The Hidden Cost of Raising Voters’ Expectations: Reference Dependence and Politicians’ Credibility

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Abstract

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. Voters prefer politicians with high valence, but random shocks may lead them to appoint a low-valence one. Candidates make statements concerning their valence. We show that if voters are standard expected utility maximizers, politicians’ announcements 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 information transmission is possible and we characterize the conditions under which it can arise. Intuitively, these behavioral biases introduce a cost of lying as overstating one’s valence may shift the electorate’s preferences toward better skilled opponents.

1 Introduction

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

Electoral speeches are key ingredients of electoral campaigns: they polarize voters’ attention, attract media’s scrutiny and often lead to heated debates about their truthfulness.

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Although the evidence concerning the overall effect of these speeches on the behavior of the electorate is mixed, there is little doubt that they play some role in shaping the candidates’ public image and, ultimately, the electoral outcome.\(^1\)

Interestingly, conventional wisdom proposes two, partially contradictory, views concerning these announcements: on the one hand, it is claimed that they have no informational content as politicians would say everything in order to get elected; on the other hand, it is often suggested that excessive promises may be counterproductive if the electorate realizes that a candidate cannot live up with expectations. The opening quote by Abraham Lincoln supports this latter view.

Moreover, these two views have very different implications on the attitude voters should exhibit toward candidates’ announcements. According to the former, voters should ignore such announcements and avoid conditioning their electoral behavior on them; instead, according to the latter view, the electorate should not only take them seriously, but also “punish” candidates who fail to deliver what promised.

This paper rationalizes Lincoln’s quote with a model of electoral competition in which the electorate exhibits reference dependence and loss aversion à la Kőszegi and Rabin. Differently from existing models, we show that informative communication is possible even though candidates do not incur any psychological cost from being deceptive, which, arguably, is a relevant assumption when dealing with professional politicians. Furthermore, we also derive some counterintuitive results concerning the likelihood of informative communication.

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 to appoint a high-valence politician as she generates a higher utility for them. Thus, the valence of a candidate could capture her level of competence, her leadership skills or the degree of alignment with the interests of the electorate.

Although a candidate’s own valence is private information, she can make an announcement concerning her type; for instance, candidates could list their past achievements to convince voters of their actual skills. In doing this, they may be tempted to overstate their valence and to take undeserved credit.\(^2\) We model this communication phase assuming that candidates do not entail any direct cost from lying. However, during the electoral campaign voters may learn the true valence of a candidate with some probability $p$; $p$ can measure

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\(^1\) For instance, Holbrook (1994) assesses the relative impact of candidates’ campaigning strategy against the one of exogenous economic shocks in determining the electoral outcome; Petrocik (1996) discusses the importance of “issue ownership” in public debates; Druckman et al. (2009) provides an empirical analysis of candidates’ communication strategies in US congressional elections; Adams and Somer-Topcu (2011) shows that changes in the political platform announced by parties are not always fully internalized by voters.

\(^2\) For instance, politicians may try to attribute to themselves an economic boom which was mostly due to the economic cycle or to reap the rewards of a reform implemented by their predecessors.
the intensity of media’s scrutiny and fact-checking activity or the likelihood that candidates’ behavior could reveal their true type. The outcome of the election is determined by voters’ beliefs concerning candidates’ types, by ideological biases, and by random shocks to candidates’ popularity. Due to these last two components, a low-valence candidate may end up being elected against a high-valence one.

If voters are standard expected utility maximizers, all equilibria are uninformative. Indeed, both candidates would claim to be high-valence in order to maximize their probability of winning; as a result, they would lose any credibility and, in equilibrium, voters would ignore their announcements.

We depart from the literature assuming that voters exhibit reference dependence à la 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 informative equilibrium may exist and we characterize the conditions under which informative communication is more likely to arise.3

The mechanism behind truthtelling can be described as follows. Candidates’ announcements, if credible, modify not only voters’ beliefs, but also their reference points and, consequently, their preferences. Then, by overstating her valence, a low-valence candidate may shift the electorate’s preferences toward more skilled politicians and this may end up favoring her opponent. Importantly, due to loss aversion, this endogenous reaction of the electorate worsens electoral prospects with respect to what a candidate could attain by truthfully revealing her type from the beginning. Thus, the interaction of electoral competition with reference dependence and loss aversion introduces a “cost of lying” which can push candidates to reveal their type.

Noticeably, the existence of this 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 would be independent of candidates’ announcements; thus, lying could not hurt and informative communication would not arise in equilibrium. Under loss aversion, instead, the advantage of high-valence candidates is higher when voters’ expectations are higher and this positive correlation determines a cost from overstating one’s valence.

Our main result characterizes the conditions under which informative communication

3 Obviously, even under reference dependence and loss aversion, uninformative equilibria are possible as voters are free to ignore candidates’ speeches.
can arise. In particular, as the cost of lying is increasing in $p$, a fully revealing equilibrium exists if and only if voters have a sufficiently high probability of learning the true type of candidates.\footnote{Under a different interpretation of parameter $p$, our results can be read as saying that informative communication is possible if and only if the cost of hiding one’s lies is too high. See Section 4.2 for details.} Intuitively a low-valence candidate who is deciding whether to overstate her type faces a trade-off. If she lies and her lie goes undetected (which happens with probability $1-p$), her probability of winning increases; if instead the lie is detected (which happens with probability $p$), such probability may decrease as her initial announcement may shift voters’ preferences in favor of her opponent.

Furthermore, the cost of lying varies non-monotonically with loss aversion. This happens because loss aversion has a two-sided effect. On the one hand, as we described above, it makes voters unwilling to accept \textit{unexpected losses} and shifts their preferences in favor of candidates who can deliver what promised. On the other hand, it makes voters unwilling to accept \textit{expected losses}. Due to this last effect, voters are more likely to support high-valence candidates against low-valence ones and the benefit from lying increases. Since the former effect dominates when loss aversion is low, while the latter prevails when loss aversion is high, the net cost of lying first increases and then decreases with the degree of loss aversion. Thus, information transmission is easier to support when the electorate is moderately loss averse.

We also show that an increase in the uncertainty of the electoral outcome may increase the likelihood of a fully revealing equilibrium. Indeed, as electoral uncertainty grows, the relative importance of valence in determining the winning candidate decreases and this reduces the benefit of lying.

Finally, we prove that, coeteris paribus, a low valence candidate has a higher incentive to reveal her type if her opponent is more likely to be high-valence, namely if the opponent is more likely to win the elections. This somehow paradoxical result can be explained noticing that the cost of lying is due to a shift in voters preferences’ toward an opponent who can live up with high expectations. Since this shift is relevant only if the opponent is high-valence, an increase in the probability of such event raises the expected cost of lying and pushes toward truthful revelation.

The paper is organized as follows. In the remaining of the Introduction, we review the relevant literature and we discuss how our model differs from existing ones. Section 2 presents the model. In Section 3, we characterize the equilibria of the game. Section 4 discusses the robustness of our findings to some assumptions and to possible extensions. Section 5 concludes. The Appendix collects all the proofs and relevant characterizations.
1.1 Related Literature

This paper focuses on information transmission between candidates and voters. In this respect it is related to the literature on strategic information transmission.\(^5\) We depart from this literature assuming that uninformed players (in our model, voters) exhibit reference dependence and loss aversion and we show how these assumptions can lead to credible communication. In doing so, we assume that the content of communication is verifiable with some probability, which links our paper to Seidmann and Winter (1997) and Ottaviani and Sorensen (2006).

Extensive research has studied how discrepancies between announcements and actual achievements can affect a candidate’s political career. Indeed, expectations management in electoral competitions has long been recognized as a key feature of the political process. In particular, Kimball and Patterson (1997) show that the gap between expectations and politicians’ real performance plays an important role in determining voters’ attitude toward US Congress (see also Boynton and Patterson (1969)), while Waterman et al. (1999) extend this analysis by showing that such expectation gap is important in explaining voters’ electoral behavior.\(^6\) On a similar note, a growing literature has documented the role played by expectations in the evaluation of public services (see James (2009) and the references therein).

On a more theoretical ground, a fruitful line of research started by Farejohn (1986) and developed (among others) by Harrington (1993a,b), Banks and Sundaram (1998), Berganza (2000), Duggan (2000) and Van Weelden (2013) addresses the conflict of interest between voters and politicians lacking any commitment power; in this context voters can discipline politicians by adopting retention policies that punish the incumbent if she performs badly. In this paper, instead of looking at the agency problem between candidates and voters, we focus on the informational content of electoral announcements in a setting where candidates have an incentive to lie and lack any exogenous commitment power. Under this modelling choice, we can show that informative communication arises thanks to the endogenous change in voters’ preferences induced by candidates’ speeches and we can derive novel comparative statics. For instance, we show that, coeteris paribus, a low-valence candidate is more likely to tell the truth when her opponent is very likely to be high-valence, or, to put it differently, when the opponent is very likely to win the elections.

who assume that candidates incur an exogenous cost of lying. In this respect, we contribute to the literature by identifying a channel through which this cost of lying can arise and by characterizing the conditions under which it can lead to truthtelling. Moreover, by directly relating the cost of lying to the behavior of the electorate, we can justify its existence also for professional politicians, who are often believed to be deceptive in nature (see also our discussion of the literature on “guilt aversion” below).

The idea that agents may exhibit reference dependence and loss aversion dates back at least to Kahneman and Tversky (1979). Since then, an extensive experimental evidence has confirmed the relevance of these behavioral biases in various social environments.\(^7\) In this paper, we follow Kőszegi and Rabin (2006, 2007, 2009) and assume that reference points are endogenously determined through a rational expectation approach;\(^8\) however, we further embed the formation of the reference point into a communication game between informed and uninformed players (respectively, politicians and voters).\(^9\)

Our work is also related to Kőszegi (2006) as it studies the role that communication and anticipatory utilities can play in an agency problem; however, differently from Kőszegi (2006), we study an environment where informed and uninformed agents have conflicting interests.

Insofar we model a setting 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).\(^10\) In particular, Battigalli et al. (2013) show that “guilt aversion” can help attaining credible information transmission and Corazzini et al. (2014) confirm with an experiment that guilt plays an important role in electoral settings. The difference with our setting is not only semantic: contrary to a model with “guilt aversion”, our approach does not require to model higher order beliefs concerning players’ intentions as the electorate’s reference point depends only on the information content that voters assign to candidates’ statements. Moreover, another key difference with the literature on guilt aversion is the identity of the agent exhibiting the behavioral bias: informed agents (i.e. candidates) under guilt aversion, uninformed agents (i.e. voters) in our setting. Although both biases

\(^7\)See, for instance Kahneman et al. (1990), Kahneman et al. (1991), van Dijk and van Knippenberg (1996) and Fehr et al. (2011).

\(^8\)As opposed to assuming that the reference point is given by the status quo. On this alternative assumption, see Kahneman and Tversky (1991) and Sugden (2003).

\(^9\)The importance of strategic interaction for the formation of the reference point has been studied both theoretically and experimentally by Gill and Stone (2010) and Gill and Prowse (2012), who investigate tournament settings.

are likely to play a role in reality, we think that our setting is particularly appropriate to analyze political environments. Indeed, the ability to be deceptive and to unabashedly lie in public is often considered a salient feature of many politicians.

To the best of our knowledge, there has been little theoretical work on the role played by reference points in determining political outcomes. Some noticeable exceptions are Banks (1990), Lindstadt and Staton (2010), Passarelli and Tabellini (2013) and Alesina and Passarelli (2014). 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 this paper, we explicitly model the channel through which false announcements can generate such a cost and we are thus able to characterize the circumstances under which truthful revelation is more likely to arise. In Lindstadt and Staton (2010) candidates are explicitly involved in expectations’ manipulation and the authors show 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 with rational expectations and shows how upward management of expectations can be counterproductive. Passarelli and Tabellini (2013) build a model in which losses with respect to the citizens’ reference point may generate political unrest; they 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 questions, our model also differs from Passarelli and Tabellini (2013) 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. Finally, Alesina and Passarelli (2014) analyze how loss aversion may affect the redistributive properties of political equilibria and derive interesting implications concerning intergenerational political conflict. Instead, we focus on the communication game between candidates and voters and we study the informational properties of electoral campaigns.

2 The Model

Two candidates, A and B, compete to get elected. Each candidate can be high- or low-valence. The valence of a candidate is represented by her type $\theta \in \{\theta_L, \theta_H\}$ and affects the utility of voters: 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 define $G \equiv g_H - g_L$. Thus, the valence of a candidate determines the utility she provides to the electorate if elected. For instance,
it can capture the level of public good that a politician can provide per unit of taxation; in this interpretation, a high-valence candidate can be thought of as somebody with cognitive and non-cognitive skills which make her a more effective policy-maker.\footnote{For instance, she could be more competent and thus more able to identify inefficiencies and to find remedies. Or she could possess superior leadership skills that allow her to select a better team/cabinet and to lead it toward a common political goal.} Alternatively, a high-valence candidate can be thought of as being more aligned with the interests of the electorate. This could happen either because her preferences over the policy space are closer to the ones of the electorate or because she is less prone to extract private rents from the office (e.g., she is more “honest”). Finally, the model can be extended to deal with the case in which the skill of a candidate is a multidimensional attribute; see Section 4.1 for details.

Each candidate has a probability $q$ (respectively, $1 - q$) to be high (respectively, low) valence. Types are determined independently and a candidate’s type is her own private information. At the beginning of the electoral competition, candidates can make simultaneous, public and costless announcements concerning their types. We assume that voters interpret these announcements in the same way and that there is common knowledge of this.

A candidate is elected if she gets $50\% + 1$ of the votes; 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 $j$ is identified by an ideological bias in favor of candidate B, $f_j$, which is assumed to be uniformly distributed in the interval $\left[-\frac{1}{2\varphi}, \frac{1}{2\varphi}\right]$. 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 $\left[-\frac{1}{2\varphi}, \frac{1}{2\varphi}\right]$. $\delta$ can be thought as a popularity shock that hits voters’ preferences after candidates made their announcements and affects electorate’s willingness to support candidate B; section 4.3 discusses the role played by this common shock in our analysis. The assumption of uniform distributions is made for analytical tractability, but the main results of the paper can be generalized to other absolutely continuous distributions.

Timing is summarized in Figure 1. In period 0, each candidate makes a statement concerning her own valence. In period 1, three random variables are realized independently: 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.

Notice that, whereas the realization of $t_i$ may reveal something about the valence of candidate $i$, $\delta$ is independent of candidates’ actual types. Thus, $\delta$ could represent some personal trait of the candidate that is uncorrelated with her valence (e.g., her empathy), some external event that makes the platform of one of the candidates more appealing to the
electorate, or some scandal that hits either candidate $i$ or its party without affecting beliefs about her valence.

Signals $t^i$ are generated according to the following technology: for every $k \in \{L, 0, H\}$ and $s \in \{L, H\}$,

$$\Pr \{t_k | \theta_s\} = \begin{cases} p & k = s \\ 1 - p & k = 0 \\ 0 & \text{otherwise} \end{cases}$$ (1)

In words, type $\theta_k$ sends 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 the true type of a candidate is revealed to the electorate. $p$ can be interpreted as a measure of the intensity of media’s scrutiny (e.g., the informativeness of questions asked during interviews or the effort put in fact-checking) and/or as the propensity of candidates to make blunders, which can reveal their true valence. For simplicity, we assume that $p$ is exogenously given; Section 4.2 discusses how this assumption can be relaxed. Furthermore, 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.

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 $S$. In this paper we only focus on equilibria in which candidates play pure communication strategies; the extension to mixed communication strategies is relatively straightforward.\(^\text{12}\)

Thus, in our model, candidates can make announcements concerning their type and, in doing so, they may overstate their type by claiming to be high-valence when they are not.\(^\text{13}\) In reality, candidates often talk about their past record and highlight the achievements

\(^{12}\)The interested reader is referred to Grillo (2014).

\(^{13}\)Although understating one’s type is also a feasible strategy, our analysis will show that candidates will never want to do so.
obtained in previous appointments. Arguably, this is done to convince voters that they possess the skills necessary to hold the office effectively. Although these achievements are often verifiable, the actual contribution of a specific person may be hard to isolate; thus, candidates may try to overstate their actual contribution. For instance, they could claim credit for improvements that were mostly due to the economic cycle, or they could attribute to themselves the benefits of policies that were initiated by their predecessors. In this case, \( p \) would capture the likelihood that media’s fact-checking activity could detect the candidate’s actual contribution. Alternatively, the claim to be high-valence can be interpreted as the decision to highlight some aspect of a candidate life that (the majority of) voters care about. For instance a candidate could focus its campaign on honesty, loyalty, family values and so on. In this context, \( p \) would represent the probability of finding some scandal that reveals discrepancies between the public image the candidate portrayed and her actual type.

Departing from the previous literature, we assume that voters have reference-dependent preferences à la Kőszegi and Rabin. In particular, let \( C = \{g_L, g_H\} \); for any pair \((g, r) \in C \times C\), the utility 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 \( v(\cdot \mid \cdot) : C^2 \to \mathbb{R} \), in which the first argument, \( g \), is the consumption utility and the second argument, \( r \), is the reference utility. We refer to \( v(\cdot \mid \cdot) \) as to the total utility. Total utility can be separated in two components: consumption utility and gain/loss utility, \( \mu(\cdot) \). Intuitively, whenever the consumption utility exceeds (respectively, falls short of) the reference utility 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,\(^{14}\) while \( \lambda > 1 \) captures loss aversion, namely the fact that voters dislike losses more than they like equal-size gains.\(^{15}\)

Following Kőszegi and Rabin (2007), we extend the utility function to random outcomes and random reference points by assuming that, for every \((\tilde{g}, \tilde{r}) \in \Delta(C) \times \Delta(C)\):\(^{16}\)

\(^{14}\)To limit the importance of reference-dependence, we impose \( \eta < 1 \).
\(^{15}\)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.
\(^{16}\)\( \Delta(X) \) is the set of probability measures over a set \( X \) and, for any \( \tilde{x} \in \Delta(X) \), \( \tilde{x}[x] \) denotes the probability measure that \( \tilde{x} \) assigns to \( x \). In what follows, we sometimes abuse notation writing \( V(g \mid \tilde{r}) \) and \( V(\tilde{g} \mid r) \) to denote the utility associated with a degenerate distribution over outcome \( g \) or reference outcome \( r \), respectively.
\[
V (\tilde{g} \mid \tilde{r}) = \sum_{g \in C} \sum_{r \in C} v (g \mid r) \tilde{g} \tilde{r} [r].
\] (4)

Notice that if \( \eta = 0 \), the electorate behaves as a standard expected utility maximizer with linear vNM utility indexes.

Let \((\sigma^A, \sigma^B)\) be the (independent) conjecture concerning the communication strategy followed by candidates.\(^{17}\) 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

\[
\pi^i_1 (m^i \mid \sigma^i) = \frac{q \sum_{s_i \in S_i} \sigma^i [s_i] s_i (\theta_H) [m^i]}{q \sum_{s_i \in S_i} \sigma^i [s_i] s_i (\theta_H) [m^i] + (1 - q) \sum_{s_i \in S_i} \sigma^i [s_i] s_i (\theta_L) [m^i]}
\] (5)

if \(q \sum_{s_i \in S_i} \sigma^i [s_i] s_i (\theta_H) [m^i] + (1 - q) \sum_{s_i \in S_i} \sigma^i [s_i] s_i (\theta_L) [m^i] > 0\) and by \(x \in [0,1]\) otherwise.

Similarly, the probability that the electorate assigns to the candidate of party \(i\) being high valence after announcements \(m^i\) and signal \(t^i\) given conjecture \(\sigma^i\) can be written as:\(^{18}\)

\[
\pi^i_2 (m^i, t^i \mid \sigma^i) = \begin{cases} 
0 & \text{if } t^i = t_L \\
\pi^i_1 (m^i \mid \sigma^i) & \text{if } t^i = t_0 \\
1 & \text{if } t^i = t_H 
\end{cases}
\] (6)

We refer to \(\pi^i_2 (.)\) as to the perceived valence of candidate \(i\) and we notice that it is affected by \(m^i\) only if \(t^i = t_0\). Finally, let \(\hat{\pi} (m^A, m^B, \sigma^A, \sigma^B) [t^A, t^B]\) the probability that a voter who receives announcements \((m^A, m^B)\) and holds conjectures \((\sigma^A, \sigma^B)\) assign to the event “signal pair \((t^A, t^B)\) is generated”.\(^{19}\)

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\(^{17}\) 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. The extension to general (correlated) conjectures is straightforward.

\(^{18}\) Thus, if the signal reveals the candidate’s type, the electorate will update its belief accordingly; otherwise it will keep its prior belief. Importantly, these beliefs would be the relevant ones for equilibrium analysis if we were to define a solution concept that adapts sequential equilibrium to a setting with reference dependence and loss aversion.

\(^{19}\) \(\hat{\pi} (m^A, m^B, \sigma^A, \sigma^B) [\cdot]\) is summarized in the following table (to save on notation we omit to specify the dependence of \(\pi^i_1 (\cdot)\) on \(m^i\) and \(\sigma^i\)):

<table>
<thead>
<tr>
<th>(t_L)</th>
<th>(t_0)</th>
<th>(t_H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(t_L)</td>
<td>(p^* (1 - \pi^A_1) (1 - \pi^B_1))</td>
<td>(p (1 - p) (1 - \pi^A_1))</td>
</tr>
<tr>
<td>(t_0)</td>
<td>((1 - p) p \pi^B_1 )</td>
<td>((1 - p)^2)</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>
</tr>
</tbody>
</table>
Voters vote sincerely. Thus, a voter with ideological bias \( f^j \), who holds (independent) conjectures \((\sigma^A, \sigma^B)\) and whose reference point is \( \bar{r} \), will vote for A (B) at information set \((m^A, m^B, t^A, t^B, d)\) if:

\[
\begin{align*}
\pi^A_2 (m^A, t^A | \sigma^A) & V (g_H | \bar{r}) + (1 - \pi^A_2 (m^A, t^A | \sigma^A)) V (g_L | \bar{r}) > ( < ) \\
\pi^B_2 (m^B, t^B | \sigma^B) & V (g_H | \bar{r}) + (1 - \pi^B_2 (m^B, t^B | \sigma^B)) V (g_L | \bar{r}) + f^j + d
\end{align*}
\]

or equivalently if:

\[
\left[ \pi^A_2 (m^A, t^A | \sigma^A) - \pi^B_2 (m^B, t^B | \sigma^B) \right] \cdot \Gamma (\bar{r} [g_H]) > ( < ) f^j + d, \tag{7}
\]

where we defined

\[
\Gamma (x) = (1 + \eta + \eta (\lambda - 1) \cdot x) \cdot G. \tag{8}
\]

Inequality (7) implies that a voter will support candidate A if the difference in perceived valences \((\pi^A_2 - \pi^B_2)\) is sufficiently high. Function \( \Gamma (\cdot) \) plays an important role in our analysis: it measures the marginal electoral benefit a candidate receives by increasing her perceived valence. Without reference-dependence, \( \Gamma (\cdot) \equiv G \) as it equals the increase in utility that a high-valence candidate can guarantee. Instead, with reference dependence, this marginal benefit is amplified by the fact that \( g_H \) appears as a gain vis-a-vis \( g_L \) and that \( g_L \) appears as a loss vis-a-vis \( g_H \).

Finally, we assume that ideological biases are sufficiently disperse to guarantee that, for any realization of \( \delta \), each voter has a positive vote share.\(^{20}\)

Thus, the probability with which candidate A wins the elections (i.e. she gets 50% +1 of the votes) after message-signal profile \((m^A, m^B, t^A, t^A)\) is given by:

\[
W^A (m^A, m^B, t^A, t^B | \sigma^A, \sigma^B) = \frac{1}{2} + \psi \left[ \pi^A_2 (m^A, t^A | \sigma^A) - \pi^B_2 (m^B, t^B | \sigma^B) \right] \Gamma (\bar{r} [g_H]), \tag{9}
\]

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

\[
W^A (m^A, m^B | \sigma^A, \sigma^B) = \sum_{t^A, t^B} \hat{\pi} (m^A, m^B, \sigma^A, \sigma^B) [t^A, t^B] W^A (m^A, m^B, t^A, t^B | \sigma^A, \sigma^B) \tag{10}
\]

Obviously, \( W^B (\cdot) = 1 - W^A (\cdot) \).

\(^{20}\)Formally: \( \varphi < \frac{\psi}{1 + 2\psi (1 + \eta A) / G} \). This assumption is made to avoid keeping track of corner solution. None of the results hinges on it.
Elections take place at the end of period 2 but the reference point of voters is determined upon listening to candidates’ announcements. Intuitively, this is the first time at which voters think of the utility candidates can deliver and this mental process modifies their reference point. In line with Kőszegi and Rabin (2006, 2007, 2009), we endogenize the formation of the reference point by assuming rational expectations: the reference point is determined by voters’ beliefs concerning the valence of the elected candidate.

Let \( (\sigma^A, \sigma^B) \) be the electorate’s (independent) conjecture and suppose candidates sent messages \( (m^A, m^B) \). Then, for every pair of signals \( (t^A, t^B) \) (which arise with probability \( \hat{\pi} (\cdot) [t^A, t^B] \)) the reference point puts mass on \( g_H \) if either candidate A is elected and turns out to be high-valence (which happens with probability \( W^A (\cdot) \cdot \pi^A_2 (\cdot) \)) or B is elected and turns out to be high-valence (which happens with probability \( W^B (\cdot) \cdot \pi^B_2 (\cdot) \)) formally:

\[
\tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_H] = \sum_{t^A, t^B} \hat{\pi} (m^A, m^B, \sigma^A, \sigma^B) [t^A, t^B] \cdot \left\{ W^A (m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) \pi^A_2 (m^A, t^A \mid \sigma^A) + W^B (m^A, m^B, t^A, t^B \mid \sigma^A, \sigma^B) \cdot \pi^B_2 (m^B, t^B \mid \sigma^B) \right\}
\]

Obviously, \( \tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_L] = 1 - \tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) [g_H] \).

The next definition imposes an obvious consistency requirement between sincere voting and reference points.

**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 \( f^j \) votes according to (7) when the reference point is given by \( \tilde{r} (m^A, m^B \mid \sigma^A, \sigma^B) \).\(^{21}\) 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 \( (m^A, m^B) \).

Thus, the reference point of the electorate is determined through a forward looking approach: it is given by the distribution over utilities induced by the electorate’s future behavior 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, at the electoral stage the reference point is inherited from the previous period. Intuitively, this paper characterizes a new channel through which communication may affect the behavior of the uninformed party, namely the change in voters’ reference point. Although this channel works insofar past announcements have some persisting saliency in the mind of the electorate, such persistency stems from the fact that the

---

\(^{21}\)If (7) holds with equality, we assume that the voters randomizes between the two candidates with equal probability. None of our results hinges on this assumption.
electorate updates its beliefs about the future in response to these announcements.\textsuperscript{22}

Candidates are standard expected utility maximizers.\textsuperscript{23} Thus, if type $\theta$ of candidate $i$ sends message $m$ and believes that the opponent is following strategy $\sigma^j$, her expected utility is given by:

$$\begin{align*}
U^i (m, \sigma^j | \theta) &= \sum_{s \in S} \sigma^j [s] \left( qW^i (m, s (\theta_H) | \sigma^i, \sigma^j) + (1 - q) W^i (m, s (\theta_L) | \sigma^i, \sigma^j) \right).
\end{align*}$$

We are now ready to define the solution concept we use in the paper.

\textbf{Definition 2} A profile of communication strategies $(s^A, s^B)$ and voters’ beliefs $(\pi^i_1, \pi^i_2)_{i \in \{A,B\}}$ is an equilibrium if:

(i) for every $i \in \{A,B\}$ and $\theta \in \{\theta_L, \theta_H\}$, $s^i (\theta) \in \arg \max_{m \in M} U^i (m, s^j | \theta), i \neq j$;

(ii) sincere voting is reference-point consistent given $(s^A, s^B)$;

(iii) beliefs are determined by (5) and (6).

In particular, we will focus on two classes of equilibria: uninformative equilibria and fully revealing ones.\textsuperscript{24} In an uninformative equilibrium, voters do not update their prior belief after any message $m$ (namely, $\pi^i_1 (m^i | \sigma^j) = q$ for every $i$ and every message $m$). Thus, we can assume $M = \{\bar{m}\}$, focus on uninformative communication strategies, $s^i_U (\theta) \equiv \bar{m}$, and avoid specifying voters’ beliefs. Instead, in a fully revealing equilibrium, each type sends a different message; thus, we can assume that $M = \{m_L, m_H\}$, where $m_k$ should be read as "my type is $\theta_k$."\textsuperscript{25} focus on fully revealing communication strategy in which $s^i_R (\theta_L) = m_L$ and $s^i_R (\theta_H) = m_H$, and omit to specify beliefs since $\pi^i_1 (m^i_H | s^i_R) = 1$ and $\pi^i_1 (m^i_L | s^i_R) = 0$.

We conclude this section imposing an assumption that guarantees that the electoral competition is sufficiently open. In particular, it states that a low-valence candidate can win against a high-valence one if the popularity shock takes an extreme value (formally, it requires (9) to be strictly in $(0,1)$ for every profile of messages and signals). Section 4.3 discusses the implications of relaxing this assumption.

\textbf{Assumption 1} $\frac{1}{2 \psi} > (1 + \eta \lambda) G$. Equivalently, $\lambda < \frac{1}{\eta} \left( \frac{1}{2 \psi G} - 1 \right) = \bar{\lambda} \in (1, \infty)$.

\begin{itemize}
  \item \textsuperscript{22}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.
  \item \textsuperscript{23}Introducing reference dependence and loss aversion in candidates’ preferences would not change any of our qualitative results.
  \item \textsuperscript{24}Given our restriction to pure strategies, these are the only symmetric equilibria.
  \item \textsuperscript{25}Equivalently, $m_L$ could be interpreted as the lack of any statement concerning valence and $m_H$ as the claim to be high-valence.
\end{itemize}
3 Equilibrium Analysis

In this section, we characterize the equilibria of the game. We start showing that without reference dependence the only equilibria are uninformative (Proposition 1). Then, we show that informative communication can arise thanks to reference dependence and loss aversion (Proposition 3). Obviously, even with reference dependence, uninformative equilibria still exist as the electorate is always free to ignore candidates’ announcements (Proposition 5). Finally, we provide sufficient conditions under which the equilibrium involving informative communication is better both for voters and for high-valence candidates (Proposition 6).

3.1 Equilibrium without Reference Dependence

Suppose the electorate does not exhibit reference dependence ($\eta = 0$). In this case the marginal benefit from increasing perceived valence with the electorate, $\Gamma(\cdot)$, is independent of candidates’ announcements and it is equal to $G$. As a result, announcements will lack any credibility. The intuition is straightforward. If a low valence candidate overstates her valence and this lie goes undetected (which happens with probability $1 - p$), she experiences a positive gain proportional to the increase in perceived valence (namely, $\pi^i(\cdot)$) induced by her announcement. Furthermore, even if the lie is detected (which happens with probability $p$), she is not worse off than by revealing her true type from the beginning. Thus, whenever perceived valences react to candidates announcements, low types will always overstate their valences. As a result, announcements will not be credible and voters will not update their beliefs based on them. The next proposition formalizes this result.

**Proposition 1** Let $\eta = 0$. Then the only equilibria are uninformative.

3.2 Full Revelation under Reference Dependence

Now, suppose $\eta > 0$ (i.e., voters exhibit reference dependence) and $\lambda > 1$ (i.e., voters are loss averse). We will show that under these assumptions informative communication is possible. To this goal, we proceed in two steps. First, we characterize candidates’ winning probabilities under the assumption that voters believe in their truthfulness. Then, we show that the way in which these probabilities depend on candidates’ announcements can lead to full revelation.

**Proposition 2** Let $\eta > 0$ and suppose Assumption 1 holds. Then, if sincere voting is reference-point consistent given $(s^A_R, s^B_R)$, the winning probabilities of candidates are fully characterized by three probabilities $W_+ (\eta, \lambda, G, \psi)$, $W_R (\eta, \lambda, G, \psi)$ and $W_- (\eta, G, \psi)$. In par-
ticular, $W^A (m^A, m^B, t^A, t^B \mid s^A_R, s^B_R)$, can be summarized as follows:\footnote{The $t_k$-th row and $t_s$-th column in matrix $(m^A, m^B)$ represents $W^A (m^A, m^B, t_k, t_s \mid s^A_R, s^B_R)$. Furthermore, to save on notation, we omit to specify the dependency of $W^+ (\cdot), W^0 (\cdot)$ and $W^- (\cdot)$ on the parameters of the model. Finally, the actual expression of these three probabilities is provided in the proof.}

<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>
</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>
</tr>
<tr>
<td>$t_0$</td>
<td>$W_+$</td>
<td>$\frac{1}{2}$</td>
<td>$\frac{1}{2}$</td>
<td>$t_0$</td>
<td>$W_R$</td>
<td>$W_R$</td>
<td>$\frac{1}{2}$</td>
</tr>
<tr>
<td>$t_H$</td>
<td>$W_+$</td>
<td>$\frac{1}{2}$</td>
<td>$\frac{1}{2}$</td>
<td>$t_H$</td>
<td>$W_R$</td>
<td>$W_R$</td>
<td>$\frac{1}{2}$</td>
</tr>
</tbody>
</table>

Furthermore: (i) $1 > W_+ (\eta, \lambda, G, \psi) > W_R (\eta, \lambda, G, \psi) > W_- (\eta, G, \psi) > \frac{1}{2}$ for every $\lambda \in (1, \bar{\lambda})$, (ii) $W_+ (\eta, 1, G, \psi) = W_R (\eta, 1, G, \psi) = W_- (\eta, G, \psi)$ and (iii) $W_+ (\eta, \bar{\lambda}, G, \psi) = W_R (\eta, \bar{\lambda}, G, \psi)$.

Proposition 2 yields some interesting implications we highlight next.

First of all, initial announcements may have a long-lasting effect on electoral outcomes. For instance, $W^A (m_H, m_H, t_L, t_H \mid s^A_R, s^B_R) \neq W^A (m_L, m_H, t_L, t_H \mid s^A_R, s^B_R)$ for every $\lambda \in (1, \bar{\lambda})$; importantly, this happens even though candidates’ perceived valences are the same for both profiles (indeed, $\pi^A_2 (m_H, t_L \mid s^A_R) = \pi^A_2 (m_L, t_L \mid s^A_R) = 0$ and $\pi^B_2 (m_H, t_H \mid s^B_R) = \pi^B_2 (m_H, t_H \mid s^B_R) = 1$). Intuitively, since initial announcements modify not only voters’ beliefs, but also their reference points, they may have a persistent effect on voters’ electoral behavior through the change they induce in the marginal benefit of perceived valence, $\Gamma (\cdot)$.

Moreover, lies may hurt a candidate’s electoral prospects. More precisely, if a candidate overstates her valence, her probability of winning the election may fall below the one she could have guaranteed to herself by being truthful. To see this, suppose candidate A has low valence and believes B is revealing her type truthfully. Then, if A reveals her valence, 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 overstates her valence and such a lie is detected (that is, if she generates signal $t_L$), her probability of winning is equal either to $1 - W_+ (\eta, \lambda, G, \psi)$ (if B has high valence) or to $\frac{1}{2}$ (if B has low valence). Since $W_R (\eta, \lambda, G, \psi) < W_+ (\eta, \lambda, G, \psi)$, lies may lower A’s probability of winning. Let $S (\eta, \lambda, G, \psi) = W_+ (\eta, \lambda, G, \psi) - W_R (\eta, \lambda, G, \psi)$; we will refer to it as to the cost of lying. Such a cost exists because the initial lie has
raised voters’ reference point and, consequently, it has increased the probability with which they appoint a high-valence candidate against to a low-valence one from $W_R (\eta, \lambda, G, \psi)$ to $W_+ (\eta, \lambda, G, \psi) > W_R (\eta, \lambda, G, \psi)$.

The cost of lying is positive ($S (\eta, \lambda, G, \psi) > 0$) 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 ($\lambda = 1$), $W_+ (\eta, 1, G, \psi) = W_R (\eta, 1, G, \psi)$ and $S (\eta, 1, G, \psi) = 0$. Thus, even if the lie is detected, the low-valence candidate is not worse off than under a truth-telling strategy; to put it differently overstating one’s valence has no downside. Intuitively, without loss aversion the gain voters get by supporting a 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 high-valence candidates is the same and depends neither on the reference point nor on the candidates’ announcements (formally, $\Gamma (\cdot) \equiv (1 + \eta) G$). 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 $\Gamma (\hat{r} [g_H]) = 1 + \eta + \eta (\lambda - 1) \hat{r} [g_H]$. In this case, being caught overstating one’s valence may significantly worsen the electoral prospects of low-valence candidates as $S (\eta, \lambda, G, \psi) > 0$.

Furthermore, the cost of lying is largest for some $\lambda \in (1, \bar{\lambda})$. To see this, notice that $S (\eta, \lambda, G, \psi)$ is continuous in $\lambda$, $S (\eta, 1, G, \psi) = S (\eta, \bar{\lambda}, G, \psi) = 0$, $\frac{\partial S (\eta, \lambda, G, \psi)}{\partial \lambda} \bigg|_{\lambda = 1} > 0$ and $\frac{\partial S (\eta, \lambda, G, \psi)}{\partial \lambda} \bigg|_{\lambda = \bar{\lambda}} < 0$. Thus, the cost of lying reaches its maximum for some intermediate value of loss aversion. The intuition behind this result hinges on the two-sided effect 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 prevent such losses. On the other hand, an increase in loss aversion makes the electorate less willing to formulate strategies that could yield expected losses; as a result, if loss aversion is large ($\lambda \geq \bar{\lambda}$), the electorate will never support a low-valence candidate when they believe a high-valence one is available. This second effect raises the marginal benefit of perceived valence, $\Gamma (\cdot)$, and pushes candidates to overstate their type.

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 raises voters expectation above what the candidate could deliver, and (iii) the opponent can live up with voters’ high expectations. These features distinguish our setting from one in which voters exhibit preferences for honesty and enable us to characterize the circumstances under which truth-telling is more likely to arise.
The next Proposition shows that a fully revealing equilibrium exists if and only if the probability of detecting a lie is sufficiently high.

**Proposition 3** Let \( \eta > 0 \) and suppose Assumption 1 holds. Then we can find a threshold level \( p^* (\eta, \lambda, G, q, \psi) \leq 1 \) such that a fully revealing equilibrium exists if and only if \( p \in [p^* (\eta, \lambda, G, q, \psi) , 1] \). Furthermore, for every profile \((\eta, G, q, \psi)\), \( p^* (\eta, \lambda, G, q, \psi) \) is minimized at some \( \lambda^* (\eta, \psi, G) \in (1, \lambda) \).

In particular, \( p^* (\eta, \lambda, G, q, \psi) \) is the value of \( p \) that solves:

\[
(1 - p) \left( W_R (\eta, \lambda, G, \psi) - \frac{1}{2} \right) = pqS (\eta, \lambda, G, \psi) \tag{11}
\]

Using the definitions of \( W_R (\eta, \lambda, G, \psi) \) and \( S (\eta, \lambda, G, \psi) \), we can conclude that:

\[
p^* (\eta, \lambda, G, q, \psi) = \frac{2 + \eta + \eta \lambda}{(2 + \eta + \eta \lambda) + q \eta (\lambda - 1) (1 - 2 \psi) (1 + \eta \lambda) G} \tag{12}
\]

Equation (11) 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 \( W_R (\eta, \lambda, G, \psi) - \frac{1}{2} \).\(^{27}\) Instead, if voters detect the lie (which happens with probability \( p \)), her probability of winning decreases by \( qS (\eta, \lambda, G, \psi) \).\(^{28}\) At \( p^* (\eta, \lambda, G, q, \psi) \) the expected benefit from lying is equal to its expected cost.

---

\(^{27}\) 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 \( q \)).

\(^{28}\) 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 \( q \)).
In Figure 2 we provide a graphical representation of this trade-off by plotting candidate A’s probability of winning ($W_A(\cdot)$) if (i) B follows a fully revealing communication strategy, (ii) sincere voting is reference point consistent given $(s^A_R, s^B_R)$, and (iii) A is either high-valence (on the left) or low-valence (on the right). Blue lines depict $W_A(\cdot)$ if A follows a truthful communication strategy, while red lines depict this probability if she lies (in this last case $W_A(\cdot)$ also depends on whether the lie is detected or not).

A further 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 voters.\footnote{Formally, this happens because $W_-(\eta, G, \psi) < W_R(\eta, \lambda, G, \psi)$.}

Intuitively, due to rational expectations, announcing to have high valence raises the electorate’s expectation in favor of high types; the positive effect of this change in reference point more than offset any electoral benefit that a high-valence candidate can get by first lowering voters’ reference point and then positively surprising them.

Moreover, the expression for $p^* (\eta, \lambda, G, q, \psi)$ in equation (12) allows us to analyze how changes in parameters affect the existence of fully revealing equilibria. In particular, if $p^* (\eta, \lambda, G, q, \psi)$ is lower, truthful revelation can be supported for a larger set of probabilities $p$.

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 arise if voters exhibit (i) reference dependence ($\eta > 0$), (ii) loss aversion ($\lambda > 1$), but (iii) 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 (i.e., $\Gamma (\cdot)$ does not depend on candidates’ messages), whereas, as we described after Proposition 2, if loss aversion is too high the benefit of lying offset its cost. In particular, $p^* (\eta, \lambda, G, q, \psi)$ is minimized at:\footnote{$\lambda^* (\eta, \psi, G)$ is obtained minimizing $p^* (\eta, \lambda, G, q, \psi)$ with respect to $\lambda$. The inequality $\lambda^* (\eta, \psi, G) > 1$ follows from Assumption 1.}

\begin{equation}
\lambda^* (\eta, \psi, G) = \sqrt{\frac{\psi (1 + \eta) G (1 + 2 \psi (1 + \eta) G)}{\psi \eta G}} - \frac{2 + \eta}{\eta} > 1
\end{equation}

Furthermore, $p^* (\eta, \lambda, G, q, \psi)$ is decreasing in the uncertainty of the electoral outcome (namely, in $\frac{1}{\psi}$). In words, an increase in electoral uncertainty favors truthtelling equilibria. Indeed, as $\psi$ decreases, extreme realizations of $\delta$ become possible and the probability with which a low-valence candidate can win against a high-valence one increases. This reduces the benefit from lying more than its cost and truthtelling becomes easier to support. Notice that a decrease 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. Therefore, the previous result can be read as saying that the incentive to lie is lower when perceived valences are relatively less important in determining the winning candidate.

Figure 3: \( p^* (\eta, \lambda, G, q, \psi) \). 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).

More interestingly, as the left-hand side of (11) is constant in \( q \), while the right-hand side increases in it, \( p^* (\eta, \lambda, G, q, \psi) \) is decreasing in \( q \). Thus a low-valence candidate is more likely to reveal her valence truthfully when she faces an opponent who is very likely to be high-valence. To put it differently, a low-valence candidate is more truthful, when she is more disadvantaged. Indeed, if the opponent is very likely to be high-valence, overstating one’s valence is likely to be costly as it modifies the preference of the electorate in favor of the opponent. This will raise the expected cost of lying and pushes toward truthtelling.

Given the previous results, we can conclude that the lowest value of \( p \) compatible with truthful revelation is given by \( \frac{1}{1+q} > \frac{1}{2} \); this is the value that minimizes \( p^* (\eta, \lambda, G, q, \psi) \) when
ψ → 0.\textsuperscript{31}

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 (\( \frac{1}{\psi} \)) and to the ex-ante probability of high-valence candidates (\( q \)) have already been justified. The non-monotonicity with respect to the relevance of reference dependence (\( \eta \)) follows from the same arguments we used for \( \lambda \). Finally, \( p^* (\eta, \lambda, G, q, \psi) \) is increasing in \( G \) as a larger difference in the skills of the two types raises the marginal benefit of perceived valence and makes lies more attractive. We summarize these results in the following proposition, whose proof follows immediately from (12).

**Proposition 4** \( p^* (\eta, \lambda, G, q, \psi) \) is decreasing in \( q \), increasing in \( G \) and \( \psi \) and first decreasing and then increasing in \( \eta \) and \( \lambda \).

### 3.3 Uninformative Equilibrium under Reference Dependence

Proposition 3 shows that reference dependence and loss aversion can lead to informative communication in a setting where this would not be possible under standard utility functions. Nevertheless, for any set of parameters an uninformative equilibrium also exists. This is standard in communication games: if voters believe that candidates’ announcements do not entail any relevant information and ignore them (that is, if they do not update beliefs based on them), uninformative communication strategies are trivially optimal and this, in turn, justifies voters’ initial conjecture. The next proposition formalizes this result; its proof is straightforward and omitted.

**Proposition 5** Let \( \eta > 0 \). Then an uninformative equilibrium always exists.

Obviously, in an uninformative equilibrium candidates’ winning probabilities depend only on the signals that politicians generate and not on their initial announcements. In Appendix 6.4 we provide a full characterization of these probabilities; such a characterization allows us to derive some interesting comparisons on the likelihood of electing a high-valence candidate in different equilibria.

First, conditional on knowing the types of candidates, the probability with which voters appoint high-valence candidates is increasing in the relative importance of reference dependence (\( \eta \)) and loss aversion (\( \lambda \)). Indeed, by Assumption 1, voters assign a positive probability to both types of candidates being elected in equilibrium. Thus, reference dependence favours

\[ \frac{1}{1+q} = \min_{\lambda \in (1, \lambda)} \lim_{\psi \to 0} p^* (\eta, \lambda, G, q, \psi). \]
high-valence candidates for two reasons: on the one hand, they generate gains compared to low-valence candidates; on the other hand low-valence candidates generate losses vis-a-vis high-valence ones.\footnote{To see this, notice that }\textcolor{red}{\text{32}}\text{Moreover, conditional on knowing the types of candidates, the probability with which a high-valence candidate wins against a low-valence one is higher in a fully revealing equilibrium than in an uninformative one if and only if }q\text{ and }p\text{ are not too high. To understand why, suppose that the candidate pair is }\left(\theta_H, \theta_L\right)\text{. Then, credibly announcing }\left(m_H, m_L\right)\text{ instead of }\left(\bar{m}, \bar{m}\right)\text{ has two effects. On the one hand, it raises }\text{\textit{\textit{W}}^A} (m_H, m_L \mid t_H, t_L)\text{ by increasing the perceived valence of candidate A whenever signal }t_0\text{ is generated.}^\textcolor{red}{\text{33}}\text{ On the other hand, it modifies voters’ reference point and decreases the disadvantage of the low-valence candidate as the electorate gets used to the idea that a low-valence candidate exists and may get elected. This latter phenomenon pushes }\text{\textit{\textit{W}}^A} (m_H, m_L \mid t_H, t_L)\text{ down and it is stronger if the ex-ante probability of low types is low (}q\text{ high). If }p\text{ is close to 1, the former effect is almost irrelevant as signal }t_0\text{ seldom arises. Thus, if }p\text{ and }q\text{ are high enough, the latter force may dominate and yield the result.}

\textbf{3.4 Welfare and Equilibrium Selection under Reference Dependence}

Proposition 3 and Proposition 5 imply that if }p\text{ is sufficiently high, multiple equilibria exist. In this section, we compare these equilibria from a welfare perspective and we use this comparison to derive implications in terms of equilibrium selection. To this goal, we compare the expected utility of candidates after they learnt their type and the consumption utility of voters before listening to candidates announcements.

Indeed, voters can decide whether to pay attention to candidates’ announcements only before the actual messages are sent: conditioning their attention on the content of the message would be contradictory as, in our setting, messages are fully identified by their informativeness.

Also, we compare consumption utilities only; thus, we assume that voters do not incorporate the gain/loss utility that their attitude toward candidates’ announcements will induce. This last assumption simplifies the analysis, but the main result of Proposition 6 would go through if we were to compare voters’ total utilities.

\textcolor{red}{\text{32}}\text{To see this, notice that }\Gamma (\hat{r} [g_H])\text{ can be written as }\left(1 + \eta \hat{r} [g_L] + \eta \lambda \hat{r} [g_H]\right) \cdot G.\textcolor{red}{\text{33}}\text{If signals }t_L\text{ or }t_H\text{ are generated, the perceived valence }\pi_A^2 (\cdot)\text{ does not depend on the announcement }m_A.
Proposition 6 Suppose assumption 1 holds and \( p > p^* (\eta, \lambda, G, q, \psi) \). Then, there exists \( q'(\eta, \lambda, G, p, \psi) \leq 1 \) such that high-valence candidates are better off in a fully revealing equilibrium than in an uninformative equilibrium if and only if \( q \leq q'(\eta, \lambda, G, p, \psi) \); the opposite is true for low-valence candidates. Furthermore there exists \( q''(\eta, \lambda, G, p, \psi) \leq 1 \) such that voters are better off in a fully revealing equilibrium than in an uninformative one if and only if \( q \leq q''(\eta, \lambda, G, p, \psi) \)

As an immediate corollary of Proposition 6 we can conclude that when multiplicity arises standard equilibria refinements for communication games would select the fully revealing equilibrium if \( q < \min \{ q'(\eta, \lambda, G, p, \psi), q''(\eta, \lambda, G, p, \psi) \} \).

Instead, if \( q > \min \{ q'(\eta, \lambda, G, p, \psi), q''(\eta, \lambda, G, p, \psi) \} \), both high-valence candidates and voters may be better off in an uninformative equilibrium than in a fully revealing one. In particular, this will be more likely to happen if \( p \simeq 1 \). Indeed, suppose \( p \simeq 1 \). Then, voters will almost certainly select candidates knowing their true types. Thus, according to our welfare criterion, both high-valence candidates and voters will prefer an equilibrium in which high types have a high probability of winning against low types. Since this probability is determined by reference point and, in particular, by the weight \( \tilde{r} \) assigns to \( g_H \), uninformative equilibria will be preferred to fully revealing ones if \( \tilde{r} (\tilde{m}, \tilde{m} | s^A_U, s^B_U) [g_H] > \tilde{r} (m_H, m_L | s^A_R, s^B_R) [g_H] \).

As we discussed after Proposition 5, this happens if \( q \) is sufficiently high.

4 Discussion of the Assumptions and Extensions

4.1 Distribution of Types and Multidimensional Types

In our model valences are drawn independently from the same distribution. The analysis can be easily extended to deal with the case of different, but independent distributions. In this case, the candidate with the lowest ex-ante probability of being high-valence (low \( q \)) is the one with the highest incentive to be truthful (lower \( p^* (\eta, \lambda, G, q, \psi) \)) as she has a higher expected cost of lying. The intuition is the same behind the negative correlation between \( p^* (\eta, \lambda, G, q, \psi) \) and \( q \).

Instead, our results are robust only to a moderate degree of positive correlation among candidates’ types.\(^{35}\) Once more, recall that low-valence candidates incur the cost of lying only if her opponent turns out to be high-valence. Thus, consider the extreme case in which valences are perfectly positively correlated (for instance because voters’ utility fully depends

\(^{34}\)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.

\(^{35}\)On the contrary, any degree of negative correlation can be incorporated.
on the realization of a macroeconomic shock and candidates’ idiosyncratic skills play no role). In such a setting, a low type would be certain that her opponent is also low type and, as a result, the cost of lying would be 0. Then, only uninformative equilibria would be possible.

In the paper we modeled candidates’ types as unidimensional attributes. However, the model can be extended to accommodate multidimensional types. In particular, suppose that each candidate $i \in \{A,B\}$ is characterized by a $n$-dimensional vector $(\theta^i_1, ..., \theta^i_n)$, where $\theta^i_k \in \{\theta_L, \theta_H\}$ denotes the competence of candidate $i$ in dimension $k$; these dimensions can be interpreted as different aspects of a political job that voters care about (i.e. expertise in foreign policy, economics or constitutional matters, environmental sensibility, leadership skills, bargaining skills,...). Assume that each $\theta^i_k$ is determined independently and that it takes value $\theta_H$ with probability $q^i_k$. The utility of voters can be extended to this multidimensional setting as follows:

$$v(\mathbf{g} \mid \mathbf{r}) = \sum_{k=1}^{n} g_k + \sum_{k=1}^{n} \mu(g_k - r_k)$$

where $\mathbf{g} = (g_1, ..., g_n), \mathbf{r} = (r_1, ..., r_n) \in \{g_H, g_L\}^n$, $g_k$ equals $g_H$ (respectively, $g_L$) if the elected candidate ends up being skilled (respectively, unskilled) in dimension $k$ and function $\mu(\cdot)$ is given by (3) in each of the $n$ dimensions. It is straightforward to introduce different weights for the various dimensions. Finally, assume that for each dimension $k$ there exists a probability $p_k$ with which the true skill of a candidate is revealed. Then, our analysis can be easily extended and, in particular, an analogous of Proposition 3 holds in each of the $n$ dimensions. The equilibrium characterization of this multidimensional setting also yields results on the relative likelihood of informative communication in the various dimensions.

4.2 Signal Technology

The signal technology given by (1) can be generalized in several directions without undermining our findings.

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36 Assuming correlation across the skills of a candidate (while preserving the independence restriction across candidates) would make the characterization of the optimal communication strategy more complicated, but would not undermine the main qualitative finding, namely that reference dependence and loss aversion may lead to informative communication.

37 It is straightforward to introduce different weights for the various dimensions.

38 Equivalently, one can think of $m_{k,L}^i$ as to the decision of candidate $i$ not to run the campaign focusing on dimension $k$. 
First of all, the probability of detecting a lie can depend on the valence of a candidate (for instance it can be higher for low types than for high types). In this case, the relevant threshold \( p^* \) in Proposition 3 would apply to the probability with which overstatements by low-valence candidates are detected.

Moreover, the probability with which the true valence of candidate \( i \) is revealed, \( p^i \), can also depend on some costly effort exerted by agent \( i \), \( e^i \). For instance, \( e^i \) can capture the amount of resources invested by a candidate to improve her communication skills (e.g., hirings of spin doctors) or to lower media’s scrutiny (e.g., lobbying activities with journalists). To capture this possibility, we can assume that \( p^i = \bar{p} - e^i \), where effort \( e^i \) is chosen by candidate \( i \) after she sent her message and entails a cost given by the increasing function \( C(e^i) \). In this context, a low-valence candidate may overstate her valence and subsequently exert effort to hide her lie. Informative communication would then take place if and only if the cost associated with such a strategy is sufficiently high. Moreover, this way of modeling the probability \( p^i \) would also allow us to restate the result of Proposition 3 as saying that informative communication is possible if and only if the cost associated with dissimulating one’s low type and pretending to be high-valence is too high.

\( p^i \) may also depend (positively) on the effort exerted by candidate \( j \neq i \), \( e^j \). For instance, \( e^j \) could represent the resources spent by \( j \) to spot weaknesses in candidate \( i \)’s campaign or to run negative advertisement. In this case, we could assume \( p^i = \bar{p} + e^j \), where \( e^j \) is chosen by \( j \) after listening to \( m^i \) and entails a cost \( C(e^j) \). In this case, informative communication would still take place if \( \bar{p} \geq p^* (\eta, \lambda, G, q, \psi) \). If instead \( \bar{p} < p^* (\eta, \lambda, G, q, \psi) \), some degree of information transmission may still take place, but the actual characterization of the optimal communication strategy would require the use of mixed strategies.\(^{39}\)

### 4.3 Popularity Shock and Electoral Outcome

In the paper we model electoral competition using probabilistic voting.\(^{40}\) Thus, the electoral outcome is determined both by candidates’ perceived valences and by a random shock, \( \delta \), which could lead the electorate to vote for the candidate with lower perceived valence. The realization of \( \delta \) can be interpreted as some unforeseen event which happens during the campaign and can alter the outcome of elections (e.g., a scandal that hits the popularity of the party to which one of candidate belongs).

In this setting, Assumption 1 ensures that a low type can win against a high one in any equilibrium and for any message pair (formally, it guarantees that \( 1 - W_+ (\eta, \lambda, G, \psi) > 0 \)). \(^{39}\)In equilibrium, effort \( e^j \) is exerted only if it increases candidate \( j \)’s expected utility, namely if it raises her probability of winning. In turn, this is possible only if \( i \) lies with positive probability.\(^{40}\)See Lindbeck and Weibull (1987) and Persson and Tabellini (2002).
If we relax Assumption 1 by shrinking the support of $\delta$ (namely, raising $\psi$), we lower the cost of lying given by $S(\eta, \lambda, G, \psi)$; then, if $\psi$ becomes too high, informative communication can no longer be supported as the expected benefit from lying offsets its expected cost.\footnote{Formally, the left hand side of (11) becomes higher than its right-hand side for every $p \in [0, 1]$.}

Conceptually, $\delta$ captures the uncertainty that is intrinsic in any electoral competition. Thus, we assumed that its realization takes place after candidates made their announcements. As a result, low-valence candidates always face an expected cost of lying and we used this feature to characterize the trade-off between lying and truthtelling in equation (11). An identical trade-off with similar implications would arise in any model in which, from the perspective of candidates, the behavior of the electorate is not fully determined by their announcements.

If we remove the uncertainty on candidates' side, the cost of lying could still arise. To see how, assume that $\delta$ is realized before candidates make their announcements and that it is observable both to candidates and to voters.\footnote{If $\delta$ were not observable to the electorate, the analysis would become more complicated as the announcement of candidates may contain information on the realization of $\delta$ as well. However, since $\delta$ is a popularity shock that affects the electoral outcome, the assumption that it is known to candidates and not to voters does not appear particularly relevant.} Thus, the electoral outcome is determined by the comparison between candidates' vote shares. These vote shares are given by

$$Z^A(m^A, m^B, t^A, t^B | \sigma^A, \sigma^B) = \frac{1}{2} - \varphi d + \varphi \left( \pi^A_2(m^A, t^A | \sigma^A) - \pi^B_2(m^B, t^B | \sigma^B) \right) \Gamma(\tilde{r}[g_H])$$

$$Z^B(m^A, m^B, t^A, t^B | \sigma^A, \sigma^B) = 1 - Z^A(m^A, m^B, t^A, t^B | \sigma^A, \sigma^B)$$

In this setting $A$ ($B$) wins if $(\pi^A_2(m^A, t^A | \sigma^A) - \pi^B_2(m^B, t^B | \sigma^B)) \Gamma(\tilde{r}[g_H]) > (\leq) d$. Following steps similar to the ones in Section 3, we can identify a range of realizations of $\delta$ for which there exists a cost of lying: for such $d$s a low-valence candidate wins if she announces her valence truthfully and loses if she overstates it and such a lie is detected.\footnote{These ranges are given by $[-G(1 + \eta \lambda), -G(1 + \eta)]$ for candidate $A$ and by $[G(1 + \eta), G(1 + \eta \lambda)]$. In these intervals, the appointment of both a low- and a high-valence candidate is reference-point consistent given sincere voting. We solve this multiplicity by selecting the reference-point-consistent electoral behavior that maximizes total utility (this is line with the definition of the Preferred Personal Equilibrium given by Köszegi and Rabin (2006)).} Thus, when $\delta$ takes value in these range, the low-valence candidate has a strict incentive to be truthful for any value of $p > 0$. However, the implications in terms of informative communication are now weaker; indeed, for these realizations of $\delta$, voters who do not exhibit reference dependence and/or loss aversion would be indifferent between lying and telling the truth. Thus, these behavioral biases would favor informative communication by providing an agent with...
a strict incentive to be truthful.

5 Conclusion

In this paper two candidates compete to get elected by announcing their skills to voters. If voters are standard expected utility maximizers, politicians’ announcements would be uninformative: since they always have an incentive to pretend to be high-valence, their statements will lack any credibility and voters will ignore them. We show that reference dependence and loss aversion enable truthful communication by adding an additional channel through which politicians’ announcements affect voters’ behavior, namely the change in their reference point. Intuitively, if a candidate announces to be high-valence, she raises voters’ expectations and shifts their preferences in favor of high types; then, if voters find out that she lied, they may decide to support the opponent. This endogenous adjustment in electoral behavior may induce candidates to reveal their valence truthfully in the first place.

Compared to the existing literature, our framework delivers interesting results concerning the relative likelihood of informative communication and, more importantly, it is able to justify the existence of a “cost of lying” also for professional politicians who do not incur any moral or psychological cost from being deceptive.

We conclude by pointing out that our model can be extended to a multiple-elections setting in which the true type of a candidate is more likely to be revealed when she is office. Such analysis would require additional assumptions on the persistency of candidates types, the formation and dynamic updating of reference points, as well as on the degree of voters’ sophistication in anticipating the changes in their preferences. We leave the analysis of such a model and of its connection with other models of repeated elections as an interesting direction for future research.

6 Appendix

6.1 Proof of Proposition 1

Let \((s^A, s^B)\) be an equilibrium. For every message \(m^i\), \(\pi^i_2 (m^i, t_L | s^i) = 0\), \(\pi^i_2 (m^i, t_0 | s^i) = \pi^i_1 (m^i | s^i)\) and \(\pi^i (m^i, t_H | s^i) = 1\). Therefore, \(\pi^i_2 (m^i, t^i | s^i)\) 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:

\[
U^A (m, s^B \mid \theta) = q \cdot W^A (m, s^B (\theta_H) \mid s^A, s^B) + (1 - q) \cdot W^A (m, s^B (\theta_L) \mid s^A, s^B).
\]
Since $\Gamma(\cdot) \equiv G$, Assumption 1 and equation (10) imply that $W^A(m^A, m^B \mid s^A, s^B)$ is strictly increasing in $\pi_1^A$; thus $U^A(m, s^B \mid \theta)$ is strictly increasing in $\pi_1^A$.

Suppose there exists a message $m'$ such that $\pi_1^A(m' \mid s^A) > q$. Then, there is also another message $m''$, sent by low types, such that $\pi_1^A(m'' \mid s^A) < q$. Thus a low-valence candidate could modify her strategy and send message $m'$. Since $\pi_1^A(m' \mid s^A) > \pi_1^A(m'' \mid s^A)$, this deviation would increase candidates’ expected utility contradicting the definition of equilibrium.

Thus $\pi_1^A(m \mid s^A) = \pi_2^A(m, t_0 \mid s^A) = q$ for every $m$ and the communication strategies can be assumed to be uninformative. Furthermore, one can show that for every profile $(m^A, m^B, t^A, t^B)$ is given by

$$W^A(m^A, m^B, t^A, t^B \mid s^A_U, s^B_U) = \frac{1}{2} + \psi \left( \pi_2^A(m^A, t^A \mid s^A) - \pi_2^B(m^B, t^B \mid s^B) \right) G.$$

### 6.2 Proof of Proposition 2

Let $(s^A_R, s^B_R)$ be the conjecture of voters. Then, for every $i \in \{A, B\}$, $\pi_i^1(m_H \mid s^i_R) = 1$ and $\pi_i^1(m_L \mid s^i_R) = 0$. Recall that for every pair of messages $(m^A, m^B)$

$$\tilde{\pi}(m^A, m^B \mid s^A_R, s^B_R)[g_H] = \sum_{t^A, t^B} \tilde{\pi}(m^A, m^B, s^A_R, s^B_R)[t^A, t^B] \cdot \left\{ W^A(m^A, m^B, t^A, t^B \mid s^A_R, s^B_R) \pi_2^A(m^A, t^A \mid s^A_R) + W^B(m^A, m^B, t^A, t^B \mid s^A_R, s^B_R) \pi_2^B(m^B, t^B \mid s^B_R) \right\}$$

We will analyze each pair $(m^A, m^B)$ separately.

First, consider message pair $(m_H, m_H)$. Obviously, $\tilde{\pi}(m_H, m_H, s^A_R, s^B_R)[t^A, t^B] > 0$ if and only if $(t^A, t^B) \in \{t_0, t_H\}^2$ and for these pairs of signals $\pi_2^A(m_H, t^A \mid s^A_R) = \pi_2^B(m_H, t^B \mid s^B_R) = 1$. Thus, $\tilde{\pi}(m^A, m^B \mid s^A_R, s^B_R)[g_H] = 1$ and $\Gamma(\tilde{\pi}[g_H]) = (1 + \eta \lambda) G$. Thus, by (9), we can conclude that:

$$W^A(m_H, m_H, t^A, t^B \mid s^A_R, s^B_R) = \frac{1}{2}$$

for every $(t^A, t^B) \in \{t_0, t_H\}^2$. If instead $(t^A, t^B) \in \{t_L\} \times \{t_0, t_H\}$ (namely, A generates signal $t_L$ while B generates either $t_0$ or $t_H$), $\pi_2^A(m_H, t^A \mid s^A_R) = 0$ and $\pi_2^B(m_H, t^B \mid s^B_R) = 1$. Thus, by (9),

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

which is positive by Assumption 1. A symmetric reasoning allows us to conclude that for
every pair \( (t^A, t^B) \in \{t_0, t_H \} \times \{t_L \} \):

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

Finally, if \( (t^A, t^B) = (t_L, t_L) \), \( \pi^i (m_H, t^i \mid s^R_i) = 0 \) for every \( i \in \{A, B\} \) and we can conclude that \( W^A (m_H, m_H, t^A, t^B \mid s^A_R, s^B_R) = \frac{1}{2} \).

Now, consider message pair \( (m_L, m_L) \). In this case \( \hat{\pi} (m_L, m_L, s^A_R, s^B_R) [t^A, t^B] > 0 \) if and only if \( (t^A, t^B) \in \{t_L, t_L\}^2 \). Moreover, for these pairs \( \pi^A (m_H, t^A \mid s^A_R) = \pi^B (m_H, t^B \mid s^B_R) = 0 \). Then, \( \tilde{r} (m^A, m^B \mid s^A_R, s^B_R) [g_H] = 0 \) and \( \Gamma (\tilde{r} [g_H]) = (1 + \eta) G \). Proceeding as before, we can conclude that:

\[
W^A (m^A, m^B, t^A, t^B \mid s^A_R, s^B_R) = \begin{cases} \\
\frac{1}{2} - \psi (1 + \eta) G & \text{if } (t^A, t^B) \in \{t_L, t_0\} \times \{t_H\} \\
\frac{1}{2} + \psi (1 + \eta) G & \text{if } (t^A, t^B) \in \{t_L, t_0\}^2 \cup \{t_H\}^2 \\
\frac{1}{2} - \psi (1 + \eta) G & \text{if } (t^A, t^B) \in \{t_H\} \times \{t_0, t_L\} \\
\end{cases}
\]

To conclude our analysis, consider message pair \( (m_H, m_L) \) (the case \( (m_L, m_H) \) is symmetric and omitted). Then \( \hat{\pi} (m_H, m_L, s^A_R, s^B_R) [t^A, t^B] > 0 \) if and only if \( (t^A, t^B) \in \{t_0, t_H\} \times \{t_L, t_0\} \).

After these signal pairs, \( \pi^A (m_H, t^A \mid s^A_R) = 1 \) and \( \pi^B (m_L, t^B \mid s^B_R) = 0 \). Thus:

\[
\tilde{r} (m_H, m_L \mid s^A_R, s^B_R) [g_H] = \sum_{t^A, t^B} \hat{\pi} (m_H, m_L, s^A_R, s^B_R) [t^A, t^B] W^A (m_H, m_L, t^A, t^B \mid s^A_R, s^B_R)
\]

and \( \Gamma (\tilde{r} [g_H]) = (1 + \eta + \eta (\lambda - 1) \tilde{r} [g_H]) G \). Since \( \tilde{r} (m_H, m_L \mid s^A_R, s^B_R) [g_H] \) does not depend on \( (t^A, t^B) \), we can use (9) and (10) and show that:

\[
W^A (m^A, m^B \mid s^A_R, s^B_R) = W^A (m_H, m_L, t^A, t^B \mid s^A_R, s^B_R)
\]

for every \( (t^A, t^B) \in \{t_0, t_H\} \times \{t_L, t_0\} \).

As a result, \( W^A (m_H, m_L \mid s^A_R, s^B_R) = \tilde{r} (m_H, m_L \mid s^A_R, s^B_R) [g_H] \). Substituting for this reference point in (9) and exploiting the expression of function \( \Gamma (\cdot) \), we conclude that for every \( (t^A, t^B) \in \{t_0, t_H\} \times \{t_L, t_0\} \):

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

Notice that \( W^A (m_H, m_L, t^A, t^B \mid s^A_R, s^B_R) \): (i) is increasing in \( \lambda \), (ii) is equal to \( \frac{1}{2} + \psi (1 + \eta) G \) if \( \lambda = 1 \), (iii) by Assumption 1 is lower than \( \frac{1}{2} + \psi (1 + \eta \lambda) G \) for every \( \lambda \in (1, \bar{\lambda}) \), and (iv) is equal to \( \frac{1}{2} + \psi (1 + \eta \bar{\lambda}) G \) when \( \lambda = 1 \) (in this last case \( W^A (m_H, m_L, t^A, t^B \mid s^A_R, s^B_R) = 1 \)).

Now, consider signal pair \( (t^A, t^B) \in \{t_0, t_H\} \times \{t_H\} \); since both \( \pi^A (m_H, t^A \mid s^A_R) \) and
\[ \pi^B (m_L, t^B | s^B_R) \] are equal to 1, it is immediate to verify that \[ \Pi^A (m_H, m_L, t^A, t^B | s^A_R, s^B_R) = \frac{1}{2} \]. Similarly, if \( (t^A, t^B) \in \{t_L\} \times \{t_L, t_0\} \), \[ \Pi^A (m_H, m_L, t^A, t^B | s^A_R, s^B_R) = \frac{1}{2} \]. The last signal pair to consider is \( (t^A, t^B) = (t_L, t_H) \); in this case

\[ \Pi^A (m_H, m_L, t^A, t^B | s^A_R, s^B_R) = \frac{1}{2} - \psi (W^A (m_H, m_L | s^A_R, s^B_R)) \]

and exploiting \( W^A (m^A, m^B | s^A_R, s^B_R) = W^A (m_H, m_L, t^A, t^B | s^A_R, s^B_R) \), we get:

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

Then, the statement of the proposition follows by defining:

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

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

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

### 6.3 Proof of Proposition 3

We will focus on candidate A as the analysis for B is symmetric. Suppose A believes B is following communication strategy \( s^B_R \). Then, by Proposition 2 the difference in expected utility between truth telling and lying for a high- and low-valence candidate are respectively given by:

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

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

Since \( W_R (\eta, \lambda, G, \psi) > W_- (\eta, G, \psi) > \frac{1}{2} \), \( U^A (m_H, s^B_R | g_H) > U^A (m_L, s^B_R | g_H) \). Thus, truthful revelation is optimal for high-valence candidates.

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

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

Then there exists a unique \( p^* (\eta, \lambda, G, q, \psi) < 1 \) that satisfies \( h (p^* (\eta, \lambda, G, q, \psi)) = 0 \). By construction

\[
U^A (m_L, s_R^B | \theta_L) = \begin{cases} 
    > U^A (m_H, s_R^B | \theta_L) & \text{if } p > p^* (\eta, \lambda, G, q, \psi) \\
    = U^A (m_H, s_R^B | \theta_L) & \text{if } p = p^* (\eta, \lambda, G, q, \psi) \\
    < U^A (m_H, s_R^B | \theta_L) & \text{if } p < p^* (\eta, \lambda, G, q, \psi)
\end{cases}
\]

As a result, a fully revealing equilibrium exists if \( p \in [p^* (\eta, \lambda, G, q, \psi), 1] \).

Now, suppose that a fully revealing equilibrium exists. Then, it must be the case that

\[
U^A (m_L, s_R^B | \theta_L) \geq U^A (m_H, s_R^B | \theta_L) \text{ and } U^A (m_H, s_R^B | \theta_H) \geq U^A (m_L, s_R^B | \theta_H).
\]

Thus, by the same reasoning as before, we conclude that \( p \in [p^* (\eta, \lambda, G, q, \psi), 1] \).

Also, given the expressions for \( W_+ (\cdot) \) and \( W_R (\cdot) \), \( p^* (\eta, 1, G, q, \psi) = p^* (\eta, \bar{\lambda}, G, q, \psi) = 1 \) (this last result follows since \( W_R (\eta, \bar{\lambda}, G, \psi) = W_+ (\eta, \bar{\lambda}, G, \psi) = 1 \)) and, by the implicit function theorem, \( \frac{\partial p^* (\eta, \lambda, G, q, \psi)}{\partial \lambda} \bigg|_{\lambda=1} < 0 \), \( \frac{\partial p^* (\eta, \lambda, G, q, \psi)}{\partial \lambda} \bigg|_{\lambda=\bar{\lambda}} > 0 \). Thus, \( p^* (\eta, \lambda, G, q, \psi) \) is minimized for some \( \lambda \in (1, \bar{\lambda}) \).

### 6.4 Characterization of Winning Probabilities in an Uninformative Equilibrium with Reference Dependence

We now characterize \( W^A (\bar{m}, \bar{m}, t^A, t^B | s_U^A, s_U^B) \) in the presence of reference dependence. Obviously, for every \( i \in \{A,B\} \) \( \pi^i_1 (\bar{m} | s_U^i) = q, \pi^i_2 (\bar{m}, t_L | s_U^i) = 0, \pi^i_2 (\bar{m}, t_0 | s_U^i) = q, \pi^i_2 (\bar{m}, t_H | s_U^i) = 1 \). Thus, \( \hat{\pi} (\bar{m}, \bar{m}, s_U^A, s_U^B) [t^A, t^B] \) is given by:

<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>( p^2 (1-q)^2 )</td>
<td>( p (1-q) (1-p) )</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>

Using (9), we can characterize \( W^A (\bar{m}, \bar{m}, t^A, t^B | s_U^A, s_U^B) \) as a function of the difference in beliefs \( \pi^A_2 (\bar{m}, t^A | s_U^A) - \pi^B_2 (\bar{m}, t^B | s_U^B) \) and of the reference point \( \bar{r} (\bar{m}, \bar{m} | s_U^A, s_U^B) \) for every possible pair \( (t^A, t^B) \).
Substituting the expressions for \( W^A (\tilde{m}, \tilde{m}, t^A, t^B | s^A_U, s^B_U) \) and \( \bar{\pi} (\tilde{m}, \tilde{m}, s^A_U, s^B_U | t^A, t^B) \) into \( \tilde{r} (\tilde{m}, \tilde{m} | s^A_U, s^B_U) [g_H] \) and rearranging terms, we get:

\[
\tilde{r} (\tilde{m}, \tilde{m} | s^A_U, s^B_U) [g_H] = \frac{q (1 + 2\psi p (1 - q) (1 + \eta))}{1 - 2\psi pq (1 - q) \eta (\lambda - 1) G}
\]

Define \( W_{U,\kappa} (\eta, \lambda, G, q, p, \psi) = \frac{1}{2} + \psi \kappa \left( \frac{1 + q\eta\lambda + (1 - q) \eta}{1 - 2\psi pq (1 - q) \eta (\lambda - 1) G} \right) G \). Then, for every signal pair \((t^A, t^B)\) we get:

\[
W^A (\tilde{m}, \tilde{m}, t^A, t^B | s^A_U, s^B_U) = W_{U,\Pi(t^A,t^B)} (\eta, \lambda, G, q, p, \psi),
\]

where \( \Pi (t^A, t^B) = \pi^A_2 (\tilde{m}, t^A | s^A_U) - \pi^B_2 (\tilde{m}, t^B | s^B_U) \).

By Assumption 1, \( W_{U,\kappa} (\eta, \lambda, G, q, p, \psi) \) is greater than \( \frac{1}{2} \) and increasing in \( q \).\(^{44}\) Furthermore, \( W_{U,1} (\eta, \lambda, G, 0, p, \psi) = W_- (\eta, G, \psi) \) and \( W_{U,1} (\eta, \lambda, G, 1, p, \psi) = W_+ (\eta, \lambda, G, \psi) \).

### 6.5 Proof of Proposition 6

We start proving the statement for high-valence candidates (the one for low-valence can be derived in a similar way). The expected utility of a high-valence candidate in a fully revealing equilibrium is given by:

\[
U^i (m_H, s_R | \theta_H) = \frac{1}{2} + \psi (1 - q) \frac{2 + \lambda \eta + \eta}{2 (1 - \psi \eta (\lambda - 1) G)} G
\]

while her expected utility in an uninformative equilibrium is equal to:

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

Thus, \( U^i (m_H, s_R | \theta_H) \geq U^i (\tilde{m}, s_U | \theta_H) \) if and only if \( \frac{2 + \lambda \eta + \eta}{2 (1 - \psi \eta (\lambda - 1) G)} \geq p \frac{1 + q\eta\lambda + (1 - q) \eta}{1 - 2\psi \eta (\lambda - 1) p (1 - q) qG} \). Since the right hand side of the previous inequality is increasing in \( q \) by Assumption 1, we conclude that \( U^i (m_H, s_R | \theta_H) \geq U^i (\tilde{m}, s_U | \theta_H) \) if and only if \( q \leq q^* (\eta, \lambda, G, p, \psi) \) for some \( q^* (\eta, \lambda, G, p, \psi) \) possibly equal to 1.

Now, consider the consumption utility of voters. In a fully revealing equilibrium, it is given by \( g_L + q^2 G + 2q (1 - q) W_R G \) where \( W_R = W_R (\eta, \lambda, G, \psi) \). Instead, in an uninformative equilibrium it is given by \( g_L + q^2 G + 2q (1 - q) Q G \) where \( Q \) is the probability with which the high-valence candidate is appointed in the event that the opponent is low-valence. Formally \( Q = p^2 W_{U,1} + \frac{(1-p)^2}{2} + p (1-p) (W_{U,(1-q)} + W_{U,q}) = \frac{1}{2} + \psi p \frac{1 + q\eta\lambda + (1 - q) \eta}{1 - 2\psi \eta (\lambda - 1) p (1 - q) qG} G \in \frac{1}{2} + \psi \frac{1 + q\eta\lambda + (1 - q) \eta}{1 - 2\psi \eta (\lambda - 1) p (1 - q) qG} G \).

\(^{44}\) Indeed, \( \frac{\partial W_{U,\kappa}(\eta,\lambda,G,q,p,\psi)}{\partial q} > 0 \) if \( 1 + 2G \psi (1 + \eta) - 4Gpq \psi (1 + \eta) - 2Gpq^2 (\lambda - 1) \psi > 0 \). This last expression is greater or equal than \( 1 - 2\psi \psi (1 + \eta) G \), which is positive by Assumption 1.
\( \left( \frac{1}{2}, W_{U,1} (\eta, \lambda, G, q, p, \psi) \right) \) (the last equality follows from substituting the expressions for \( W_{U,k} = W_{U,k} (\eta, \lambda, G, q, p, \psi) \) that we derive in Appendix 6.4). Furthermore, \( Q \) is increasing in \( q \). Then the consumption utility of voters in a fully revealing equilibrium is higher than the one in an uninformative equilibrium if and only if \( W_R \geq Q \). Since \( W_R \) is constant in \( q \), while \( Q \) is increasing in it, there exists a threshold \( q'' (\eta, \lambda, G, p, \psi) \) (possibly equal to 1) such that \( W_R \geq Q \) if and only if \( q \leq q'' (\eta, \lambda, G, p, \psi) \).

### References


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\(^{45}\)To see this, notice that the derivative of \( Q \) with respect to \( q \) has the same sign of \((1 - 2p\psi (1 + \eta) (2q - 1) G - 2pq^2 \psi \eta (\lambda - 1) G) \) which is greater or equal than \( 1 - 2p\psi \eta (1 + \lambda \eta) G \); this last expression is positive by Assumption 1.


