the voter, and (iii) electing the other candidate could reduce this loss. These features distinguish our setting from one in which voters exhibit preferences for honesty and enable us to highlight the circumstances under which truth-telling is more likely to arise.

Given the results of Proposition 2, we can characterize the conditions under which $(s^A_R, s^B_R)$ is an equilibrium.
Proposition 3 Suppose assumption 1 holds. Then there exists $p^* (\eta, \lambda, G, q, \psi) < 1$ such that a fully revealing equilibrium exists if and only if $p \in (p^* (\eta, \lambda, G, q, \psi), 1)$. Furthermore $p^* (\eta, \lambda, G, q, \psi)$ is minimized at some $\lambda \in (1, \lambda^*)$.

Proposition 3 states that, under assumption 1, a fully revealing equilibrium exists if and only if the probability of detecting a lie is sufficiently high. The actual value of $p^* (\eta, \lambda, G, q, \psi)$ is implicitly defined by

$$
(1 - p^* (\eta, \lambda, G, q, \psi)) \cdot \left( W_R - \frac{1}{2} \right) = p^* (\eta, \lambda, G, q, \psi) \cdot q \cdot (W^+ - W_R)
$$

which yields:

$$p^* (\eta, \lambda, G, q, \psi) = \frac{2 + \eta + \lambda \eta}{(2 + \eta + \lambda \eta) + q \eta (\lambda - 1) (1 - 2 \psi G (1 + \eta \lambda))}.
$$

Equation (7) captures the key trade off faced by a low-valence candidate. If she lies and the lie is not detected (which happens with probability $(1 - p)$), her probability of winning increases by $W_R (\eta, \lambda, G, \psi) - \frac{1}{2}$.\(^{31}\) If instead voters detect the lie (which happens with probability $p$), her probability of winning decreases by $q \cdot S (\eta, \lambda, G, \psi)$.\(^{32}\) $p^* (\eta, \lambda, G, q, \psi)$ is the probability level that equates the expected benefit from lying with its expected cost.

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\(^{30}\)To simplify notation, we omit to specify the arguments of $W_R (\eta, \lambda, G, \psi)$ and $W^+ (\eta, \lambda, G, \psi)$.

\(^{31}\)In particular, the probability of winning goes from $\frac{1}{2}$ to $W_R (\eta, \lambda, G, \psi)$ if the opponent is low-valence (which happens with probability $1 - q$) and from $(1 - W_R (\eta, \lambda, G, \psi))$ to $\frac{1}{2}$ if the opponent is high-valence (which happens with probability $q$).

\(^{32}\)In particular, the probability of winning stays constant at $\frac{1}{2}$ if the opponent has low valence (which happens with probability $(1 - q)$) and goes from $(1 - W_R (\eta, \lambda, G, \psi))$ to $(1 - W^+ (\eta, \lambda, G))$ if the opponent has high valence (which happens with probability $q$).
possibility that the electorate detects a lie.

An implication of Proposition 3 is that the only relevant incentive compatibility constraint is the one associated with low-valence candidates. To put it differently, a high valence candidate has no incentive to understate her actual valence in order to subsequently surprise the voter.33 Intuitively, announcing to have high valence from the beginning raises the electorate’s expectation in favor of high-valence candidates and this increases the winning probability of high-valence candidates more than what positive surprises with respect to a lower reference point could do.

Notice that \( p^* (0, \lambda, G, q, \psi) = p^* (\eta, 1, G, q, \psi) = p^* (\eta, \bar{\lambda}, G, q, \psi) = 1 \). Thus, fully revealing equilibria exist only if voters exhibit reference dependence \( (\eta > 0) \) and loss aversion \( (\lambda > 1) \), but loss aversion is not too high \( (\lambda < \bar{\lambda}) \). Indeed, in the absence of reference dependence or loss aversion announcements do not have any long-lasting effect on the electorate’s preferences \( (\Gamma (\cdot) \) does not depend on candidates’ messages), whereas if loss aversion is too high, overstating one’s valence is always optimal for low-valence candidates.

If instead \( \lambda \in (1, \bar{\lambda}) \), then \( p^* (\eta, \lambda, G, q, \psi) < 1 \). Moreover it is easy to check that \( p^* (\eta, \lambda, G, q, \psi) \) is minimized at:

\[
\lambda^* (\eta, \psi, G) = \left( \frac{\sqrt{G \psi (1 + \eta) (2 \psi G (1 + \eta) + 1)}}{G \psi \eta} \right) - \frac{2 + \eta}{\eta}
\]

Taking the limit of \( p^* (\eta, \lambda, G, q, \psi) \) as \( \psi \to 0 \), we get:

\[
\lim_{\psi \to 0} p^* (\eta, \lambda, G, q, \psi) = \frac{2 + \eta + \lambda \eta}{(2 + \eta + \lambda \eta) + q (\lambda - 1)}
\]

which is decreasing in \( \lambda \). Since \( \lim_{\psi \to 0} \bar{\lambda} = \infty \), we can also conclude that:

\[
\lim_{\lambda \to \infty} \left( \lim_{\psi \to 0} p^* (\eta, \lambda, G, q, \psi) \right) = \frac{1}{1 + q}
\]

Thus, as we increase the uncertainty of the electoral outcome (namely, we decrease \( \psi \)) and the degree of loss aversion (namely, we increase \( \lambda \)), the lower bound on the probability of detecting lies necessary to support fully revealing equilibria (namely, \( p^* (\eta, \lambda, G, q, \psi) \)) decreases. In particular, it converges to \( \frac{1}{1 + q} > \frac{1}{2} \) as \( \psi \to 0 \) and \( \lambda \to \infty \). In words, an increase in electoral uncertainty favors truthtelling equilibria. Indeed, as \( \psi \) increases, extreme realizations of \( \delta \) become relatively more likely and the probability with which a low-valence candidate can win against a high-valence one increases. This will reduce the disadvantage associated with announcing to be low-valence and favors truthtelling. Notice that an increase in \( \psi \), keeping \( G \) fixed, can be also interpreted as an increase in the saliency of issues different from valences in determining the electoral outcome. In this context, the previous result can be read as saying that the incentive to lie will be higher, when perceived valences are key in determining the winner of elections.

Figure 3 plots \( p^* (\eta, \lambda, G, q, \psi) \) as a function of the parameters in our model. The non-monotonic pattern of \( p^* (\eta, \lambda, G, q, \psi) \) with respect to loss aversion \( (\lambda) \) and its decreasing pattern with respect to electoral uncertainty \( (\frac{1}{\psi}) \) have already been justified. The non-monotonicity with respect to the degree of reference dependence \( (\eta) \) follows from the same arguments we used for \( \lambda \). Then, we can simply notice that \( p^* (\eta, \lambda, G, q, \psi) \) is increasing in \( G \) and decreasing in \( q \). The former result follows

\[33\] This follows from \( W^- (\eta, G) < W_R (\eta, \lambda, G | \psi) \).
from the fact that a bigger difference in the skills of the two types makes lies more attractive, whereas the latter one hinges on the fact that the cost of lying is incurred only if the opponent is high valence (which happens with probability $q$).

![Graphs showing the relationship between $p^*$ and parameters $\lambda$, $\eta$, $q$, and $\psi$.](image)

Figure 3: $p^*(\eta, \lambda, G, q, \psi)$. Not varying parameters are set equal to $\eta = \frac{1}{2}$, $\lambda = 5$, $q = \frac{3}{4}$, $\psi = \frac{1}{10}$, $G = \frac{1}{4}$ (black line), $G = \frac{1}{2}$ (red line), $G = 1$ (green line).

### 3.3 Uninformative Equilibrium

Proposition 3 shows that reference dependence and loss aversion can yield full revelation even though this would not be possible under standard utility functions. Nevertheless, the equilibrium we described in the previous section is not unique: an uninformative equilibrium also exists for any set of parameters. This is standard in communication games: if the electorate believes that candidates’ announcements do not entail any relevant information and ignores them (that is, if voters do not update their beliefs based on such announcements), uninformative communication strategies would be trivially optimal and this would, in turn, justify the electorate’s initial conjectures. The next proposition characterizes uninformative equilibria.
Proposition 4 Let

\[ W_{U,\kappa} = W_{U,\kappa} (\eta, \lambda, G, q, p, \psi) = \frac{1}{2} + \psi \cdot \kappa \cdot \frac{(1 + \eta \lambda q + \eta (1 - q))}{1 - 2\psi \eta (\lambda - 1) p (1 - q) q G} \cdot G \]

and suppose assumption 1 holds. Then, there exists an uninformative equilibrium \((s^A_U, s^B_U)\) and the probability with which candidate \(A\) wins the election \(W^A \left( m^A, m^B, t^A, t^B \mid s^A_U, s^B_U \right)\) can be summarized as follows:

<table>
<thead>
<tr>
<th>((\tilde{m}, \tilde{m}))</th>
<th>(t_L)</th>
<th>(t_0)</th>
<th>(t_H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(t_L)</td>
<td>(\frac{1}{2})</td>
<td>(1 - W_{U,q})</td>
<td>(1 - W_{U,1})</td>
</tr>
<tr>
<td>(t_0)</td>
<td>(W_{U,q})</td>
<td>(\frac{1}{2})</td>
<td>(1 - W_{U,(1-q)})</td>
</tr>
<tr>
<td>(t_H)</td>
<td>(W_{U,1})</td>
<td>(W_{U,(1-q)})</td>
<td>(\frac{1}{2})</td>
</tr>
</tbody>
</table>

Furthermore, (i) \(W_{U,1} (\eta, \lambda, G, q, p, \psi)\) is increasing in \(q\), (ii) \(W_{U,1} (\eta, \lambda, G, 0, p, \psi) = W^- (\eta, G)\), and (iii) \(W_{U,1} (\eta, \lambda, G, 1, p, \psi) = W^+ (\eta, \lambda, G)\).

Proposition 4 implies that in an uninformative equilibrium the probability with which candidate \(A\) wins depends only on the signals candidates generate. Furthermore, it is straightforward to check that \(W_{U,\kappa} (0, \lambda, G, q, p, \psi) = \frac{1}{2} + \psi \kappa G\) and that \(W_{U,\kappa} (\eta, \lambda, G, q, p, \psi)\) is increasing in \(\eta\). Thus, the advantage high-valence candidates have against low-valence ones in an uninformative equilibrium is increasing in the importance of reference dependence \((\eta > 0)\). To understand why, observe that since voters assign positive probability to both types of candidates being elected, reference dependence favours high-valence candidates for two reasons: on the one hand, they generate gains vis-a-vis low valence candidates, on the other hand low valence candidates generate losses vis-a-vis high valence ones. To see this, notice that the benefit function \(\Gamma (\tilde{r} \left[ g_H \right]) = (1 + \eta + \eta (\lambda - 1) \cdot \tilde{r} \left[ g_H \right]) \cdot G\) can be equivalently written as \((1 + \eta \cdot \tilde{r} \left[ g_L \right] + \eta \lambda \cdot \tilde{r} \left[ g_H \right]) \cdot G\).

Proposition 4 also implies that there exists a cutoff \(q^* (\eta, \lambda, G, p, \psi)\) implicitly defined by

\[ W_{U,1} (\eta, \lambda, G, q^* (\eta, \lambda, G, p, \psi), p, \psi) = W_R (\eta, \lambda, G, \psi) \]

such that \(W_{U,1} (\eta, \lambda, G, q, p, \psi) > (\prec) W_R (\eta, \lambda, G, \psi)\) if \(q > (\prec) q^* (\eta, \lambda, G, p, \psi)\); furthermore, it is easy to check that for every profile of parameters satisfying Assumption 1, \(q^* (\eta, \lambda, G, p, \psi) > \frac{1}{2}\). In words, if voters are certain about candidates’ types, their likelihood of voting for a high-valence candidate against a low-valence one will be higher in a fully revealing equilibrium than in an informative one if and only if \(q\) is sufficiently low. To get the intuition behind this result, suppose that the candidate pair is \((\theta_H, \theta_L)\). Then, the effect of announcement pair \((m_H, m_L)\) over \((\tilde{m}, \tilde{m})\) is twofold. On the one hand, it raises \(\pi^A_2 (\cdot)\) yielding an increase in \(W^A \left( m^A, m_L \mid t_H, t_L \right)\) through its effect on \(\pi^A_2 (m^A, t_0 \mid s^A_R) - \pi^A_2 (m^A, t^B \mid s^B_R), t^B \in T\). On the other hand, it modifies voters reference point making them used to the idea that a low-valence candidate exists and may get elected. This second effect may decrease \(W_R (\eta, \lambda, G, \psi)\), through its effect on \(\Gamma (\tilde{r} \left( m_H, m_L \mid s^A_R, s^B_R \left[ g_H \right])\). In particular, this latter phenomenon will arise if low types have low ex-ante probability \((q \text{ high})\). If \(p\) is close to 1, the former effect will be almost irrelevant as voters will learn candidate’ valence
anyway through signal \(t^A\); furthermore, if \(q\) is sufficiently high, \(\tilde{r} (\tilde{m}, \tilde{m} \mid s^A_U, s^B_R)\) may assign a higher probability to \(g_H\) than \(\tilde{r} (m_H, m_L \mid s^A_U, s^B_R)\) yielding \(W_{U,1} (\eta, \lambda, G, q, p, \psi) > W_R (\eta, \lambda, G, \psi)\).

### 3.4 Partially Revealing Equilibria

Although fully revealing and uninformative equilibria are useful benchmarks, other, *partially revealing equilibria* may also exist. In these equilibria probabilities \(\left(\pi^i_1 (\cdot)\right)_{i \in \{A,B\}}\) depend on candidates’ announcements, but do not always jump to 0 or 1. In general, the class of partially revealing equilibria may include complex mixed strategy profiles and a full characterization of such class is beyond the scope of this paper.

Thus, we will focus only on symmetric partially revealing equilibria, namely equilibria in which both candidates follow the same communication strategy. Formally, \((\sigma^A_p, \sigma^B_p)\) is a symmetric partially revealing equilibria if \(\sigma^A_p = \sigma^B_p = \sigma_p\). To further simplify the analysis we strengthen Assumption 1.

**Assumption 2** \( \frac{1}{2} \psi > G \left( 2 + \frac{1}{2} \eta + \frac{3}{2} \lambda \eta \right) \).

Under Assumption 2, one can prove that the probability that the reference point assigns to \(g_H\) is increasing in \(\pi_1^i (m^i \mid \sigma_p)\) for every \(i \in \{A,B\}\) is high-valence.

**Lemma 1** Let \((\sigma_p, \sigma_p)\) be a symmetric equilibrium. Then, under assumption 2, for every \(m^i, (m^i)' \in M\) and for every \(m^j \in M\)

\[
\pi_1^i (m^i \mid \sigma_p^i) > \pi_1^i ((m^i)' \mid \sigma_p^j) \implies \tilde{r} (m^i, m^i \mid \sigma_p^A, \sigma_p^B) [g_H] > \tilde{r} ((m^i)', m^i \mid \sigma_p^A, \sigma_p^B) [g_H]
\]

To understand why the statement in Lemma 1 is not always true, consider an increase in the probability that candidate A is high valence, \(\pi_1^A (m^A \mid \sigma_p^A)\), keeping \(\pi_1^B (m^B \mid \sigma_p^B)\) fixed. This leads to an increase in \(W^A (\cdot \mid \sigma_p, \sigma_p)\) and to a symmetric decrease in \(W^B (\cdot \mid \sigma_p, \sigma_p)\). In general, this will be associated with a raise in \(\tilde{r} (m^A, m^B \mid \sigma_p^A, \sigma_p^B) [g_H]\) as high-valence candidates are now more likely. However, if \(\pi_1^A (m^A \mid \sigma_p^A)\) is relatively low and \(\pi_1^B (m^B \mid \sigma_p^B)\) is relatively high, the raise in \(W^A (\cdot \mid \sigma_p, \sigma_p)\) and the decrease in \(W^B (\cdot \mid \sigma_p, \sigma_p)\) could shift the probability of winning from a candidate who is likely to be high-valence to one who is likely to be low-valence. As a result, \(\tilde{r} (m^A, m^B \mid \sigma_p^A, \sigma_p^B) [g_H]\) could decrease. Assumption 2 guarantees that the former effect dominates; intuitively, it states that the electoral outcome is so uncertain that voters’ reference points already assign sufficiently high probability to both \(g_L\) and \(g_H\), limiting in this way the relevance of the latter effect.

Thanks to Lemma 1, we can show that the characterization of symmetric partially revealing equilibria can focus without loss of generality on equilibria in which: (i) for each candidate \(i \in \{A,B\}, M = \{m_*, m^*\}\), (ii) high-valence candidates always send \(m^*\), and (iii) low-valence candidates randomize with probability \(z \in [0,1]\) between \(m_*\) and \(m^*\).
**Lemma 2** Suppose assumption 2 holds. Then, if \((\sigma_P, \sigma_P)\) is a partially revealing equilibrium, we can assume without loss of generality that: (i) \(M = \{m_s, m^*\}\), (ii) if \(s(\theta_H) = m_s, \sigma_P[s] = 0\).

By lemma 2, symmetric partially revealing equilibria can be indexed by the common probability \(\pi_1(m^* \mid \sigma_P) = \pi\) or, equivalently, by the probability with which low-valence candidates send message \(m^*\). Let this probability be \(z_\pi\); by Bayes rule \(z_\pi = \frac{q}{1-q} \cdot \frac{(1-\pi)}{\pi}\). We refer to these equilibria as to \(\pi\)-symmetric partially revealing equilibria. Moreover, Lemma 2 implies that in \(\pi\)-symmetric partially revealing equilibria the only relevant incentive compatibility constraint is the one of low-valence candidates. In particular, the trade off faced by low-valence candidates is similar to the one we described for the case of full revelation: by sending message \(m_s\), they reveal their types and the electoral outcome depends only on the information the electorate gathers on their opponent; if instead they send message \(m^*\), they could increase or decrease the probability of winning with respect to \(m_s\) depending on whether they generate signal \(t_0\) or \(t_L\).

It is easy to see that, in a \(\pi\)-symmetric partially revealing equilibrium, the reference-point after message pair \((m_s, m^*_*)\) is identical to the one arising in a fully revealing equilibrium after pair \((m_L, m_L)\). Similarly, if the message pair is \((m^*, m^*_*)\), the reference-point will be equal to the one arising in an uninformative equilibrium when the prior probability of high-valence candidates is \(\pi\). The next Proposition provides a full characterization of winning probabilities in a \(\pi\)-symmetric partially revealing equilibrium.

**Proposition 5** Suppose Assumption 2 holds. Define

\[
W^\pi_{U, \kappa} = W_{U, \kappa}(\eta, \lambda, G, \pi, p, \psi) \quad \text{and} \quad W_{P, \kappa} = W_{P, \kappa}(\eta, \lambda, G, \pi, p, \psi) = \frac{1}{2} + \psi \cdot \kappa \cdot \left( \frac{(1 + \eta) + \pi \eta (\lambda - 1)}{1 - \psi \eta (\lambda - 1) (\pi^2 + p \pi (1 - \pi))) G} \right).
\]

Let \((\sigma_P, \sigma_P)\) be a \(\pi\)-symmetric partially revealing equilibrium. Then \(W^A(m^A, m^B, t^A, t^B \mid \sigma_P, \sigma_P)\) can be summarized as follows.

<table>
<thead>
<tr>
<th>((m^<em>, m^</em>_*))</th>
<th>(t_L)</th>
<th>(t_0)</th>
<th>(t_H)</th>
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<tbody>
<tr>
<td>(t_L)</td>
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<td>(1 - W^\pi_{U, \pi})</td>
<td>(1 - W^\pi_{U, 1})</td>
</tr>
<tr>
<td>(t_0)</td>
<td>(W^\pi_{U, \pi})</td>
<td>(\frac{1}{2})</td>
<td>(1 - W^\pi_{U, (1-\pi)})</td>
</tr>
<tr>
<td>(t_H)</td>
<td>(W^\pi_{U, 1})</td>
<td>(W^\pi_{U, (1-\pi)})</td>
<td>(\frac{1}{2})</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>((m^<em>_-, m^</em>_+))</th>
<th>(t_L)</th>
<th>(t_0)</th>
<th>(t_H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(t_L)</td>
<td>(\frac{1}{2})</td>
<td>(1 - W_{P, \pi})</td>
<td>(1 - W_{P, 1})</td>
</tr>
<tr>
<td>(t_0)</td>
<td>(W_{P, \pi})</td>
<td>(W_{P, \pi})</td>
<td>(1 - W_{P, (1-\pi)})</td>
</tr>
<tr>
<td>(t_H)</td>
<td>(W_{P, 1})</td>
<td>(W_{P, 1})</td>
<td>(\frac{1}{2})</td>
</tr>
</tbody>
</table>

Furthermore, \(W^\pi_{U, 1} \in (W_{U, 1}(\eta, \lambda, G, q, p, \psi), W_{R}(\eta, \lambda, G, \psi))\) and \(W_{P, 1} \in \left( W^\pi - (\eta, G), \hat{W}_1 \right)\).

Since in a \(\pi\)-symmetric partially revealing equilibrium low-valence candidates randomize between
two messages ($m_*$ and $m^*$), they must be indifferent between them. Define:

$$d_P (\eta, \lambda, G, \pi, p, \psi) = \frac{(1 + \eta) + \frac{\pi}{2} \eta (\lambda - 1)}{1 - \psi \eta (\lambda - 1) (\pi^2 + p \pi (1 - \pi)) G}$$  \hspace{2cm} (9)

$$d_U (\eta, \lambda, G, \pi, p, \psi) = \frac{1 + \eta \lambda \pi + \eta (1 - \pi)}{1 - 2 \psi \eta (\lambda - 1) p (1 - \pi) \pi G}$$  \hspace{2cm} (10)

$W_{U,1} (\eta, \lambda, G, \pi, p, \psi) > W_{P,1} (\eta, \lambda, G, \pi, p, \psi)$ implies $d_U (\eta, \lambda, G, \pi, p, \psi) > d_P (\eta, \lambda, G, \pi, p, \psi)$. Then, if low valence candidates send $m_*$, their expected utility will be given by ($i, j \in \{A,B\}, i \neq j$):

$$U^i (m_*, \sigma_P | \theta_L) = \frac{1}{2} - q \cdot \psi \cdot d_P (\eta, \lambda, G, \pi, p, \psi) \cdot G,$$

Instead, if they send message $m^*$, they pool with high-valence ones and their expected utility becomes ($i, j \in \{A,B\}, i \neq j$):

$$U^i (m^*, \sigma_P | \theta_L) = \frac{1}{2} + (1 - p) \cdot (\pi - q) \cdot \psi \cdot d_P (\eta, \lambda, G, \pi, p, \psi) \cdot G - q \cdot p \cdot \psi \cdot d_U (\eta, \lambda, G, \pi, p, \psi) \cdot G$$

Thus, the indifference condition requires:

$$(1 - p) \pi \cdot d_P (\eta, \lambda, G, \pi, p, \psi) = q p \cdot (d_U (\eta, \lambda, G, \pi, p, \psi) - d_P (\eta, \lambda, G, \pi, p, \psi))$$  \hspace{2cm} (11)

Notice that, if $p = 1$, the right hand side of (11) is bigger than the left hand one; on the contrary, if $p = 0$, the reverse inequality holds. Moreover, keeping all other parameters constant and exploiting Assumption 2, we can conclude that the left hand side of (11) is decreasing in $p$, while the right hand side is increasing in it.\(^{34}\) Therefore, for every profile of parameters $(\eta, \lambda, G, q, \pi, \psi)$, there exists a unique $p^{**} (\eta, \lambda, G, q, \pi, \psi) \in (0, 1)$ such that (11) holds if and only if $p = p^{**} (\eta, \lambda, G, q, \pi, \psi)$.

Now, consider the expected utility of a high-valence candidate in a $\pi$-symmetric partially revealing equilibrium. If she sends message $m^*$, her utility will be given by:

$$U^i (m^*, \sigma_P | \theta_H) = \frac{1}{2} + (1 - q) \cdot \psi \cdot z_\pi \cdot p \cdot d_U (\eta, \lambda, G, \pi, p, \psi) + (1 - q) \cdot \psi \cdot (1 - z_\pi) \cdot (p + (1 - p) \pi) \cdot d_P (\eta, \lambda, G, \pi, p, \psi).$$

\(^{34}\)To see this last point, observe that:

$$\frac{\partial (q pd_U)}{\partial p} = G q \cdot \frac{(1 + \eta) + \pi (\lambda - 1) \eta}{(1 - 2 \psi \eta (\lambda - 1) p (1 - \pi) \pi G)^2}$$

whereas:

$$\frac{\partial (q pd_P)}{\partial p} = G q \cdot \frac{(1 - \pi^2 \eta (\lambda - 1) \psi G)}{(1 - \psi \eta (\lambda - 1) (\pi^2 + p \pi (1 - \pi)) G)^2} \cdot \left(1 + \eta + \frac{1}{2} \pi (\lambda - 1) \eta\right)$$

The result follows from noticing that Assumption 1 implies

$$\frac{(1 - \pi^2 \eta (\lambda - 1) \psi G)}{(1 - G \eta (\lambda - 1) (p + (1 - p) \pi))^2} < \frac{1}{(1 - 2 G (\lambda - 1) (1 - \pi) \pi p \psi \eta)^2}. $$
Using equation (11), we can rewrite the previous expression as:

\[ U^i(m^*, \sigma_P | \theta_H) = \frac{1}{2} + (1 - q) \psi \cdot d_P(\eta, \lambda, G, p, \psi) \cdot G \]

On the contrary, if she sends message \( m_* \), her expected utility will be given by:

\[ U^i(m_*, \sigma_P | \theta_H) = \frac{1}{2} - q(1 - p) \pi \psi \cdot d_P(\eta, \lambda, G, p, \psi) \cdot G. \]

Since \( d_P(\eta, \lambda, G, p, \psi) > 0 \), high valence candidates will be better off sending message \( m^* \).

The next Proposition formalizes the previous analysis.

**Proposition 6** Suppose Assumption 2 holds. Let \( s' \) and \( s'' \) be two strategies such that \( s'(\theta_H) = m^* \), \( s'(\theta_L) = m_* \) and \( s''(\theta_H) = s''(\theta_L) = m^* \). Suppose Assumption 2 holds. Then, \( (\sigma_P, \sigma_P) \) is a \( \pi \)-symmetric partially revealing equilibrium if: (i) \( \sigma_P[s''] = \frac{q(1 - \pi)}{1 - q} \), (ii) \( p = p^{**}(\eta, \lambda, G, q, \pi, \psi) \in (0, 1) \). This is also the unique \( \pi \)-symmetric partially revealing equilibrium in the sense of Lemma 2.

### 3.5 Equilibrium Comparison

From the previous propositions, it is obvious that as long as \( p \) is sufficiently high, multiple equilibria may exist. Now, we will derive some results concerning the welfare implications of these equilibria. To this goal, we will compare the expected utility of candidates at the interim stage (namely, after they learnt their type) and the total utility of voters before listening to the announcements. Indeed as voters represent the recipients of information, they can decide whether to listen or ignore the announcements only before the actual messages are sent. Intuitively, if voters pay attention to what candidates said, these announcements will affect their beliefs and, through this channel, their reference point.

To understand the next proposition, recall that \( q^*(\eta, \lambda, G, p, \psi) \) is the cutoff on the prior probability of high-types that determines whether \( W_R(\eta, \lambda, G, \psi) \) is greater (\( q < q^*(\eta, \lambda, G, p, \psi) \)) or lower (\( q > q^*(\eta, \lambda, G, p, \psi) \)) than \( W_{U,1}(\eta, \lambda, G, q, p, \psi) \).

**Proposition 7** If \( q < q^*(\eta, \lambda, G, p, \psi) \), high-valence candidates are better off in a fully revealing equilibrium than in an uninformative equilibrium. Furthermore, if Assumption 2 holds, high-valence candidates are always better off in a fully revealing equilibrium than in a \( \pi \)-partially revealing equilibrium with \( \pi \in (q, 1) \). Low-valence candidates have opposite preferences.

Thus, if \( q < q^*(\eta, \lambda, G, p, \psi) \) high-valence candidates’ preferred equilibrium is fully revealing.

The next proposition shows that voters share the same preferences.

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35 The actual steps are shown in the proof of Proposition 7.

36 This is a by-product of the fact that in this model we abstract from the use of rhetorical tools and from the choice of messages’ clarity; thus, the informational content of a message is a property of the equilibrium construction and not of the actual announcement sent by candidates. For a model in which agents strategically choose the clarity of their messages, see Blume and Board, 2009.
Proposition 8 If \( q < q^* (\eta, \lambda, G, p, \psi) \), voters are better off in a fully revealing equilibrium than in an uninformative equilibrium. Furthermore, if Assumption 2 holds, voters are always better off in a fully revealing equilibrium than in a \( \pi \)-partially revealing equilibrium with \( \pi \in (q, 1) \).

Propositions 7 and 8 imply that if \( q < q^* (\eta, \lambda, G, p, \psi) \), standard equilibria refinements for communication games would select the fully revealing equilibrium whenever such equilibrium exists.\(^{37}\)

If \( q^* (\eta, \lambda, G, p, \psi) > q \), we can find profiles of parameters for which both high-valence candidates and voters are better off in the uninformative equilibrium than in the fully revealing one; as a result, fully revealing equilibria will no longer satisfy standard equilibrium refinements. In particular, this will happen if \( q \) is sufficiently high and \( p \simeq 1 \). The intuition is similar to the one we provided after Proposition 4. Suppose \( p \simeq 1 \). Then, the difference in voters’ consumption utility between the two equilibria will be low as, in both cases, voters will almost certainly select candidates knowing their true types. Consider a high valence-candidate. If she faces another high-valence candidate (which happens with probability \( q \)), her expected probability of winning the election will be equal to \( \frac{1}{2} \) in both equilibria. If instead she faces a low-valence candidate, she will have an electoral advantage determined by the gain/loss component and such advantage will be proportional to the weight the reference point assigns to \( g_H \). If \( q \) is sufficiently high, \( \tilde{r} (\tilde{m}, \tilde{m} | s^A_U, s^B_U) [g_H] > \tilde{r} (m_H, m_L | s^A_R, s^B_R) [g_H] \) and high-valence candidates will be better off in the uninformative equilibrium.

4 Discussion

4.1 Distribution over Types

In our model the valences of candidates are drawn independently from the same distribution. All our results can be easily extended to deal with the case of different, but independent distributions. In this case, the candidate with the lowest \( \text{ex-ante} \) probability of being low-valence is the one with the highest incentive to lie as it assigns a lower probability to her opponent being high-valence and, consequently, to her lie being harmful in terms of winning probability.

Instead, our results are robust to the introduction of positive correlation among agents’ types only if such correlation is not too high.\(^{38}\) To understand why, recall that a low-valence candidate incurs the cost of lying only if her opponent turns out to be high-valence (this is the only case in which her lie could shift voters’ preferences in favor of the contender). Thus, consider the extreme case in which valences are perfectly correlated (this could also be interpreted as a situation in which the amount of public good provided fully depends on the realization of a macroeconomic shock and individual skills play no role). In such a situation, a low-valence candidate is certain that her opponent is also low-valence and lying does not entail any cost. As a result, only uninformative equilibria will be possible.

\(^{37}\)For instance, the fully revealing equilibrium would satisfy neologism-proofness (Farrell, 1993), announcement-proofness (Matthews et al., 1991) and NITS (namely, “No Incentive to Separate”, Chen et al., 2008), whereas uninformative equilibria would not.

\(^{38}\)Instead, negative correlation can be easily accommodated.
4.2 Voting Behavior

In the paper, we modeled the electorate as a continuum of agents who cast their vote sincerely. Alternatively, we could have analyzed a setting in which the electoral outcome is determined by the voting behavior of a well identified median voter. One can show that this approach would lead to exactly the same results, but would entail greater notational complexity. Indeed, the reference point would then depend not only on the announcements of candidates and by (the conjectures over) their communication strategies, but also on the voting strategy of the median voter. Formally, the reference point would now be a random distribution \( \tilde{r} (m^A, m^B | \gamma, \sigma^A, \sigma^B) \), where \( \gamma : M^2 \times T^2 \times \left[ -\frac{1}{2\psi}, \frac{1}{2\psi} \right] \to [0, 1] \) is a function representing the electoral strategy of the median voter: for every profile of messages and signal pairs \((m^A, m^B, t^A, t^B)\) and for every realization of the popularity shock, \(d\), \(\gamma (m^A, m^B, t^A, t^B, d)\) is the probability with which the median voter will vote in favor of candidate \(i\).

A similar approach could be used to model a setting in which the identity of the median voter is uncertain, but it is known to belong to a finite set of individuals. In this case, the reference point \(\tilde{r} (\cdot | \cdot)\) will depend on the profile of strategies of all individuals in this set. Although conceptually straightforward, this last extension would hardly lead to tractable analytical solutions.

4.3 Voters’ Heterogeneity

In our model, the only source of heterogeneity among voters is given by the ideological bias \(\phi^j\). This is done as we are more interested in the communication game between candidates and the electorate than in the redistributive conflict among voters. Nevertheless, heterogeneity in the redistributive preferences can be incorporated in our setting. For instance, suppose that for every level of ideological bias, \(f^j\), there exists a continuum of voters indexed by income level, \(y^j\), and distributed according to an absolutely continuous cdf \(H (\cdot)\) with support in the interval \([0, \infty)\). Assume that the consumption utility of a voter is given by \(c^i + G (h)\), where \(c^i\) denotes the private consumption level, \(G (\cdot)\) is a continuous, strictly increasing and strictly concave function with \(\lim_{x \to 0} G' (x) = \infty\) and \(h\) is a public good that must be financed through a proportional tax \(\tau\). Thus \(c^i = (1 - \tau) \cdot y^i\).

The government budget constraint is affected by the type of the elected politician as \(\tau \int_0^\infty y dH (y) \geq \frac{h}{\theta}\). Thus, a high-valence candidate \((\theta = \theta_H)\) is more effective in transforming tax revenue into public good and all voters agree on this. However, income heterogeneity yields a standard disagreement on the level of public good: high-income voters would prefer a lower \(h\) than low-income voters.

In this setting, we can interpret candidates’ messages as announcements concerning the total level of utility they can provide to various agents and we could assume that elected candidates choose the actual pair \((\tau, h)\) in order to maximize political consensus or total welfare. Under these assumptions, the analysis carried out in Section 3 can be easily adapted and would lead to same conclusions concerning candidates’ communication strategies.

\[\text{Equivalently, one could also let the distribution of income levels to depend on ideological biases.}\]

\[\text{The actual choice of candidates’ objective function is irrelevant as long as the optimal choice would result in voters preferring high-valence candidates to low-valence ones.}\]
4.4 Signal Technology

In the paper we assumed that candidates’ true valence are revealed with an exogenous probability equal to \( p \). This assumption can be relaxed in several dimensions. First of all, as our analysis makes clear, the main result of the paper extends to any signal technology that reveals the type of a low-valence candidate with some positive probability.

Moreover, one can allow the probability with which the type of a low-valence candidate candidate \( i \) is revealed, \( p^i \), to depend negatively on some costly effort exerted by agent \( i \), \( e^i \). Effort \( e^i \) could be interpreted as the amount of resources invested by the candidate to improve his ability to communicate (e.g., hirings of spin doctors) or to lower media’s scrutiny (e.g., lobbying activities with journalists and/or newspapers owners). For instance, we could assume that 
\[ p^i = (1 - e^i) \cdot \bar{p} \]
and that the cost associated with \( e^i \) is given by \( C(e^i) \), with \( \frac{\partial C(\cdot)}{\partial e^i} > 0 \) and \( \frac{\partial^2 C(\cdot)}{\partial (e^i)^2} > 0 \). In this case, full revelation arises if the convexity of the cost function \( C(\cdot) \) prevents candidates from choosing extremely low values of \( p^i \). Furthermore, one could assume that \( p^j \) depends positively on some costly effort exerted by candidate \( j \), \( e^j \). For instance, \( e^j \) could represent the amount of resources spent by candidate \( j \) to run a negative campaign against \( i \) aimed at pointing out her weakness. In this case, one could assume 
\[ p^j = e^j \cdot \bar{p} \]
and represent the cost incurred by candidate \( j \) with a function \( C(\cdot) \) such that \( \frac{\partial C(\cdot)}{\partial e^j} > 0 \) and \( \frac{\partial^2 C(\cdot)}{\partial (e^j)^2} > 0 \). In this setting, fully revealing equilibria would exist for the same set of parameters we characterized in Proposition 3.

4.5 Reference Dependence and Other Behavioral Biases

In our setting, false announcements modify the electorate’s reference point and, through this channel, generate a cost for low-valence candidate. This cost, in turn, pushes candidates toward truth-telling. Other models explain truth-telling using different behavioral biases. For instance, Charness and Dufwenberg, 2006, 2010, 2011 and Battigalli et al., 2013 attain truth-telling through guilt aversion. In such a setting, candidates would not lie in order to avoid the guilt associated with letting down voters. This approach would require to model players’ higher order beliefs as voters beliefs about candidates’ intentions and candidates beliefs about these beliefs would matter. Our modelling choice, instead, does not require to model players’ intentions: the change in the electorate’s reference point depends only on the information content that voters assign to candidates’ statements.

Alternatively, one could also assume that voters have preferences for honesty and punish candidates for not delivering what they promised.\(^{41}\) Although this assumption is sensible in many settings, we believe that our approach represents a step forward. First of all, preferences for honesty would, strictly speaking, lead voters to punish candidates even when they deliver a positive surprise, whereas our approach is able to distinguish between gains and losses. Moreover, by modelling the formation of reference points and the mechanism through which it affects voters preferences, we provide a justification behind preferences for honesty and, consequently, we can characterize the

\(^{41}\) See Banks, 1990.
conditions under which lies are most likely to hurt candidates’ electoral prospects. Finally, it is important to stress that, although in our model voters may react to a lie as if they were punishing candidates, they are not really carrying out a punishment strategy. Instead, their behavior follows from the joint effect of a change in the reference point induced by the lie and of the desire to avoid painful losses.

5 Conclusion

In this paper, we provide a model in which politicians are held accountable for their electoral announcements even though there is a single electoral round. To be more precise, we build a simple probabilistic voting model in which two candidates compete to get elected. If voters care about consumption utility only, politicians’ announcements would be uninformative: since politicians always have an incentive to pretend to be high valence, their statements will lack any credibility and voters will ignore them. The introduction of reference dependence and loss aversion overcome this problem by adding an additional channel through which politicians’ announcements affect voters’ behavior, namely the formation of reference point. Indeed, if a candidate announce to be high valence, she raises electorate’s expectations; then, if voters subsequently find out that she cannot deliver such payoff because her valence is lower than what initially claimed, they may vote for the opponent to avoid harmful disappointment. This channel may induce candidates to reveal their valence truthfully.

A natural direction for future research would be to extend the model to a multiple-elections setting in which the true type of a candidate is more likely to be revealed when she is elected as voters can gather information by looking her in office. Such analysis would require additional assumptions on the formation and dynamic updating of the reference point, as well as on the degree of voters’ sophistication in anticipating the changes in preferences associated with these processes.

6 Appendix

6.1 Proof of Proposition 1

Let \((\sigma^A, \sigma^B)\) be an equilibrium. First notice that for every message \(m^i\), \(\pi^1_2 (m^i, t_L | \sigma^i) = 0\), \(\pi^1_2 (m^i, t_0 | \sigma^i) = \pi^1_1 (m^i | \sigma^i)\) and \(\pi^i (m^i, t_H | \sigma^i) = 1\). Therefore, \(\pi^1_2 (m^i, t^i | \sigma^i)\) depends on \(m^i\) only if \(t^i = t_0\).

Consider candidate A (the reasoning for B is analogous and omitted). Her expected utility when her type is \(\theta\) and she sends message \(m \in M\) is given by:

\[
U^A (m, \sigma^H | \theta) = \sum_{s \in S} \sigma^H [s] \left[ q \cdot W^A (m, s (\theta_H) ) + (1 - q) \cdot W^A (m, s (\theta_L) ) \right].
\]

which is increasing in \(\pi^1_1 (\cdot)\) as, by Assumption 1, \(W^A (m^A, m^B)\) is strictly increasing in \(\pi^1_1 (\cdot)\).
Suppose that there exists a message \( m_H \) sent with positive probability such that \( \pi^A_1 (m_H \mid \sigma^A) > q \). Then, there must exists another message \( m_L \), sent with positive probability, such that \( \pi^A_1 (m_L \mid \sigma^A) < q \). Obviously, message \( m_L \) must be sent with positive probability by a candidate with low valence. Then, the low valence candidate could modify her strategy and send message \( m_H \) every time she was supposed to send message \( m_L \). Obviously, \( \pi^A_1 (m_H \mid \sigma^A) > \pi^A_1 (m_L \mid \sigma^A) \) and this deviation would increase candidates’ expected utility and contradict the definition of equilibrium.

Thus, for every message \( m \), \( \pi^A_1 (m \mid \sigma^A) = \pi^B_1 (m \mid \sigma^B) = q \) and

\[
\pi^i_2 (m^i, t^i \mid \sigma^i) = \begin{cases} 
1 & t^i = 1 \\
q & t^i = t_0 \\
0 & t^i = t_L 
\end{cases}, \quad i \in \{A,B\}
\]

and the communication strategies can be assumed to be uninformative. Then the probability that candidates A wins after message-signal pair \((\bar{m}, m, t^A, t^B)\) is given by:

\[
\frac{1}{2} + \psi \cdot (\pi^A_2 (\bar{m}, t^A \mid \sigma^A) - \pi^B_2 (\bar{m}, t^B \mid \sigma^B)) \cdot G
\]

The statement of the theorem follows immediately. ■

### 6.2 Proof of Proposition 2

Suppose voters hold conjecture \((s^A_{R}, s^B_{R})\). Then, for every \( i \in \{A,B\}, \pi^i_1 (m_H \mid s^i_{R}) = 1, \pi^i_1 (m_L \mid s^i_{R}) = 0 \). Recall that (i) given a message pair \((m^A, m^B)\) the reference point assigns probability

\[
\sum_{t^A, t^B} \left[ \hat{\pi} (t^A, t^B \mid m^A, m^B, s^A_{R}, s^B_{R}) \cdot (W^A (m^A, m^B, t^A, t^B \mid s^A_{R}, s^B_{R}) \cdot \pi^A_2 (m^A, t^A \mid s^A_{R}) + \\
+ (1 - W^A (m^A, m^B, t^A, t^B \mid s^A_{R}, s^B_{R})) \cdot \pi^B_2 (m^B, t^B \mid s^B_{R})) \right]
\]

to \( g_H \) and complementary probability to \( g_L \), and that (ii) given a message-signal profile \((m^A, m^B, t^A, t^B)\):

\[
W^A (m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) = \\
= \left[ \frac{1}{2} + \psi \cdot (\pi^A_2 (m^A \mid s^A_{R}) - \pi^B_2 (m^B \mid s^B_{R})) \cdot \Gamma (\tilde{\pi} (m^A, m^B \mid s^A_{R}, s^B_{R}) [g_H]) \right]
\]

We will analyze each pair of messages separately.

First, consider message pair is \((m_H, m_H)\). Notice that \( \pi (t^A, t^B \mid m_H, m_H, s^A_{R}, s^B_{R}) > 0 \) if and only if \((t^A, t^B) \in \{(t_H, t_H), (t_H, t_0), (t_0, t_H), (t_0, t_0)\}\). Furthermore, for all these signals pairs \( \pi^i_2 (m_H, t^i \mid s^i_{R}) = 1 \) for every \( i \in \{A,B\} \). Thus, the reference point will be a degenerate probability measure that assigns mass 1 to \( g_H \). Therefore for every \((t^A, t^B) \in \{(t_H, t_H), (t_H, t_0), (t_0, t_H), (t_0, t_0)\}:

\[
W^A (m_H, m_H, t^A, t^B \mid s^A_{R}, s^B_{R}) = \frac{1}{2}
\]

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Suppose instead that A generates signal $t_L$, while B generates either $t_0$ or $t_H$. Then $\pi_A^1 (m_H, t_L \mid s_R^A) = 0$, while $\pi_A^B (m_H, t_H \mid s_R^B) = \pi_B^B (m_H, t_0 \mid s_R^B) = 1$. Thus,

$$W^A (m_H, m_H, t_L, t_0 \mid s_R^A, s_R^B) = W^A (m_H, m_H, t_L, t_H \mid s_R^A, s_R^B) = \frac{1}{2} - \psi \cdot (1 + \eta \lambda) \cdot G$$

which is greater than $-\frac{1}{2\psi}$ by assumption 1. A symmetric reasoning allows us to conclude that

$$W^A (m_H, m_H, t_H, t_L \mid s_R^A, s_R^B) = W^A (m_H, m_H, t_0, t_L \mid s_R^A, s_R^B) = \frac{1}{2} + \psi \cdot (1 + \eta \lambda) \cdot G$$

Finally if both candidates generate signal $t_L$, then for every $i \in \{A,B\}$ $\pi_i (m_H, t_L \mid s_R^i) = 0$ and

$$W^A (m_H, m_H, t_L, t_L \mid s_R^A, s_R^B) = \frac{1}{2}$$

Now, consider message pair $(m_L, m_L)$. In this case, $\hat{\pi} (t^A, t^B \mid m_L, m_L, s_R^A, s_R^B) > 0$ if and only if $(t^A, t^B) \in \{(t_L, t_L), (t_L, t_0), (t_0, t_L), (t_0, t_0)\}$ and for every $i \in \{A,B\}$ and every $t^i \in \{t_L, t_0\}$, $\pi^i (m_L, t^i \mid s_R^i) = 0$. Then, the reference point at $(m_L, m_L)$ will be a degenerate measure that assigns mass 1 to $g_L$. Therefore, for every $(t^A, t^B) \in \{(t_L, t_L), (t_L, t_0), (t_0, t_L), (t_0, t_0)\},$

$$W^A (m_A, m_B, t^A, t^B \mid s_R^A, s_R^B) = \frac{1}{2}$$

Following the same steps described above, we can further conclude that:

$$W^A (m_L, m_L, t_H, t_0 \mid s_R^A, s_R^B) = W^A (m_L, m_L, t_L, t_L \mid s_R^A, s_R^B) = \frac{1}{2} + \psi \cdot (1 + \eta \lambda) \cdot G$$

$$W^A (m_L, m_L, t_0, t_H \mid s_R^A, s_R^B) = W^A (m_L, m_L, t_L, t_H \mid s_R^A, s_R^B) = \frac{1}{2} - \psi \cdot (1 + \eta \lambda) \cdot G$$

$$W^A (m_L, m_L, t_H, t_H \mid s_R^A, s_R^B) = \frac{1}{2}$$

Finally, let the messages pair be $(m_H, m_L)$ (the case $(m_L, m_H)$ is symmetric and omitted). Then $\hat{\pi} (t^A, t^B \mid m_H, m_L, s_R^A, s_R^B) > 0$ if only if $(t^A, t^B) \in \{(t_0, t_0), (t_H, t_L), (t_H, t_0), (t_0, t_L)\}$. Furthermore, after these signal pairs we have $\pi_A^1 (m_H, t^A \mid s_R^A) = 1$ and $\pi_B^B (m_L, t^B \mid s_R^B) = 1$. Thus:

$$\hat{\tau} (m_H, m_L \mid s_R^A, s_R^B) [g_H] = \sum_{t^A \mid t^B} \left[ \hat{\pi} (t^A, t^B \mid m_H, m_L, s_R^A, s_R^B) \cdot W^A (m_H, m_L, t^A, t^B \mid s_R^A, s_R^B) \right]$$

Moreover, for every $i \in \{A,B\}$, $\pi_i^1 (m_H, t^i \mid s_R^i)$ is the same across all these signal pairs. Thus

$$W^A (m_A, m_B \mid s_R^A, s_R^B) = \sum_{t^A \mid t^B} \left[ \hat{\pi} (t^A, t^B \mid m_H, m_L, s_R^A, s_R^B) \cdot W^A (m_H, m_L, t^A, t^B \mid s_R^A, s_R^B) \right] = W^A (m_H, m_L, t^A, t^B \mid s_R^A, s_R^B)$$

As a result, the reference point, $\hat{\tau} (m_H, m_L \mid s_R^A, s_R^B)$, will assign probability $W^A (m_H, m_L \mid s_R^A, s_R^B)$ to $g_H$ and complementary probability to $g_L$.

Thus, for every signal pair $(t^A, t^B) \in \{(t_0, t_0), (t_H, t_L), (t_H, t_0), (t_0, t_L)\}$, the probability with
which A wins after message-signal pair \((m_H, m_L, t^A, t^B)\) is implicitly defined by:

\[
W^A(m_H, m_L, t^A, t^B \mid s^A_R, s^B_R) = \frac{1}{2} + \psi \cdot (1 - 0) \cdot \Gamma(W^A(m_H, m_L, t^A, t^B \mid s^A_R, s^B_R))
\]

Using, the expression for function \(\Gamma(\cdot)\) and rearranging terms, we get:

\[
W^A(m_H, m_L, t^A, t^B \mid s^A_R, s^B_R) = \frac{1}{2} + \psi \cdot (1 + \eta) \cdot \frac{G}{1 - \psi \cdot \eta (\lambda - 1) \cdot G}
\]

Notice that \(W^A(m_H, m_L, t^A, t^B \mid s^A_R, s^B_R)\) (i) is increasing in \(\lambda\), and, (ii) by Assumption 1, it belongs to the inverval \([\frac{1}{2} + \psi (1 + \eta) G, \frac{1}{2} + \psi (1 + \eta \lambda) G]\). Now suppose A generates signal \(t_H\) or \(t_0\), while candidate B generates signal \(t_H\). Then \(\pi^A_0(m_H, t_H \mid s^A_R) = \pi^A_0(m_H, t_0 \mid s^A_R) = 1\) and \(\pi^B_0(m_H, t_H \mid s^B_R) = 1\) and we can conclude that:

\[
W^A(m_H, m_L, t_H, t_H \mid s^A_R, s^B_R) = W^A(m_H, m_L, t_0, t_H \mid s^A_R, s^B_R) = \frac{1}{2}
\]

Following a similar reasoning:

\[
W^A(m_H, m_L, t_L, t_L \mid s^A_R, s^B_R) = W^A(m_H, m_L, t_L, t_0 \mid s^A_R, s^B_R) = \frac{1}{2}
\]

Finally, consider signal pair \((t_L, t_H)\). Then, the probability with which A wins will be given by:

\[
W^A(m_H, m_L, t_L, t_H \mid s^A_R, s^B_R) = \left( \frac{1}{2} - \psi \cdot \Gamma(W^A(m_H, m_L, t_H, t_L \mid s^A_R, s^B_R)) \right)
\]

Substituting for \(W^A(m_H, m_L, t_H, t_L \mid s^A_R, s^B_R)\) and rearranging, we get:

\[
W^A(m_H, m_L, t_L, t_H \mid s^A_R, s^B_R) = \frac{\frac{1}{2} - \psi (1 + \eta \lambda) G}{1 - \psi \eta (\lambda - 1) G} = 1 - W^A(m_H, m_L, t_H, t_L \mid s^A_R, s^B_R).
\]

### 6.3 Proof of Proposition 3

Consider candidate A (the analysis for candidate B is similar and omitted) and suppose she conjectures that B is following communication strategy \(s^B_R\). Then by proposition 2, the difference in expected utility between truth-telling and lying is given by:

\[
U^A(m_H, s^B_R \mid \theta_H) - U^A(m_L, s^B_R \mid \theta_H) = q \cdot \frac{1}{2} + (1 - q) W_R(\eta, \lambda, G, \psi) - q \left( \frac{P}{2} + (1 - p) (1 - W_R(\eta, \lambda, G, \psi)) \right) - (1 - q) \left( pW^-(\eta, G) + \frac{(1 - p)}{2} \right)
\]
conclude that if the candidate has high valence and by

\[ U^A (m_L, s^B_R | \theta_L) - U^A (m_H, s^B_R | \theta_L) = q (1 - W_R (\eta, \lambda, G, \psi)) + \frac{(1-q)}{2} - q \left( p (1 - W^+ (\eta, \lambda, G)) + \frac{(1-p)}{2} \right) - (1-q) \left( \frac{p}{2} + (1-p) W_R (\eta, \lambda, G, \psi) \right) \]

if the candidate has low valence.

Since \( W_R (\eta, \lambda, G, \psi) > W^- (\eta, G) > \frac{1}{2} \), we can easily conclude that \( U^A (m_H, s^B_R | g_H) > U^A (m_L, s^B_R | g_H) \). Therefore truth-telling is optimal for high-valence candidates.

Define \( h(p) = U^A (m_L, s^B_R | \theta_L) - U^A (m_H, s^B_R | \theta_L) \). Obviously, \( h(\cdot) \) is continuous in \( p \). Furthermore since \( W^+ (\eta, \lambda, G) > W_R (\eta, \lambda, G, \psi) > \frac{1}{2} \),

\[
\begin{align*}
    h(0) &= q \left( \frac{1}{2} - W_R (\eta, \lambda, G, \psi) \right) - (1-q) \left( W_R (\eta, \lambda, G, \psi) - \frac{1}{2} \right) < 0 \\
    h(1) &= q \left( W^+ (\eta, \lambda, G) - W_R (\eta, \lambda, G, \psi) \right) > 0 \\
    h'(p) &= q \left( W^+ (\eta, \lambda, G) - \frac{1}{2} \right) + (1-q) \left( W_R (\eta, \lambda, G, \psi) - \frac{1}{2} \right) > 0, \forall p.
\end{align*}
\]

Thus, there exists a unique \( p^* (\eta, \lambda, G, q, \psi) < 1 \), such that \( U^A (m_L, s^B_R | \theta_L) = U^A (m_H, s^B_R | \theta_L) \). If \( p > (\leq) p^* (\eta, \lambda, G, q, \psi) \), then \( U^A (m_L, s^B_R | \theta_L) > (\leq) U^A (m_H, s^B_R | \theta_L) \). As a result, if \( p \in [p^* (\eta, \lambda, G, q, \psi), 1] \), then \( U^A (m_L, s^B_R | \theta_L) \geq U^A (m_H, s^B_R | \theta_L) \) and \( U^A (m_H, s^B_R | \theta_H) \geq U^A (m_L, s^B_R | \theta_H) \) so that a fully revealing equilibrium exists.\(^{42}\)

On the contrary, if a fully revealing equilibrium exists, then we need \( U^A (m_L, s^B_R | \theta_L) \geq U^A (m_H, s^B_R | \theta_L) \) and \( U^A (m_H, s^B_R | \theta_H) \geq U^A (m_L, s^B_R | \theta_H) \). By the previous reasoning, we can conclude that \( p \) must belong to the interval \([p^* (\eta, \lambda, G, q, \psi), 1] \).

Also notice that \( p^* (\eta, 1, G, q, \psi) = p^* (\eta, \bar{\lambda}, G, q, \psi) = 1 \) (this last result follows from the fact that \( W_R (\eta, \bar{\lambda}, G, \psi) = W^+ (\eta, \bar{\lambda}, G, \psi) = 1 \)). Furthermore, by the implicit function theorem

\[
\frac{\partial p^* (\eta, \lambda, G, q, \psi)}{\lambda} \bigg|_{\lambda=1} < 0, \quad \frac{\partial p^* (\eta, \lambda, G, q, \psi)}{\lambda} \bigg|_{\lambda=\bar{\lambda}} > 0,
\]

Thus, \( p^* (\eta, \lambda, G, q, \psi) \) is minimized for some \( \lambda \in (1, \bar{\lambda}) \).

### 6.4 Proof of Proposition 4

To prove the existence of the uninformative equilibrium, it is sufficient to show that probabilities \( W^A (\bar{m}, \bar{m}, t^A, t^B | s^A_U, s^B_U) \) are the ones described in the proposition, as the optimality of uninformative strategies follows immediately from voters’ conjectures.

Obviously, for every \( i \in \{A,B\} \) \( \pi^1_i (\bar{m} | s^U_i) = q \), \( \pi^2_i (\bar{m}, t_L | s^U_i) = 0 \), \( \pi^2_i (\bar{m}, t_0 | s^U_i) = q \),\(^{42}\)In the knife-edge case in which \( p = p^* (\eta, \lambda, G, q | \psi) \), we assume that type \( \theta_L \) sends message \( m_L \). None of our results hinges on this tie-breaking rule.
\( \pi_2^i (\bar{m}, t_H \mid s_U^i) = 1 \). Furthermore, \( \tilde{\pi} (t^A, t^B \mid m^A, m^B, s_U^A, s_U^B) \) is given by:

<table>
<thead>
<tr>
<th>( (m^A, m^B) )</th>
<th>( t_L )</th>
<th>( t_0 )</th>
<th>( t_H )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t_L )</td>
<td>( p^2 (1 - q)^2 )</td>
<td>( p (1 - q)^2 )</td>
<td>( p^2 (1 - q) q )</td>
</tr>
<tr>
<td>( t_0 )</td>
<td>( (1 - p) p (1 - q) )</td>
<td>( (1 - p)^2 )</td>
<td>( (1 - p) pq )</td>
</tr>
<tr>
<td>( t_H )</td>
<td>( p^2 q (1 - q) )</td>
<td>( pq (1 - p) )</td>
<td>( p^2 q^2 )</td>
</tr>
</tbody>
</table>

Notice that for any reference point and for any signal \( t \in \{ t_L, t_0, t_H \} \), \( \pi_2^A (\bar{m}, t \mid s_U^A) = \pi_2^B (\bar{m}, t \mid s_U^B) \). Thus, we can immediately conclude that for every \( (t^A, t^B) \in \{(t_L, t_L), (t_0, t_0), (t_H, t_H)\} \):

\[
W^A (\bar{m}, \bar{m}, t^A, t^B \mid s_U^A, s_U^B) = \frac{1}{2}
\]

Now, consider signal pair \( (t_H, t_L) \). Then, \( \pi_2^A (\bar{m}, t_H \mid s_U^A) = 1 \), \( \pi_2^A (\bar{m}, t_L \mid s_U^A) = 0 \) and we can conclude that:

\[
W^A (\bar{m}, \bar{m}, t_H, t_L \mid s_U^A, s_U^B) = \frac{1}{2} + \psi \cdot \Gamma (\tilde{\pi} (\bar{m}, \bar{m} \mid s_U^A, s_U^B) [g_H]) \tag{12}
\]

Symmetrically:

\[
W^A (\bar{m}, \bar{m}, t_L, t_H \mid s_U^A, s_U^B) = \frac{1}{2} - \psi \cdot \Gamma (\tilde{\pi} (\bar{m}, \bar{m} \mid s_U^A, s_U^B) [g_H]) \tag{13}
\]

Following similar steps we can conclude that:

\[
W^A (\bar{m}, \bar{m}, t_H, t_0 \mid s_U^A, s_U^B) = \frac{1}{2} + \psi \cdot (1 - q) \cdot \Gamma (\tilde{\pi} (\bar{m}, \bar{m} \mid s_U^A, s_U^B) [g_H]) \tag{14}
\]

\[
W^A (\bar{m}, \bar{m}, t_0, t_H \mid s_U^A, s_U^B) = \frac{1}{2} - \psi \cdot (1 - q) \cdot \Gamma (\tilde{\pi} (\bar{m}, \bar{m} \mid s_U^A, s_U^B) [g_H]) \tag{15}
\]

and

\[
W^A (\bar{m}, \bar{m}, t_0, t_L \mid s_U^A, s_U^B) = \frac{1}{2} + \psi \cdot q \cdot \Gamma (\tilde{\pi} (\bar{m}, \bar{m} \mid s_U^A, s_U^B) [g_H]) \tag{16}
\]

\[
W^A (\bar{m}, \bar{m}, t_L, t_0 \mid s_U^A, s_U^B) = \frac{1}{2} - \psi \cdot q \cdot \Gamma (\tilde{\pi} (\bar{m}, \bar{m} \mid s_U^A, s_U^B) [g_H]) \tag{17}
\]

Equations (12)-(17), together with \( \tilde{\pi} (t^A, t^B \mid m^A, m^B, s_U^A, s_U^B) \) define the reference point of voters in an uninformative equilibrium. In particular, one can show that:

\[
\tilde{\pi} (\bar{m}, \bar{m} \mid s_U^A, s_U^B) [g_H] = \frac{q (1 + 2 \psi p (1 - q) (1 + \eta) G)}{1 - 2 \psi pq (1 - q) \eta (\lambda - 1) G}
\]

Probabilities \( W^A (\cdot \mid s_U^A, s_U^B) \) follow from substituting \( \tilde{\pi} (\bar{m}, \bar{m} \mid s_U^A, s_U^B) [g_H] \) into (12)-(17).

By Assumption 1, \( W_{U, \kappa} (\eta, \lambda, G, q, p, \psi) \) is greater than \( \frac{1}{2} \) and increasing in \( q \) (to see this last...
point, notice that \( \frac{\partial W_{i,\epsilon}(\eta, \lambda, G, q, p, \psi)}{\partial q} \) has the same sign of the expression
\[
(1 + 2Gp\psi (1 + \eta) - 4Gpq\psi (1 + \eta) - 2Gp\eta^2 (\lambda - 1) \psi\eta),
\]
which is greater or equal than \( 1 - 2\psi p (1 + \eta \lambda) G \). This last term is positive by Assumption 1). Furthermore, \( W_{U,1} (\eta, \lambda, G, 0, p, \psi) = W^- (\eta, G) \) and \( W_{U,1} (\eta, \lambda, G, 1, p, \psi) = W^+ (\eta, \lambda, G). \]

### 6.5 Proof of Lemma 1

Fix an equilibrium \((\sigma^A, \sigma^B)\). Then for every \((m^A, m^B)\),
\[
W^A (m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) = \frac{1}{2} + \psi \cdot \left[ \pi^A (m^A, t^A \mid \sigma^A) - \pi^B (m^B, t^B \mid \sigma^B) \right] \cdot \Gamma (\tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_H])
\]

Then using the expression for \( \tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_H] \) and the one for \( \tilde{\pi} (t^A, t^B \mid m^A, m^B, \sigma^A, \sigma^B) \),
we can conclude that:
\[
\tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_H] = \pi^A + \pi^B + \psi \cdot \left[ (\pi^A - \pi^B)^2 + \left( \pi^A (1 - \pi^A) + \pi^B (1 - \pi^B) \right) \right] \cdot \Gamma (\tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_H])
\]

Substituting the expression for \( \Gamma \) and rearranging terms we get:
\[
\tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_H] = \frac{\pi^A + \pi^B}{2} + \psi (1 + \eta) \left[ (\pi^A - \pi^B)^2 + \left( \pi^A (1 - \pi^A) + \pi^B (1 - \pi^B) \right) \right] G
\]
\[
1 - \psi \eta (\lambda - 1) \left[ (\pi^A - \pi^B)^2 + \left( \pi^A (1 - \pi^A) + \pi^B (1 - \pi^B) \right) \right] G
\]

Notice that if \( \pi^A = \pi^B = q \), the previous expression is identical to the one we derived for the uninformative equilibrium. Deriving the previous expression with respect to \( \pi^A \) and imposing symmetricity, we can conclude that \( \tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_H] \) is everywhere increasing in \( \pi^A \):
\[
\frac{1}{2\psi} - G \left( 2 + \frac{1}{2} \eta + \frac{3}{2} \lambda \eta \right) > 0
\]

(this follows from noticing that the derivative is minimized when \( \pi^A = 0, \pi^B = 1 \) and \( p = 0 \).)

### 6.6 Proof of Lemma 2

Let \((\sigma^A, \sigma^B)\) be a symmetric equilibrium. Pick any player \( i \) and define \( \pi^{i*} = \max_{m \in M} \pi^i (\cdot \mid \sigma^i) \).
The maximum exists since the message space is finite. Obviously \( \pi^{i*} > 0 \). By symmetricity \( \pi^{A,*} = \pi^{B,*} = \pi^* \).

\[\text{To simplify notation, we omit to specify the dependency of } \pi^1 \text{ on message } m^i \text{ and communication strategy } \sigma^i.\]
First, we show that high-valence candidates will only send messages that yield probability $\pi^*$. Formally, we show that for every $i$, $\sigma^i [s^i] > 0$ if and only if $\pi^i_1 (s^i | \sigma_P) = \pi^*$. Thus, we will be able to focus on equilibria in which high-types only send message $m^*$, where $\pi^i_1 (m^* | \sigma_P) = \pi^*$.

Suppose not. Then we can find a message $m$ such that: (i) $s^i (g_H) = m$ for some $s^i$ such that $\sigma^i [s^i] > 0$, and (ii) $\pi^i_1 (m | \sigma^i) < \pi^*$. Thus, high valence candidate must be indifferent between inducing belief $\pi^*$ and inducing belief $\pi^i_1 (m | \sigma^i)$.

Pick any message $m^*$ such that $\pi^i_1 (m^* | \sigma^i) = \pi^*$ and consider the strategy that always sends message $m^*$. Notice that $\pi^i_2 (m^*, t_0 | \sigma^i) = \max_{m \in M} \pi^i_2 (m, t_0 | \sigma^i)$, $\pi^i_2 (m^*, t_L | \sigma^i) = \pi^i_2 (m, t_L | \sigma^i) = 0$, $\pi^i_2 (m^*, t_H | \sigma^i) = \pi^i_2 (m, t_H | \sigma^i) = 1$ and that Lemma 1 implies that $\tilde{f} (m^*, m^j | \sigma^i, \sigma^j) [g_H]$ is increasing in $\pi^i_1$. Thus, for every message $m^j$ $W^i (m^*, m^j | \sigma_P, \sigma_P) > W^i (m, m^j | \sigma_P, \sigma_P)$ and, as a result $U^i (m^*, \sigma_P | \theta_H) > U^i (m, \sigma_P | \theta_H)$, contradicting our initial hypothesis. As a result, $\sigma^i [s^i] > 0$ if and only if $\pi^i_1 (s^i (g_H) | \sigma^i) = \pi^*$.

Now, consider low-valence candidate. Three cases are possible. If low-valence candidates never (respectively, always) send message $m^*$, then the equilibrium is fully informative (respectively, uninformative). Finally, consider the case in which low-valence candidates send both $m^*$ and some other messages. In this case, we can assume that they only send one additional message $m^* \neq m^*$ as our previous result implies that $\pi^i_1 (m | \sigma^i) = 0$ for every $m \neq m^*$. Obviously, $\pi^i_1 (m^* | \sigma^i) = 0$.

### 6.7 Proof of Proposition 5

Let $(\sigma_P, \sigma_P)$ be a $\pi$-symmetric partially revealing equilibrium. By Lemma 2, we can focus our attention on message spaces $M = \{m^*, m^*\}$. We will consider each message pair separately.

If the message pair is $(m^*, m^*)$, probabilities are identical to the one generated in a fully revealing equilibrium after message pair $(m^*, m^*)$. If instead the message pair is $(m^*, m^*)$, the analysis is identical to the one we developed for the uninformative equilibrium with $q = \pi$. Thus, $W^A (m^*, m^*; \cdot, \cdot | \sigma_P, \sigma_P)$ and $W^A (m^*, m^*; \cdot, \cdot | \sigma_P, \sigma_P)$ can be summarized as follows:

<table>
<thead>
<tr>
<th>$(m^<em>, m^</em>)$</th>
<th>$t_L$</th>
<th>$t_0$</th>
<th>$t_H$</th>
<th>$(m^<em>, m^</em>)$</th>
<th>$t_L$</th>
<th>$t_0$</th>
<th>$t_H$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_L$</td>
<td>$\frac{1}{2}$</td>
<td>$1 - W_{U;\pi}^\pi$</td>
<td>$1 - W_{U;1}^\pi$</td>
<td>$t_L$</td>
<td>$\frac{1}{2}$</td>
<td>$\frac{1}{2}$</td>
<td>$1 - W^-$</td>
</tr>
<tr>
<td>$t_0$</td>
<td>$W_{U;\pi}^\pi$</td>
<td>$\frac{1}{2}$</td>
<td>$1 - W_{U;1}^\pi$</td>
<td>$t_0$</td>
<td>$\frac{1}{2}$</td>
<td>$\frac{1}{2}$</td>
<td>$1 - W^-$</td>
</tr>
<tr>
<td>$t_H$</td>
<td>$W_{U;1}^\pi$</td>
<td>$W_{U; (1 - \pi)}^\pi$</td>
<td>$\frac{1}{2}$</td>
<td>$t_H$</td>
<td>$W^-$</td>
<td>$W^-$</td>
<td>$\frac{1}{2}$</td>
</tr>
</tbody>
</table>

Since $\pi > q$, $W_{1,U} (\eta, \lambda, G, q, p, \psi)$ is increasing in $q$ and reaches $W^+ (\eta, \lambda, G)$ at $q = 1$, we conclude that $W_{1} (\eta, \lambda, G, \pi, p, \psi) \in [W_{1,U} (\eta, \lambda, G, q, p, \psi), W^+ (\eta, \lambda, G)]$.

Now, consider message pair $(m^*, m^*)$ (the case $(m^*, m^*)$ is symmetric and omitted). In this case $\tilde{f} (t^A, t^B | m^*, m^*, \sigma_P, \sigma_P)$ is given by

<table>
<thead>
<tr>
<th>$(m^<em>, m^</em>)$</th>
<th>$t_L$</th>
<th>$t_0$</th>
<th>$t_H$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_L$</td>
<td>$p^2 (1 - \pi)$</td>
<td>$p (1 - p) (1 - \pi)$</td>
<td>0</td>
</tr>
<tr>
<td>$t_0$</td>
<td>$(1 - p) p$</td>
<td>$(1 - p)^2$</td>
<td>0</td>
</tr>
<tr>
<td>$t_H$</td>
<td>$p^2 \pi$</td>
<td>$p (1 - p) \pi$</td>
<td>0</td>
</tr>
</tbody>
</table>
Furthermore, given the expression for $W^A (m^A, m^B, t^A, t^B)$ we know that for every $(t^A, t^B)$:

$$W^A (m^*, m^*, t^A, t^B) = \frac{1}{2} + \psi \cdot \left( \frac{\pi^2}{2} (m^* | \sigma_p) - \frac{\pi^2}{2} (m^* | \sigma_p) \right) \cdot \Gamma (\tilde{r} (m^*, m^* | \sigma_p, \sigma_p) [g_H])$$

Substituting these expressions in the one for $\tilde{r} (m^*, m^* | \sigma_P, \sigma_P, \gamma_{P}) [g_H]$, using the definition of $\Gamma (\cdot)$ and rearranging terms, we get:

$$\tilde{r} (m^A, m^B | \sigma^A, \sigma^B) [g_H] = \frac{\pi^2}{2} + \psi (1 + \eta) \left( \frac{\pi^2 + p \pi (1 - \pi)}{1 - \psi \eta (\lambda - 1) (\pi^2 + p \pi (1 - \pi))} \right) G$$

Thus, if we define:

$$W_{P,\kappa} = W_{P,\kappa} (\eta, \lambda, G, \pi, p, \psi) = \frac{1}{2} + \psi \cdot \kappa \cdot \left( \frac{1 + \eta + \frac{\pi^2}{2} (\lambda - 1)}{1 - \psi \eta (\lambda - 1) (\pi^2 + p \pi (1 - \pi))} \right) G$$

$W^A (m^*, m^*, \cdot, \cdot | \sigma_P, \sigma_P)$ can be summarized in the following table:

<table>
<thead>
<tr>
<th>$(m^<em>, m^</em>)$</th>
<th>$t_L$</th>
<th>$t_0$</th>
<th>$t_H$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_L$</td>
<td>$\frac{1}{2}$</td>
<td>$\frac{1}{2}$</td>
<td>$1 - W_{P,1}$</td>
</tr>
<tr>
<td>$t_0$</td>
<td>$W_{P,\pi}$</td>
<td>$W_{P,\pi}$</td>
<td>$1 - W_{P, (1 - \pi)}$</td>
</tr>
<tr>
<td>$t_H$</td>
<td>$W_{P,1}$</td>
<td>$W_{P,1}$</td>
<td>$\frac{1}{2}$</td>
</tr>
</tbody>
</table>

Notice that $W_{P,1} (\eta, \lambda, G, \pi, p, \psi)$ is increasing in $\pi$ and reaches $W_R (\eta, \lambda, G, \psi)$ when $\pi = 1$. Thus, $W_{P,1} (\eta, \lambda, G, \pi, p, \psi) < W_R (\eta, \lambda, G, \psi)$ for every $\pi$ and $p$. Furthermore $W_{P, \kappa} (\eta, \lambda, G, \pi, p, \psi) < W_{U, \kappa} (\eta, \lambda, G, \pi, p, \psi)$ if and only if:

$$1 - 2 \psi G (\pi (1 + \eta) - (1 - \pi) p (1 + \eta) + \pi^2 (\lambda - 1) \eta) > 0$$

which is guaranteed by assumption 1.

### 6.8 Proof of Proposition 7

We will only prove the statements concerning high-valence candidates as the result for low-valence candidates can be derived in a similar way. Given our previous analysis, in a fully revealing equilibrium, if agent $i$ is high-valence, he would get an expected utility equal to:

$$U^i (m_H, s_R | \theta_H) = \frac{q}{2} + (1 - q) \cdot W_R = \frac{1}{2} + (1 - q) \cdot \psi \cdot \frac{2 + \lambda \eta + \eta}{2 (1 - \psi \eta (\lambda - 1) G)} \cdot G$$
On the other hand, her expected utility in an uninformative equilibrium would be given by:

\[
U^i (\bar{m}, s_U | \theta_H) = \frac{1}{2} + \psi \cdot (1 - q) \cdot p \cdot \frac{1 + \eta \lambda q + \eta (1 - q)}{1 - 2\psi \eta (\lambda - 1) p (1 - q) q G} \cdot G
\]

It is easy to verify that \( q \leq q^* (\eta, \lambda, G, p, \psi) \) implies \( \frac{2 + \lambda q + \eta}{2(1 - \psi \eta \lambda - 1) G} \geq \frac{1 + \eta \lambda q + \eta (1 - q)}{1 - 2\psi \eta (\lambda - 1) p (1 - q) q G} \) and consequently \( U^i (m_H, s_R | \theta_H) \geq U^i (\bar{m}, s_U | \theta_H) \).

Furthermore, the payoff of a high-valence candidate in a \( \pi \)-symmetric partially revealing equilibrium is given by:

\[
U^i (m^*, \sigma_P | \theta_H) = \frac{1}{2} + (1 - q) \cdot \psi \cdot z_{\pi} \cdot p \cdot d_U (\eta, \lambda, G, \pi, p, \psi) \cdot G + (1 - q) \cdot \psi \cdot (1 - z_{\pi}) \cdot ((1 - p) \pi + p) \cdot d_P (\eta, \lambda, G, \pi, p, \psi) \cdot G
\]

Now notice that:

\[
z_{\pi} \cdot p \cdot d_U (\eta, \lambda, G, \pi, p, \psi) + (1 - z_{\pi}) \cdot ((1 - p) \pi + p) \cdot d_P (\eta, \lambda, G, \pi, p, \psi)
\]

can be rewritten as:

\[
z_{\pi} \cdot p \cdot (d_U (\eta, \lambda, G, \pi, p, \psi) - d_P (\eta, \lambda, G, \pi, p, \psi)) + ((1 - p) \pi + p) \cdot d_P (\eta, \lambda, G, \pi, p, \psi) - z_{\pi} \cdot (1 - p) \pi \cdot d_P (\eta, \lambda, G, \pi, p, \psi)
\]

Substituting the expression for \( z_{\pi} \) and using equation (11) on the first term, we can conclude that the previous expression is equal to \( d_P (\eta, \lambda, G, \pi, p, \psi) \). Thus:

\[
U^i (m^*, \sigma_P^B | \theta_H) = \frac{1}{2} + (1 - q) \cdot \psi \cdot d_P (\eta, \lambda, G, \pi, p, \psi) \cdot G
\]

One can show that \( d_P (\eta, \lambda, G, \pi, p, \psi) \) is increasing in \( \pi \) and equals \( \frac{2 + \lambda q + \eta}{2(1 - \psi \eta \lambda - 1) G} \) when \( \pi = 1 \). As a result, \( U^i (m_H, s_R | \theta_H) > U^i (m^*, \sigma_P^B | \theta_H) \).

### 6.9 Proof of Proposition 8

In a fully revealing equilibrium, the expected total utility of a voter is given by:

\[
g_L + q^2 \cdot G + 2 \cdot q \cdot (1 - q) \cdot W_R (\eta, \lambda, G, \psi) \cdot G \\
- 2 \cdot q \cdot (1 - q) \cdot \eta (\lambda - 1) \cdot W_R (\eta, \lambda, G, \psi) \cdot (1 - W_R (\eta, \lambda, G, \psi)) \cdot G
\]
On the contrary, in an uninformative equilibrium it is given by:

\[
g_L + q^2 \cdot G + 2 \cdot q \cdot (1 - q) \cdot (g_L + K \cdot G) + \\
+ \left( q^2 \eta \cdot \tilde{r} (\tilde{m}, \tilde{m} | s_U, s_U) [g_L] - (1 - q)^2 \eta \lambda \cdot \tilde{r} (\tilde{m}, \tilde{m} | s_U, s_U) [g_H] \right) \cdot G + \\
+ 2q (1 - q) \cdot (\eta K \cdot \tilde{r} (\tilde{m}, \tilde{m} | s_U, s_U) [g_L] - \eta \lambda (1 - K) \cdot \tilde{r} (\tilde{m}, \tilde{m} | s_U, s_U) [g_H]) G
\]

where \( K \) is the probability with which the high-valence candidate is chosen when one candidate is high-valence and the other one is low valence. Formally:

\[
K = p^2 \cdot W_{U,1} (\eta, \lambda, G, q, p, \psi) + \frac{(1 - p)^2}{2} + \\
+ p (1 - p) \cdot W_{U,(1-q)} (\eta, \lambda, G, q, p, \psi) + (1 - p) p \cdot W_{U,q} (\eta, \lambda, G, q, p, \psi) = \\
= \frac{1}{2} + \psi \cdot p \cdot d_U (\eta, \lambda, G, q, p, \psi) \cdot G
\]

Furthermore,

\[
\tilde{r} (\tilde{m}, \tilde{m} | s_U, s_U) [g_H] = q + 2q (1 - q) \cdot p \cdot \psi \cdot d_U (\eta, \lambda, G, q, p, \psi)
\]

Let \( W_R = W_R (\eta, \lambda, G, \psi) \) and for every \( x \), \( W_{U,x} (\eta, \lambda, G, q, p, \psi) = W_{U,x} \). Using the definition of reference points and simplifying, we can conclude that the total utility of the electorate in the fully revealing equilibrium is greater than the one in the uninformative equilibrium if and only if:

\[
2 \cdot (W_R - K) > \eta (\lambda - 1) \cdot \left( 2 \cdot W_R \cdot (1 - W_R) - q (1 - q) - 2q^2 (1 - K) - 2 (1 - q)^2 K - 4q (1 - q) K (1 - K) \right)
\]

Notice that \( W_R, K > \frac{1}{2} \). Since we are assuming \( q < q^* (\eta, \lambda, G, p, \psi) \), \( W_R > W_{U,1} > K \). Thus, the left hand side of the previous inequality is positive. Instead, the right-hand side is lower or equal than:

\[
\eta (\lambda - 1) \cdot \left( 2 \cdot K \cdot (1 - K) - q (1 - q) - 2q^2 (1 - K) - 2 (1 - q)^2 K - 4q (1 - q) K (1 - K) \right)
\]

which is always negative (indeed, the previous expression is maximized when \( K = \max \left\{ \frac{1}{2}, \frac{q^2}{1-2q(1-q)} \right\} \) and, in both these cases, it is negative). We conclude that voters are better off in the fully revealing equilibrium than in the uninformative one.

Now consider a \( \pi \)-symmetric partially revealing equilibrium. Denote with \( d_P \) and \( d_U \), thresholds \( d_P (\eta, \lambda, G, \pi, p, \psi) \) and \( d_U (\eta, \lambda, G, \pi, p, \psi) \) defined in (9) and (10). In such an equilibrium, the probability with which a high-valence candidate gets elected is given by:
\[ q^2 + 2q (1 - q) (1 - z_\pi) \cdot (pW_{P,1} + (1 - p) W_{P,1}) + \\
+ 2q \cdot (1 - q) \cdot z_\pi \cdot \left( \frac{p^2 W_{U,1}^\pi + (1 - p)^2}{2} + p (1 - p) W_{U,(1 - \pi)}^\pi + (1 - p) p W_{U,\pi}^\pi \right) \]

which can be simplified to:

\[ q^2 + 2q (1 - q) z_\pi \left( \frac{1}{2} + p \psi d_U \right) + 2q (1 - q) (1 - z_\pi) \left( \frac{1}{2} + p \psi d_P + (1 - p) \pi \psi d_P \right) \]

Similarly, the probability of electing a low-valence candidate can be written as:

\[ (1 - q)^2 + 2q (1 - q) z_\pi \left( \frac{1}{2} - p \psi d_U \right) + 2q (1 - q) (1 - z_\pi) \left( \frac{1}{2} - p \psi d_P - (1 - p) \psi \pi d_P \right) \]

Thus, the expected consumption utility that voters get in a \( \pi \)-symmetric partially revealing equilibrium is given by:

\[ g_L + qG + 2\psi q (1 - q) ((1 - z_\pi) \cdot (p + (1 - p) \pi) \cdot d_P + z_\pi \cdot p \cdot d_U) \cdot G \]

which can be simplified to\(^{44}\) \[ g_L + qG + 2\psi q (1 - q) d_P G. \] On the other hand, the expected gain/loss utility is given by:

\[ -\eta (\lambda - 1) \left( q^2 + 2q (1 - q) z_\pi \left( \frac{1}{2} + p \psi d_U \right) + 2q (1 - q) (1 - z_\pi) \left( \frac{1}{2} + p \psi d_P + (1 - p) \pi \psi d_P \right) \right) \cdot \\
\cdot \left( (1 - q)^2 + 2q (1 - q) z_\pi \left( \frac{1}{2} - p \psi d_U \right) + 2q (1 - q) (1 - z_\pi) \left( \frac{1}{2} - p \psi d_P - (1 - p) \psi \pi d_P \right) \right) G \]

Observe that the consumption utility in a fully revealing equilibrium is higher than the one in a \( \pi \)-symmetric partially revealing equilibrium if and only if \( 2W_R \geq 1 + 2(p \psi d_P) \) or equivalently if \( \frac{(2 + \eta + \eta \lambda)G}{2(1 - \psi \eta (\lambda - 1)G)} \geq d_P \), which holds since \( d_P (\eta, \lambda, G, \pi, p, \psi) \) is increasing in \( \pi \) and equals \( \frac{(2 + \eta + \eta \lambda)G}{2(1 - \psi \eta (\lambda - 1)G)} \) at \( \pi = 1 \).

Furthermore, exploiting (11), the gain/loss utility in a fully revealing equilibrium will be higher (namely, lower in absolute value) than in a \( \pi \)-symmetric partially revealing one if and only if:

\[ 2 \left( \frac{1}{2} + \psi \cdot \frac{(2 + \eta + \eta \lambda)G}{2(1 - \psi \eta (\lambda - 1)G)} \right) \left( \frac{1}{2} - \psi \cdot \frac{(2 + \eta + \eta \lambda)G}{2(1 - \psi \eta (\lambda - 1)G)} \right) \leq (1 + 2\psi (1 - q) d_P) \cdot (1 - 2pq d_P) \]

\[ (18) \]

\(^{44}\)This follows using equation (11) as we did in the proof of Proposition 7.
The right-hand side of (18) is decreasing in \( q \). Thus a sufficient condition for (18) is:

\[
2 \cdot \left(1 - \psi \cdot \frac{(2 + \eta \lambda \pi + \eta (2 - \pi))}{1 - \psi \eta (\lambda - 1) (\pi^2 + p \pi (1 - \pi)) G \cdot G}\right)
\]

\[
> \left(1 + \psi \cdot \frac{(2 + \eta + \eta \lambda) G}{(1 - \psi \eta \lambda G)}\right) \cdot \left(1 - \psi \cdot \frac{(2 + \eta + \eta \lambda) G}{(1 - \psi \eta (\lambda - 1) G)}\right)
\]

which follows from noticing that \( 2 > \left(1 + \psi \frac{G(2+\eta+\lambda \pi+\eta(2-\pi))}{(1-G(\lambda-1)(p+(1-p)\pi)\psi \eta)}\right) \) by Assumption 2 and that \( \frac{G(2+\eta+\lambda \pi+\eta(2-\pi))}{1-G(\lambda-1)(p+(1-p)\pi)\psi \eta} \) is increasing in \( \pi \) and equals \( \frac{G(2+\eta+\lambda \pi)}{1-G(\lambda-1)\psi \eta} \) when \( \pi = 1 \).

References


