Hindsight-biased evaluation of political decision makers

Florian Schuett a,*, Alexander K. Wagner b

a TILEC, Centre, Tilburg University, P.O. Box 90153, 5000 LE Tilburg, The Netherlands
b Department of Economics, University of Konstanz, Box 150, 78457 Konstanz, Germany

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ABSTRACT

Hindsight bias is a cognitive deficiency that leads people to overestimate ex post how predictable an event was. In this paper we develop a political-agency model in which voters are hindsight-biased and politicians differ in ability, defined as information concerning the optimal policy. When public information is not too accurate, low-ability politicians sometimes gamble on suboptimal policies: in an attempt to mimic the high-ability type, who has superior private information, they go against public information and choose a policy whose expected payoff to society is negative. We model hindsight bias as a memory imperfection that prevents voters from accessing their ex ante information about the state of the world. We show that the bias can act as a discipline device that reduces policy gambles and can therefore be welfare enhancing. Although it is well known that restrictions on information acquisition can be beneficial for a principal, our contribution is to show that a psychological bias can have such an effect.

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1. Introduction

The psychology literature provides ample evidence that many people exhibit hindsight bias: in retrospect, they systematically overestimate how predictable an event was. The bias can cause problems when a decision maker is evaluated after the outcome of his actions is known, and no ex ante contract, mapping outcomes into performance assessments, exists. Democratic elections are a prominent example of such a situation. Voters typically have to make an ex post assessment of the decisions of an incumbent politician and decide whether to confirm him in office or replace him with a challenger. Hindsight bias is often thought to adversely affect the voters’ decision by altering their perception of the incumbent’s responsibility (Camerer et al., 1989; Frey and Eichenberger, 1991). Because they deem observed outcomes more predictable than they actually were, hindsight-biased voters tend to give the incumbent less credit than is due for success and more blame than is warranted for failure.

In this paper we argue that hindsight bias may not be altogether detrimental to the functioning of the political system because it can have a disciplining effect on politicians. We present a model in which the incumbent politician has a tendency to engage in policy gambles: to mislead voters into thinking that he has superior private information, the incumbent goes against public information and chooses a policy whose expected payoff to society is negative but which, in the event of success, boosts his chances of staying in office. We show that hindsight bias on the part of voters can reduce such policy gambles and can therefore be welfare-enhancing.

To motivate our analysis, let us briefly consider two episodes from U.S. politics: the first Gulf war, and the Iran hostage crisis. The Gulf war of 1991 is a well-documented example of how hindsight bias can influence the public perception of policy choices, and arguably the outcome of elections. President George H.W. Bush had initiated military action in response to the Iraqi invasion of Kuwait, an endeavor of considerable political risk, and came away with what observers unanimously viewed...
as a huge success. Opinion polls about the decision to go to war clearly bear out voters’ hindsight bias:

In December 1990, respondents had split about 50/50 on a question asking whether they preferred sanctions or military action. But when asked after the war how they had felt before the war, those inclined to remember that they had supported military action outnumbered those recalling their support for sanctions by nearly four to one. (Mueller, 1994, p. 87)

If voters considered the decision to go to war as an easy call in retrospect, such a belief would surely have been detrimental to the President's hope of winning reelection.2

The Iran hostage crisis illustrates the fact that policy gambles are an important political accountability problem. In 1979, 66 U.S. diplomats had been taken hostage in the Tehran embassy. President Jimmy Carter’s low approval ratings and a slumping U.S. economy meant that the president was unlikely to be confirmed in office unless he somehow managed to resolve the crisis before the November 1980 election. As negotiations with Iran dragged on, Carter started to contemplate a military solution that most observers at the time thought impossible or too risky. Polls showed that only 10% of voters were in favor of using military force (Brulé, 2005), and Secretary of State Cyrus Vance resigned because of disagreement with Carter and his team of advisors on the issue (Houghton, 2001). In spite of the opposition, Carter decided to launch a high-risk military rescue operation. It became one of the best-known fiascos in the history of American military intervention.3

How does hindsight bias reduce the tendency toward policy gambles? The reason why a politician may sometimes choose a policy that both he and the public expect to reduce welfare is that, if the gamble pays off, rational voters are “surprised” and make an upward adjustment of their beliefs about the politician’s ability. Hindsight-biased voters, however, think they knew all along that the policy was going to work (they are not surprised), and do not give him as much credit. Therefore, when facing hindsight-biased voters, the politician is less tempted to gamble on an inefficient policy in the first place.

To be more precise, in the model we develop, a politician whose ability is unknown to voters has to choose between two policies. While voters and low-ability politicians obtain only an imperfect signal about which policy is preferable ex ante, high-ability politicians know the state of the world with certainty. This setup creates incentives for a low-ability politician to inefficiently ignore public information concerning the welfare-maximizing policy in an attempt to “look smart,” i.e., to make it seem as if he had superior private information, the trademark of high-ability politicians. To see why, consider what happens in the case of rational voters who are “surprised” and make an upward adjustment of their beliefs about the politician’s ability. Hindsight-biased voters, however, think they knew all along that the policy was going to work (they are not surprised), and do not give him as much credit. Therefore, when facing hindsight-biased voters, the politician is less tempted to gamble on an inefficient policy in the first place.

We show that if the public signal is in an intermediate range such that neither policy choice clearly dominates the other in terms of expected welfare, the equilibrium with rational voters has the low-ability politician randomizing between choosing the policy that is optimal according to the signal and doing exactly the opposite. This randomization is detrimental to welfare because policy choices do not use all available information.

We assume that voters suffering from hindsight bias distort their recollection of the signal so as to make it consistent with the state of the world revealed by the policy outcome. If the signal suggested that the state of the world is 0, but the politician successfully enacts a policy that reveals that the opposite is the case, then voters wrongly believe that the signal had suggested all along that the state was 1. Therefore, with hindsight-biased voters, some of the gain in reputation that follows from an unpopular policy which turns out to be a success is destroyed. Ex post, biased voters think that it was the obvious choice anyway. Anticipating voters’ biased belief updating, the low-ability politician gambles on the inefficient policy less often when voters are hindsight biased than when they are rational. Thus, hindsight bias on the part of voters can act as a discipline device.

Another way to interpret the effect of hindsight bias is the following. In our model, politicians sometimes try to improve their reputation by going against the public signal. Hindsight bias makes voters forget the public signal and replace it with an erroneous recollection based on outcome knowledge. By doing so, the bias takes away the tool of going against the public signal.

We also show that when the two policies are asymmetric with respect to the probability of revealing the state of the world, hindsight bias may have a less benign effect. Because revelation of the state of the world has the potential to uncover the incumbent’s lack of ability, the low type may refrain from choosing the more revealing policy even though it is efficient. Under hindsight-biased evaluation, the politician does not get as much credit for success as he deserves. Compared to rational evaluation, he may be more inclined to choose the policy that has lower expected welfare but whose outcome is certain and does not entail the risk of uncovering him as a low type. Thus, hindsight bias can sometimes discourage efficient risk taking.

Even when the disciplining effect prevails, so that hindsight bias increases voters’ first-period welfare, an overall welfare assessment also has to take into account the second (i.e., post-election) period. We discuss how hindsight bias affects the selection of the second-period politician and conclude that the impact of the bias is ambiguous. On the one hand, biased voters hold erroneous posteriors about the incumbent’s ability, sometimes leading them to elect the wrong candidate. On the other hand, hindsight bias may generate offsetting benefits in terms of inferences about the politician’s type. By changing the low type’s behavior in the first period, the bias can make it easier for voters to distinguish low- from high-ability politicians.

Our contribution to the literature is twofold. First, our result that a behavioral bias can improve welfare adds to the behavioral-economics literature. It is similar in spirit to Compte and Postlewaite (2004), Bénabou and Tirole (2002) and Köszegi (2006). Those papers, however, consider how a psychological bias (namely, overconfidence) affects intrapersonal welfare.4 By contrast, we investigate how a bias on the part of one group of agents (voters) can affect the behavior of other agents (politicians) in a way that increases the welfare of the former. We use a standard welfare measure that is unaffected by which “self” of an individual one considers; nor does it involve belief consumption.

Second, our paper extends the literature on political agency, in particular by going beyond the standard rational-voter assumption, as suggested by Besley (2006). Our basic model is related to the recent literature on the dysfunctional effects of reelection concerns which can arise when politicians have better information than voters. This literature has mainly emphasized distortions such as inefficient policy experimentation and pandering (see, e.g., Majumdar and Mukand, 2004; Maskin and Tirole, 2004; Smart and Sturm, 2006). The

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2 We discuss this example in more detail in Section 5.

3 A phenomenon that arises as a special case of the policy gambles in our model is gambling for resurrection. Downs and Rokee (1994) provide historical examples of gambling for resurrection by policy makers. Systematic evidence is difficult to come by because the information needed to identify a behavior as gambling for resurrection is private. Hess and Orphanides’s (1995) finding that U.S. presidents are more likely to start a war in an election year when the economy is doing badly nevertheless suggests that such behavior is not merely anecdotal.

4 In Compte and Postlewaite (2004), an agent’s self-confidence affects his performance in a task. Information-processing biases such as repressing memories of bad performance can improve the individual’s welfare by boosting his confidence, thus helping him do better. Bénabou and Tirole (2002) show how overconfidence can help an individual overcome time inconsistency and thus improve his well-being (at least from an ex ante (“self zero”) perspective). Köszegi (2006) lets individuals consume their self-perception, so that an overly positive self-image can raise utility.
inefficiency in our model consists in politicians signaling their ability by choosing an *unpopular* policy.

Canes-Wrone et al. (2001) obtain both kinds of inefficient behavior in a model where politicians try to signal their ability and the policies available differ in the probability of uncertainty resolution, i.e., the probability that the policy outcome is realized before the election. In contrast to our model, the quality of the challenger is known at the outset. When the challenger’s quality is low, the low-ability incumbent may choose a suboptimal policy simply because it is popular among voters (pandering). When the challenger’s ability is high and the probability of uncertainty resolution is sufficiently asymmetric, however, the incumbent may engage in something the authors call “fake leadership”: he acts against both popular belief and his private signal, trying to be perceived as a leader.\(^3\) In our model, inefficient policy gambles (i.e., fake leadership) occur regardless of the asymmetry between probabilities of uncertainty resolution, although the effect of hindsight bias depends on it.

Our results are similar to those obtained by Levy (2004) for the case of decision makers with career concerns. The decision makers in her model display a behavior labeled “anti-herding,” i.e., they have a tendency to take decisions contradicting the public prior. In Prat (2005), the agent may disregard valuable private information in an attempt to mimic the more able type. As a result, the principal may be better off not observing the agent’s action.

The finding that less information can be better for a principal is a common theme in setups where the principal lacks commitment power. It is a feature of Crémer (1995), for example, where the principal may disregard valuable private information in an attempt to imitate the more able type. As a result, the principal may be better off not observing the agent’s action.

In our model, inefficient policy gambles (i.e., fake leadership) occur regardless of the asymmetry between probabilities of uncertainty resolution, although the effect of hindsight bias depends on it.

The remainder of the paper is organized as follows. Section 2 introduces the model and defines a hindsight-biased information structure. Section 3 determines the equilibria under rational and hindsight information. Section 4 discusses our modeling of hindsight bias and outlines the effect of the bias on selection. Finally, Section 5 concludes. All proofs are relegated to the Appendix.

\section{Model}

We consider a simple two-period political agency model. In each period, the state of the world \(\omega\) can be either 0 or 1. Politicians and voters receive an imperfect public signal \(\sigma \in \{0, \sigma_1\}\) about the state of the world. Let \(\nu \in \{\nu_0, \nu_1\}\) denote the probability that the state of the world is 1 conditional on signal \(\sigma\). That is, \(\nu_0 \equiv Pr(\omega = 1|\sigma_0)\) and \(\nu_1 \equiv Pr(\omega = 1|\sigma_1)\). There are two possible policies (or actions) \(a \in \{a_0, a_1\}\) from which the decision maker can choose. The actions can produce different policy outcomes \(y \in \{0, \kappa, 1\}\) (defined as the payoff to voters), which depend on the state of the world. Policy \(a_1\) delivers a payoff of 1 if \(\omega = 1\), and 0 if \(\omega = 0\). Thus, the outcome associated with \(a_1\) is always contingent on \(\omega\).

The outcome associated with policy \(a_0\) is contingent on \(\omega\) only with probability \(p\), in which case it delivers a payoff of 1 if \(\omega = 0\), and 0 if \(\omega = 1\). With probability \(1 - p\), policy \(a_0\) delivers a payoff of \(\kappa\), independent of \(\omega\). We assume \(0 < \kappa < 1\) so that \(a_0\) yields a higher payoff than \(a_1\) if and only if \(\omega = 1\).

A politician can be of high or low ability and knows his own type \(\theta \in \{\theta_0, \theta_1\}\). The prior probability \(\lambda \in (0, 1)\) that the incumbent is of high ability is common knowledge. High ability is defined as an informational advantage over voters as to the welfare-maximizing policy. While a low-ability politician only learns the signal \((\sigma, \omega)\), a high-ability politician also learns the state of the world \((\omega)\).

Our assumption that voters obtain an informative signal about the state of the world, just as politicians do, and that the signal coincides with that of low-ability politicians, reflects the idea that voters are exposed to a certain amount of policy-relevant public information (e.g., from the media). On average, politicians still have “expertise,” i.e., they are more likely to have correct information concerning the underlying state of the world than voters.

We impose the following assumption on the signal:

**Assumption 1.** \(0 < \nu_0 < 1/2 < \nu_1 < 1\).

This assumption ensures that the public signal is informative but imperfect: while it does not reveal the state of the world with certainty, the likelihood that the state is 0 after signal \(\omega_0\) is greater than the likelihood that the state is 1 \(- \omega_0\). In other words, the signal is more likely to be correct than incorrect.

In order to model hindsight bias, we introduce a distinction between the original signal \(\sigma\) received by all players before the politician chooses an action, and the *recollection* \(\hat{\sigma}\) of the original signal that voters have when deciding who to vote for. While rational voters always correctly recall the signal \((\hat{\sigma} = \sigma)\), hindsight-biased voters’ recollection sometimes differs from the original signal, as we outline below.

\subsection{Timing}

The game is played in two periods (interpreted as terms in office). Period 1 is divided into four stages; see Fig. 1. At \(t = 0\), nature draws the incumbent’s type \(\theta\), the state of the world \(\omega\), and the public signal \(\sigma\). All types of incumbents and voters observe \(\sigma\) but only type-\(\theta_1\) incumbents learn \(\omega\). At \(t = 1\), the incumbent decides which policy to implement. At \(t = 2\), the outcome of the policy is realized and learned by all players. At \(t = 3\), the election stage of the game, voters choose between the incumbent and a challenger. The electorate’s perception of the challenger (i.e., the probability that the challenger is of high ability) is \(\lambda\), which is randomly drawn from a distribution on \([0, 1]\). The perception of the incumbent’s ability depends on the recollection \(\hat{\sigma}\) that voters have of the original signal \(\sigma\) at this stage. In the second period, following a draw of \(\omega\) and \(\sigma\), the appointed politician takes an action. After that, the second-period outcome is realized and publicly observed. At this point, the game ends.

\subsection{Politicians and voters}

The voters’ task is to decide whether to reelect or replace the incumbent. Their strategy consists of a probability distribution over the actions “reelect the incumbent” and “elect the challenger” for each possible combination of recalled signal, action, outcome, and perceived ability of the challenger. The voters’ payoff equals the expected social welfare.

The politician’s preferences are given by \(u = \phi W + (1 - \phi) Pr{\text{reelection}}\).

where \(W\) is current-period social welfare.\(^6\) The parameter \(\phi \in (0, 1)\) measures the politician’s relative concern for welfare and reelection. We assume that it satisfies the following assumption:

\(^5\) Canes-Wrone et al. (2001) distinguish fake leadership from true leadership, the latter being defined as a high-ability incumbent ignoring public information and following his superior private signal, a behavior that is in the public interest.

\(^6\) The assumption that all types of politician care about social welfare, as well as holding office, can be justified, for example, by the fact that politicians are drawn from the population of voters. Thus, they can be expected to consume the same goods as the rest of the electorate. This formulation follows authors such as Rogoff (1990), Harrington (1993), Canes-Wrone et al. (2001) and Majumdar and Mukand (2004).
Assumption 2. \((1 - \phi)/\phi < \min(1, (p + (1 - p)\nu)/\lambda, (1 - (1 - p)\nu)/\lambda)\).

This assumption puts an upper bound on the strength of reelection concerns. As we show below, it rules out equilibria in which the high-incumbent is of type \(\sigma_i\), while voters’ beliefs about \(\sigma_i\) before the informative event are determined by the signal \(a_i\). Following research in psychology, we interpret hindsight bias as a memory imperfection according to which an evaluator follows some mental strategy to reconstruct the original prior from the default information he holds ex post; this is what Hawkins and Hastie (1990, p. 321) call “reconstruction of the prior judgment by ‘rejudging’ the outcome.” The following definition of hindsight bias ensures consistency of the set of recalled prior beliefs with the set of original prior beliefs an evaluator may hold about the state of the world.\(^7\)

Definition (Hindsight bias with a binary signal). After an informative policy outcome, \(y \in \{0, 1\}\) voters overestimate the accuracy of their prior belief about the state of the world. Let \(\omega\) be the true state of the world, as revealed by \(y\). Irrespective of the original signal, the voters’ recalled prior is based on \(\sigma_\omega\).

Table 1 specifies which signal hindsight-biased voters will recall, according to this definition, as a function of policy choice and outcome. If \(\sigma = \sigma_0\) and voters learn that \(\omega = 1\), they think that ex ante they attached probability \(y_i\) to the state of the world being \(1\) even though according to their original signal it was \(y = y_i\). To close the model, we make an assumption about the voters’ awareness of their bias:

Assumption 3. Hindsight-biased voters are unaware of their memory imperfection: they believe that the signal they recall is the true signal.

According to this assumption, hindsight-biased voters are naive in the sense that they are certain that they correctly remember the signal even though the bias sometimes causes erroneous recollection. The assumption of naivety simplifies the exposition without affecting the qualitative results, as we discuss in Section 4.\(^8\)

3. Hindsight bias as a discipline device

In this section, we derive the equilibrium of the game. We compare rational evaluation with hindsight-biased evaluation and study the

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\(^7\) In a pooling equilibrium, all types of politician choose the same policy irrespective of their information and voters believe that any politician who deviates is of low ability. Pooling equilibria could also be pruned by using a refinement (namely, the D1 criterion), in which case Assumption 2 could be reduced to \((1 - \phi)/\phi < 1\).

\(^8\) Strictly speaking, there are three types of politicians in this model: two types of high-ability politicians (one for each realization of the first-period state of the world), and one type of low-ability politician. We have labeled types in more intuitive terms for greater clarity of exposition.
We will categorize equilibria according to the low type's equilibrium strategy: when $s(\sigma)=0$ or $s(\sigma)=1$, we speak of a pure-strategy equilibrium, while for $0<s(\sigma)<1$ (the low type randomizes between $a_0$ and $a_1$) we speak of a mixed-strategy equilibrium.\footnote{It would be an abuse of language to speak of a separating equilibrium because the model has three types of politicians; see footnote 8. The two high-type abilities play pure strategies corresponding to the state of nature. Hence, whatever the low type's strategy, the equilibrium is always partially pooling.}

### 3.1. Equilibrium with rational voters

Rational voters always correctly recall the original signal, so $\hat{\sigma} = \sigma$. Using this to replace $\mu$ according to Eq. (2) in expressions (3) and (4), the low-ability politician’s payoff from action $a_0$ becomes

$$
\phi(1-p)\kappa + p(1-v) + (1-\phi)\left[\frac{(1-p)(1-v)}{\lambda(1-v) + (1-\lambda)(1-s(\sigma))} + \frac{p(1-v)\lambda}{\lambda + (1-\lambda)(1-s(\sigma))}\right]
$$

while his payoff from $a_1$ becomes

$$
\phi v + (1-\phi)\lambda \frac{v\lambda}{\lambda + (1-\lambda)s(\sigma)}.
$$

Because the politician cares about his reputation as well as welfare, his incentives are not perfectly aligned with those of voters. The following lemma describes the equilibrium of the resulting game with rational evaluation, for which $s^*(\sigma)$ denotes the low type’s equilibrium strategy.

**Lemma 2.** Suppose voters are rational. There exists a unique equilibrium characterized by thresholds $\nu^L$ and $\nu^R$, such that the high-ability politician chooses $a_0$ when $\omega = 0$ and $a_1$ when $\omega = 1$, while for $\nu^L \leq \nu \leq \nu^R$ the low-ability politician always plays $a_0$ if $s^*(\sigma) = 0$, for $\nu^R \leq \nu$ he always plays $a_1$ ($s^*(\sigma) = 1$), and for $\nu^L < \nu < \nu^R$ he randomizes between $a_0$ and $a_1$: $s^*(\sigma) = S^*(\nu)$ where $S^*(\nu) = 1$ is increasing in $\nu$.

In the unique equilibrium, the high-ability politician always chooses the socially optimal policy. The low-ability politician’s equilibrium behavior depends on the probability that $\omega = 1$, given by $\nu$. When $\nu$ is small, we are in a pure-strategy equilibrium in which the low-ability politician always chooses $a_0$. When $\nu$ is large, we are in a pure-strategy equilibrium in which he always chooses $a_1$. When $\nu$ is in an intermediate range, we are in a mixed-strategy equilibrium in which he randomizes and chooses each action with probability $S^*(\nu)$, obtained by equating Eqs. (5) and (6).

Note that Lemma 2 describes the equilibrium for both the $\sigma_0$ and the $\sigma_1$ subgame. For example, suppose $v_0 < \nu^L < v_1 < \nu^R$. Then, $S^*(\sigma_0) = 0$ and $0 < S^*(\sigma_1) < 1$, i.e., the low type plays $a_0$ with certainty after receiving signal $\sigma_0$ and randomizes after receiving signal $\sigma_1$. Together with Assumption 1, Lemma 2 implies that $S^*(\sigma_0) \leq S^*(\sigma_1)$, i.e., the low-ability politician is more likely to play $a_1$ after $\sigma_1$ than after $\sigma_0$. It follows immediately from the fact that there can be a mixed-strategy equilibrium that the low type’s behavior exhibits inefficiencies, as optimality requires the low type to follow the cutoff rule of playing $a_0$ if and only if $\nu \leq \nu^L$, and $a_1$ otherwise (formally, $S^* = \nu^R = \nu^L$). The following proposition makes the nature of the inefficiencies more precise.

**Proposition 1.** The equilibrium with rational voters involves inefficient behavior by the low-ability politician for some part of the signal space: $\nu^R > \nu^L$, and $\nu^L < \nu^R$ iff $\kappa < \bar{\kappa}$, where

$$
\bar{\kappa} \equiv \frac{1-\nu^*(\nu^L) - \sqrt{(1-\nu^L)(1-\nu^R)^2 - 4(\nu^L)^2(1-\nu^R)^2}}{2(1-\nu^R)p}.
$$

As $p \to 1$, $\bar{\kappa} \to 1$.

Proposition 1 tells us that there is always a range of $\nu$ for which the low-ability politician plays $a_0$ too often (i.e., he sometimes chooses $a_0$ too often). We can then apply the procedure above to the low type's equilibrium strategy, the equilibrium is always partially pooling.

**Table 1**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Policy choice</th>
<th>$a_0$</th>
<th>$a_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y=0$</td>
<td>$\alpha_1$</td>
<td>$\alpha_0$</td>
<td>$\alpha_1$</td>
</tr>
<tr>
<td>$y=k$</td>
<td>$\alpha_1$</td>
<td>$\alpha_0$</td>
<td>$\alpha_1$</td>
</tr>
<tr>
<td>$y=1$</td>
<td>$\alpha_0$</td>
<td>$\alpha_0$</td>
<td>$\alpha_1$</td>
</tr>
</tbody>
</table>

**Effect of the bias on first-period welfare.** As a benchmark, we look at the welfare-maximizing policy choice for the politician. The high-ability politician should always choose the policy corresponding to the state of the world. The low-ability politician should choose policy $a_0$ if and only if $p(1-v) + (1-p)\kappa \geq v^*$, defining a threshold value of $v^*$ given by

$$
\nu^* \equiv \frac{p(1-v) + (1-p)\kappa}{1+p}
$$

such that policy $a_0$ is optimal for $\nu \leq \nu^*$ and policy $a_1$ is optimal for $\nu > \nu^*$. Thus, whatever the realization of the signal and the values of $v_0$ and $v_1$, there is always a unique policy that the low-ability politician should choose in order to maximize expected welfare given the available information.

Turning to the analysis of equilibrium, we begin by establishing that Assumption 2 rules out equilibria in which the high-ability politician does not implement the welfare-maximizing policy.

**Lemma 1.** Under Assumption 2, there cannot be an equilibrium in which the high-ability politician deviates from the welfare-maximizing policy.

**Lemma 1** implies that, if an equilibrium exists, it must be such that the high-ability politician implements the welfare-maximizing policy. That is, he chooses the policy corresponding to the state of nature. Formally, $s(0,\sigma) = 0$ and $s(1,\sigma) = 1$, for all $\sigma$. When reallocation concerns are not too strong, the high-type politician never plays a strategy that requires him to choose a socially suboptimal policy. The reason, as shown in the proof, is that the high type always has stronger incentives to deviate from a suboptimal to the optimal policy than the low type. Note that the result of the Lemma does not depend on whether voters are rational or hindsight-biased; as long as Assumption 2 holds it is true for any beliefs. Accordingly, suppose voters believe that type $\theta$ plays the action corresponding to the state of the world. Under Assumption 3, voters’ beliefs are then given by

$$
\mu(\theta, a, 0) = 0 \forall \theta, a
$$

$$
\mu(\theta, a_0, \kappa) = \mu(\sigma, a_0, \kappa) = \frac{\lambda(1-v)}{\lambda(1-v) + (1-\lambda)(1-s(\sigma))}
$$

$$
\mu(\theta, a_1, 1) = \frac{\lambda}{\lambda + (1-\lambda)(1-s(\sigma))}
$$

Note that these expressions depend on the voters’ recalled signal $\hat{\sigma}$, which does not always coincide with the original signal $\sigma$ under hindsight-biased evaluation (except when $y = \kappa$, in which case $\sigma$ is always correctly remembered). A low-ability politician’s expected payoff from $a_0$ is then

$$
\phi(1-p)\kappa + p(1-v) + (1-\phi)[(1-p)\mu(\hat{\sigma}, a_0, \kappa) + p(1-v)\mu(\hat{\sigma}, a_1, 1)];
$$

while from $a_1$ it is

$$
\phi v + (1-\phi)v\mu(\hat{\sigma}, a_1, 1).
$$
even though $a_1$ is optimal); moreover, if $\lambda$ is not too large, there is also a range of $\nu$ for which the low-ability politician plays $a_1$ too often. The result is illustrated in Fig. 2 for the case where $\lambda < \bar{\lambda}$ and thus $\nu^R < \nu < \nu^R$. In this case, inefficiencies arise for all values of $\nu$ between $\nu^R$ and $\nu^R$.

The basic intuition is that, because the high-ability politician disregards the public signal and follows his superior private information, deviating from the policy choice that the public believes to be optimal can signal competence. While producing a failure ($y = 0$) always leads to a reputation of zero, producing a success ($y = 1$) has asymmetric effects on the politician's reputation depending on how likely the voters perceive a success as coming from a high type. When there is a policy that the low type is not supposed to choose in equilibrium, voters believe that anyone who successfully implements this policy must be of the high type. This creates incentives for the low-ability politician to ignore the information provided by the public signal and choose the opposite of what voters believe to be optimal.

To better understand the result, it is instructive to consider two special cases: $p = 0$ and $p = 1$. When $p = 1$, the game is symmetric in the sense that both actions reveal the state of the world with probability 1. Thus, for the suboptimal policy, since then the politician could improve both likely the voters perceive a success as coming from a high type. When forming their posterior about the incumbent, they will think that the low-ability politician's equilibrium strategy assigns probability $\frac{s^\nu(\sigma_1)}{\lambda}$ to playing $a_1$. The politician's expected payoff from playing $a_0$ is unaffected because $\mu(\sigma_0, a_0) = \mu(\sigma_1, a_0) = 0$; it is still given by Eq. (5). His payoff from $a_1$, however, becomes

$$\phi_{\nu_0} + (1-\phi)\nu_0(\mu(\sigma_0, a_1) + (1-\nu_0)\mu(\sigma_1, a_0))$$

$$= \phi_{\nu_0} + (1-\phi)\nu_0 \frac{\nu_0}{\lambda + (1-\lambda)s^\nu(\sigma_1)}. \quad (8)$$

Similarly, consider the politician's decision problem when $\sigma = \sigma_1$. If he chooses policy $a_0$ and succeeds ($\nu = 1$) or chooses $a_1$ and fails ($\nu = 0$), voters' recalled signal will be $\hat{\sigma} = \sigma_0$. When forming their posterior about the incumbent, they will think that the low-ability politician's equilibrium strategy assigns probability $\frac{s^\nu(\sigma_1)}{\lambda}$ to playing $a_1$. The politician's payoff from $a_1$ is unaffected (because $\mu(\sigma_1, a_1, 0) = 1$) and thus given by Eq. (6). His payoff from $a_0$, however, becomes

$$\phi(\nu - 1) \left( 1 - \phi \right) \left( 1 - \phi \right) \nu_0(\mu(\sigma_1, a_0) + (1-\nu_0)\mu(\sigma_1, a_1))$$

$$+ (1-\nu_0)\mu(\sigma_1, a_0, 0) = \phi(\nu - 1) \mu(\sigma_1, a_0, 0) + (1-\nu_0)\mu(\sigma_1, a_1, 0)$$

$$+ (1-\phi) \left[ \frac{\nu_0(p)(1-\nu_1)\mu(\sigma_1, a_0, 0) + (1-p)(1-\nu_1)\mu(\sigma_1, a_1, 0)}{\lambda + (1-\lambda)(1-s^\nu(\sigma_1))} + (1-p)(1-\nu_1)\mu(\sigma_1, a_1, 0) \right]. \quad (9)$$

Expressions (8) and (9) reveal the key difference between rational and hindsight-biased evaluation: with hindsight-biased voters, the politician's strategy in the $\sigma_0$ subgame depends on his strategy in the $\sigma_1$ subgame, and vice versa. 13 The following lemma characterizes the

Fig. 2. The equilibrium strategy for type $\sigma$, with rational voters.

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13 This is partly due to the assumption of pessimistic out-of-equilibrium beliefs. The assumption is generally not crucial though. The only case where pessimistic beliefs matter is when $s(\sigma_1) = 1$ and $s(\sigma_0) > 1$. Without the pessimistic belief assumption pinning down out-of-equilibrium beliefs, $\mu(\sigma_0, a_0, 0)$ could be strictly positive in that case. Hindsight bias would then increase the incumbent's reputation in the case of failure. Such a result is counter-intuitive: we would expect hindsight bias to lead voters to second-guess politicians' decisions and give more blame than is warranted, rather than the opposite. Any intuitive setup for hindsight bias requires out-of-equilibrium beliefs to be pessimistic.

14 This is true except when $p = 0$. In that case, the term that depends on $s(\sigma_0)$ in Eq. (9) disappears, and $s^\nu(\sigma_1) = s^\nu(\sigma_0)$.
resulting equilibrium with hindsight-biased evaluation, for which $s^H(\sigma)$ denotes the low type's equilibrium strategy.

**Lemma 3.** Suppose voters are hindsight biased. There exists a unique equilibrium characterized by four thresholds, $s^H_0, s^H_1, \nu^B_0, \nu^B_1$, and $s^H$, such that the high-ability politician chooses $a_0$ when $\omega = 0$ and $a_1$ when $\omega = 1$, while

(i). in the $c_0$ subgame, for $\nu_0 \leq \nu^B_0$ the low-ability politician always chooses $a_0$ ($s^H(\nu_0) = 0$), for $\nu_0 > \nu^B_0$ he always chooses $a_1$ ($s^H(\nu_0) = 1$), and for $\nu^B_0 < \nu_0 < \nu^B_1$ he randomizes between $a_0$ and $a_1$: $s^H(\nu_0) = \Phi(\nu_0, 1)$ where $\Phi(\nu_0, 1) \in (0, 1)$ increases with $\nu_0$ and decreases with $\nu_1$;

(ii). in the $c_1$ subgame, for $\nu_1 \leq \nu^B_1$ the low-ability politician always chooses $a_0$ ($s^H(\nu_1) = 0$), for $\nu_1 > \nu^B_1$ he always chooses $a_1$ ($s^H(\nu_1) = 1$), and for $\nu^B_1 < \nu_1 < \nu^B_2$ he randomizes between $a_0$ and $a_1$: $s^H(\nu_1) = \Phi(\nu_0, 1)$ where $\Phi(\nu_0, 1) \in (0, 1)$ decreases with $\nu_0$ and increases with $\nu_1$.

Even under hindsight-biased evaluation, the high type follows his information and chooses the welfare-maximizing policy.\textsuperscript{15} Moreover, the low type's equilibrium strategy again depends on $\nu$. In contrast to the equilibrium under rational evaluation, there are now two sets of thresholds, one for each subgame. In addition, both the thresholds and the mixing probabilities in each subgame now depend on both $\nu_0$ and $\nu_1$, as shown in Fig. 3. The figure plots $\nu_0$ on the horizontal axis and $\nu_1$ on the vertical axis, and shows the low type's equilibrium strategy $s^H(\sigma)$ in each of the two subgames as a function of $\nu_0$ and $\nu_1$. The shaded triangle below the 45-degree line represents values such that $\nu_0 > \nu_1$, which are ruled out by Assumption 1. Fixing $\nu_1$, it remains true that for low levels of $\nu_0$ we have a pure-strategy equilibrium in which the low type plays $a_0$, for high levels of $\nu_0$ we have a pure-strategy equilibrium in which the low type plays $a_1$, and for intermediate values, we have a mixed-strategy equilibrium. However, while in the case of rational evaluation, the equilibrium in the $c_0$ subgame, say, is pinned down by $\nu_0$ only, in the case of hindsight-biased evaluation, it also depends on $\nu_1$. Fixing $\nu_1$, the low type's equilibrium probability of playing $a_1$ decreases with $\nu_1$.

An important observation that is apparent from Fig. 3 is that, whatever $\nu_0$ and $\nu_1$, we always have $s^H(\nu_0) \leq s^H(\nu_1)$. As we show in the proof of Lemma 3, this result follows from a consistency argument. Under Assumption 1, $\omega = 1$ is more likely after $c_1$ than after $c_0$, and therefore the expected welfare from $c_1$ is higher after $c_0$ as well. Even with hindsight-biased voters, in equilibrium it cannot be the case that $a_1$ is played more often after $c_0$ than after $c_1$. Having characterized the equilibrium under hindsight biased evaluation, we now compare the low-ability politician's behavior to that under rational evaluation.

**Proposition 2.** Under hindsight-biased evaluation, the low-ability politician plays $a_1$ less often after $c_0$ and more often after $c_1$ than he does under rational evaluation: $s^H(\nu_0) \leq s^R(\nu_0)$ and $s^H(\nu_1) \geq s^R(\nu_1)$.

That is, hindsight bias increases the probability that the low-ability politician plays the action that—according to the signal—corresponds to the more likely state of the world: $a_0$ after $c_0$, and $a_1$ after $c_1$. The consistency argument mentioned above is crucial for this result. It implies that a politician who successfully enacts policy $a_1$ after signal $c_0$ or policy $a_0$ after signal $c_1$ will get less credit than he deserves. Voters consider the success as more predictable than it was, and therefore overestimate the probability that a low type would have chosen the policy. For example, when the original signal is $c_0$, but the politician successfully implements policy $a_1$, voters wrongly believe that the probability of the low type playing $a_1$ was $s^H(\nu_1)$ instead of $s^H(\nu_0)$. Because $s^H(\nu_1) \geq s^H(\nu_0)$, they exaggerate the likelihood that the observed event can be attributed to a low type, which reduces their esteem for the incumbent.

Anticipating the voters' bias, a low-ability politician knows that he has relatively little to gain from deviating to the action corresponding to the less likely state of the world, and does so less often. As the following proposition shows, this is often good for voters' first-period welfare, but can sometimes be bad.

**Proposition 3.** Let $\kappa \equiv \nu_0(1 + p) - p \frac{-1}{1 - p}$ and $R \equiv \nu_1(1 + p) - p \frac{-1}{1 - p}$.

For $p > 0$, the effect of hindsight bias on first-period welfare is positive if $\kappa < \nu_0$ and ambiguous otherwise. For $p = 0$, the effect of hindsight bias on first-period welfare is positive if $\kappa \geq \nu_0$ and negative otherwise.

Note that $\lim_{p \to 1} \kappa = -\infty$ and $\lim_{p \to 0} \kappa = \infty$. Thus, as $p$ increases, the range of values of $\kappa$ for which the effect of hindsight bias is positive expands, eventually to encompass the entire $(0, 1)$ interval. Based on this insight, we can rephrase Proposition 3 as follows. When $p$ is large, hindsight bias is sure to enhance first-period welfare. When $p$ is small, the effect of hindsight bias depends on $\kappa$. If $\kappa$ is in an intermediate range, the effect of hindsight bias is positive; otherwise, its effect is ambiguous. When $p = 0$ and $\kappa \geq \nu_0$, hindsight bias is bad for first-period welfare; otherwise, its effect is positive.

According to Proposition 3, hindsight bias can enhance first-period welfare by improving the low-ability politician’s discipline. Sometimes, however, it affects behavior in a way that is detrimental to welfare. To build intuition for which of the two is going to happen, it is again helpful to take a closer look at the two polar cases of $p = 0$ and $p = 1$. When $p = 1$, we have $\nu_1 = 1$. Optimality requires that the low type plays $a_1$ after $c_1$ and $a_0$ after $c_0$. We know from Proposition 2 that hindsight bias nudges him in exactly this direction. Hence, for $p = 1$ the bias is welfare-enhancing.\textsuperscript{16} By continuity, this also holds for some $p < 1$.

Hindsight bias eliminates some of the policy gambles that occur under rational evaluation. Recall that with rational voters, the reason that the low type sometimes chooses the inefficient policy is to...
impress voters: when a policy is unlikely to be played by a low type (as is the case when the signal indicates that the other policy leads to higher expected welfare), successfully enacting this policy boosts the politician’s reputation. Rational voters are surprised that the policy was a success; they think that it must be attributed to a high type having superior private information and adjust their beliefs upward. Hindsight-biased voters are less easily impressed. They consider the policy outcome in retrospect more predictable than it actually was, and therefore think that choosing the right policy was “obvious” even for a low-ability politician. Put differently, hindsight-biased voters effectively forget their prior when they learn the state of the world, which takes away the possibility of going against public beliefs.

When \( p = 0 \), hindsight bias affects only the strategy in the \( s_0 \) subgame. The strategy \( s_1 \) is unaffected because voters do not learn anything after \( s_0 \), so hindsight bias only changes the recollection from \( s_1 \) to \( s_0 \) after \( s_1 \) and outcome \( y = 0 \). But \( \mu(s_0, a_1, 0) = \mu(s_1, a_1, 0) = 0 \), implying \( s^*(s_1) = s^*(s_0) \) (the term in \( s(s_0) \) disappears from Eq. (9) when \( p = 0 \)). From Proposition 2, we know that hindsight bias changes the strategy in the \( s_0 \) subgame towards a greater probability of playing \( a_0 \). Whether this is good or bad for welfare depends on \( \kappa \), which equals the expected payoff from \( a_0 \) when \( p = 0 \). The expected payoff from \( a_1 \) is \( v_0 \). If \( \kappa > v_0 \), the expected payoff from \( a_0 \) is smaller than that from \( a_1 \), and by increasing the frequency at which \( a_0 \) is played, hindsight bias exacerbates inefficiencies. If \( \kappa \geq v_0 \), playing \( a_0 \) is efficient, so the bias has a positive effect.

The case \( p = 0, \kappa < v_0 \) illustrates a second effect of hindsight bias, namely, that it sometimes discourages efficient risk-taking. When \( p = 0 \), policy \( a_1 \) is risky while policy \( a_0 \) is safe, in the sense that the policy outcome after \( a_1 \) depends on the state of the world whereas after \( a_0 \) it does not. Because the low-ability politician knows that with hindsight-biased voters he will get less credit than he deserves for successfully enacting the risky policy \( a_1 \), he plays \( a_0 \) more often than with rational voters, independently of which policy is more efficient.

As we increase \( p \) slightly above zero, a countervailing effect appears that makes the effect of hindsight bias ambiguous. For low values of \( \kappa (\kappa < v_0) \), the bias continues to exacerbate excessive play of \( a_0 \) in the \( s_0 \) subgame, but it now also affects the \( s_1 \) subgame, where it reduces excessive play of \( a_0 \). For high values of \( \kappa (\kappa > v_0) \), playing \( a_0 \) is efficient, and so the effect of the bias is the opposite: in the \( s_0 \) subgame, it reduces excessive play of \( a_1 \), while in the \( s_1 \) subgame, it exacerbates it. Only for intermediate values of \( \kappa \) is hindsight bias unambiguously good: for \( \kappa < \kappa \leq v_0 \) it nudges the low-ability politician toward the efficient choice in both subgames.

4. Discussion

The results in the previous section were derived under the assumption of naivety on the part of voters. In addition, the results focus on the effect of hindsight bias on discipline (and thus first-period welfare). In this section, we discuss the implications of relaxing the naivety assumption and the effect of hindsight bias on selection (and thus second-period welfare).

4.1. Awareness: naive versus sophisticated voters

According to Assumption 3, voters in our model are naive, i.e., post unaware of their bias: they are certain that they correctly remember the signal. The imperfect recollection process hinders conscious learning and implies a reduction in surprises. A natural extension is to depart from the assumption of naivety as, for example, in Bénabou and Tirole (2002), where individuals repress information but know about their tendency to repress. Suppose that evaluators are aware of their possibly distorted recollection of the ext ante signal at the voting stage, i.e., they are sophisticated. Voters will then use Bayes’ rule to calculate the reliability of their recollection. The reliability of a voter’s recollection is the probability that the recalled signal matches the original signal. For example, suppose that a sophisticated voter observes policy \( a_1 \) and outcome \( y = 1 \), and recalls signal \( \sigma_1 \). He knows that, with some probability, the original signal was indeed \( \sigma_1 \), but with some probability it was actually \( \sigma_0 \) and has been replaced by \( \sigma_1 \) due to hindsight bias. Let \( r_{\omega}(\omega = \sigma_0, \tilde{\omega} = \sigma_0, y = 1, \alpha) \) denote the reliability of the voter’s recollection given that the state of the world has been revealed to be \( \omega \) and \( y = 1 \). Two of the voter’s posterior beliefs about the incumbent now have to be modified from Eq. (2). They are replaced by

\[
\mu(s_0, a_0, 1) = \frac{\lambda}{\kappa + (1-\lambda)(1-s(s_0))} + (1-r_{\omega}) \frac{\lambda}{\kappa + (1-\lambda)(1-s(s_0))},
\]

\[
\mu(s_1, a_1, 1) = \frac{\lambda}{\kappa + (1-\lambda)s(s_1)} + (1-r_{\omega}) \frac{\lambda}{\kappa + (1-\lambda)s(s_1)};
\]

all other beliefs are the same. Computing \( r_{\omega} \) is straightforward, but it requires some additional notation and is therefore relegated to Appendix B. A sophisticated voter questions his own memory. When having recollection \( \tilde{\omega} = \sigma_1 \) after a successful policy \( a_1 \), for example, the voter realizes that the low-ability politician played \( a_1 \) with probability \( s(\sigma_1) \) if the recollection is reliable (probability \( r_{\omega} \)) and with probability \( s(\sigma_0) \) if the recollection is unreliable (probability \( 1 - r_{\omega} \)).

How does the behavior of the low-ability politician change when he faces sophisticated rather than naive voters? Notice that the politician’s reputation after enacting a successful policy is a convex combination of those with naive hindsight-biased and rational voters. Therefore, the effect of hindsight bias on his behavior is qualitatively the same as with naive voters. Sophistication lowers the impact of hindsight bias but does not eliminate it. The essence of the previous analysis remains intact.

4.2. Selection and welfare

The analysis in Section 3 shows how hindsight bias affects the behavior of the low-ability incumbent in the first period. To make a general statement about the impact of hindsight bias on welfare, however, we must also take into account the second period. Even though the absence of reelection concerns in the second period means that hindsight bias does not change behavior, the bias impacts second-period welfare through its effect on selection: voters are always weakly better off if a high-ability politician is in office.

The effect of hindsight bias on selection works through two channels. The first is that voters sometimes have erroneous posteriors, so that they don’t always elect the politician that is truly more able (in expected terms); this is clearly bad for welfare. Hindsight bias blurs the difference between the two major elements voters initially set out to distinguish between in their evaluation, namely, skill and luck of the decision maker. The second is more indirect: since anticipation of voters’ hindsight biases changes the low-ability politician’s first-period behavior, the inferences that can be drawn from a given event are also modified. The welfare implications of this second effect are more complex. For example, hindsight bias increases the low type’s equilibrium probability of playing \( a_0 \) after receiving \( s_0 \). This decreases the posterior probability that the incumbent is a high type after observing \( s_0 \) and either \( y = 1 \) or \( y = \kappa \), while it increases the posterior after observing \( a_1 \) and \( y = 1 \). The net effect on selection can go either way and depends on various parameters such as the prior beliefs about the state of the world.

Note that, even if hindsight bias is bad for selection, it can still be good for overall welfare. In particular, suppose \( \kappa < \kappa < \kappa \), so that by Proposition 3, hindsight bias has a disciplining effect on the low-ability politician. Then, there exists a discount factor such that hindsight bias is overall welfare-enhancing. Because voters discount
the future, discipline is more important than selection for a sufficiently low discount factor.

5. Conclusion

We have presented a political-agency model in which voters exhibit a cognitive deficiency known as hindsight bias: after the uncertainty about an event is resolved, they consider the realized outcome as being more foreseeable than it actually was. In the model, voters have to evaluate the incumbent in order to decide whether to reelect him or replace him with a challenger. Politicians are assumed to differ in ability, where ability is defined as the quality of their information about the welfare-maximizing policy. High-ability politicians are better informed than low-ability politicians and voters. In this setup, low-ability politicians have incentives to disregard public information on what the optimal policy is in order to appear smart, but would not necessarily help in choosing the right candidate.

We now return to the Gulf War anecdote brought up in the introduction and discuss why it supports our claim that hindsight bias can affect elections. A case can be made that hindsight bias contributed to George H.W. Bush’s defeat in the 1992 presidential election. With Bayesian voters, Bush’s success in Iraq would have shown up positively in his foreign-policy approval rate. But to hindsight-biased voters, Bush’s success in Iraq would have shown up positively in can affect elections. A case can be made that hindsight bias contributed to the gradual decline in the approval rate is consistent with experimental evidence according to which hindsight bias increases the Middle East follow the same pattern. The gradual decline in the approval rate is, but would not necessarily help in choosing the right candidate.

employees from deviating to suboptimal actions in order to appear smart, on the part of the human resources department may prevent low-ability employees from deviating to suboptimal actions in order to appear smart, but would not necessarily help in choosing the right candidate.

We close by noting that, with the benefit of hindsight, all of our results are, of course, obvious.

Appendix A. Proofs

Proof of Lemma 1. We have to consider two types of equilibria: pooling equilibria, and equilibria in which the high type plays $a_{1-cp}$

Claim 1. There cannot be a pooling equilibrium. Consider the following sets of strategies and beliefs: (i) all types pool on $a_0$, and voters believe that any politician who plays $a_1$ is of type $\theta_1$, i.e., $\mu(\sigma,a_1,y)=0 \forall \sigma; (ii)$ all types pool on $a_1$, and voters believe that any politician who plays $a_0$ is of type $\theta_1$, i.e., $\mu(\sigma,a_0,y)=0 \forall \sigma$. Regardless of $c$, the type with the strongest incentive to deviate from pooling on $a_0$ is $(\theta_0,1)$. Playing $a_0$ procures him $\phi(1-p)\kappa + (1-\phi)\lambda$, while playing $a_1$ would procure him $\phi$. Assumption 2 implies that he prefers $a_1$. The type with the strongest incentive to deviate from pooling on $a_1$ is $(\theta_0,0)$. Playing $a_0$ procures him $(1-\phi)\lambda$, while playing $a_1$ would procure him $\phi(1-p)\kappa + p$. Again, Assumption 2 implies that he prefers $a_0$.

Claim 2. There cannot be an equilibrium in which the high type plays $a_{1-cp}$.

We show first that, whatever the voters’ beliefs, $(\theta_0,1)$ has a stronger incentive to play $a_1$ than $\theta_1$, and $\theta_1$ has a stronger incentive to play $a_1$ than $(\theta_0,0)$. The difference in expected payoffs between playing $a_1$ and $a_0$ for type $\theta_1$ is given by

$$\phi + (1-\phi)[\mu(\sigma,a_1) - \mu(\sigma,a_0)] - \phi[p(1-p)\kappa + (1-\phi)\mu(\sigma,a_0) + (1-p)\mu(\sigma,a_0,1) - (1-\phi)[\mu(\sigma,a_0) + (1-p)\mu(\sigma,a_0,1)]] = 0.$$ (10)

The difference in expected payoffs between $a_1$ and $a_0$ for type $(\theta_0,0)$ is given by

$$\phi(1-p)\kappa + (1-\phi)\mu(\sigma,a_0) + (1-p)\mu(\sigma,a_0,1) - (1-\phi)[\mu(\sigma,a_0) + (1-p)\mu(\sigma,a_0,1)] = 0.$$ (11)

Subtracting Eq. (11) from Eq. (10), we see that $\theta_1$’s incentive to play $a_1$ is greater than $(\theta_0,0)$’s if and only if $\phi(1+p) + (1-\phi)[\mu(\sigma,a_1) - \mu(\sigma,a_0)] > 0$. Subtracting Eq. (10) from Eq. (12), we see that $\theta_0$’s incentive to play $a_1$ is greater than $\theta_1$’s under exactly the same condition. Since the term in square brackets cannot be smaller than $-\theta_1$ for any of the voters’ beliefs, under Assumption 2 this condition is always satisfied. We can thus conclude that: if $\theta_0$ is indifferent, $\theta_0$ strictly prefers $a_0$; if $\theta_0$ strictly prefers $a_0$, so does $(\theta_0,0)$; and if $\theta_0$ strictly prefers $a_1$, so does $(\theta_0,1)$. Hence, there cannot be an equilibrium where both $(\theta_0,0)$ and $(\theta_0,1)$ play $a_{1-cp}$.

Proof of Lemma 2. By Lemma 1, any equilibrium, if it exists, must have the high-ability politician choosing the welfare-maximizing policy. Taking the behavior of the high type as given, we derive conditions for pure and mixed strategy equilibria on the part of the low-ability politician. We then show that, giving the low type’s behavior and voters’ beliefs, the high-ability politician indeed finds it optimal to follow the claimed equilibrium strategy.

Define $\Delta(\sigma) \equiv \frac{\phi}{1+\phi}(1-p)\kappa + (1-\phi)\mu(\sigma,a_0)$. A pure-strategy equilibria with $s(\sigma) = 0$ requires that the low type prefers $a_0$, given by Eq. (5), even though he could fool voters about his type by playing $a_1$, given by Eq. (6), when evaluating both expressions at $s(\sigma) = 0$. That is,

$$\phi(1-p)\kappa + (1-\phi)\mu(\sigma,a_0) > (1-\phi)\mu(\sigma,a_0,1) = 0.$$ (13)
\[ \Delta(v) \geq -\left[ p\lambda(1-v) + \frac{(1-p)\lambda(1-v)}{1-\lambda v} \right]. \]  

(14)

The left-hand side (LHS) is decreasing and the right-hand side (RHS) increasing in \( v \). Moreover, the LHS is positive and the RHS negative when evaluated at \( v=0 \). The LHS is negative and the RHS positive at \( v=1 \). Hence there exists a unique cutoff \( v^*=0,1 \) below which \( s^R(\sigma) = 0 \) is an equilibrium. The cutoff value \( v^* \) is defined by expression (14) holding with equality. A necessary and sufficient condition for a pure-strategy equilibrium where \( s(\sigma) = 1 \) is that type \( \theta_l \) prefers \( a_1 \), even though voters believe that he will always play \( a_1 \). This condition is obtained by evaluating Eqs. (5) and (6) at \( s=1 \). That is,

\[ \phi((1-p)\kappa + p(1-v)) + (1-\phi)(1-p) + p(1-v)) \leq \nu(\phi + (1-\phi)\lambda) \]

(15)

\[ \implies \Delta(v) \leq v(\lambda + p) - 1. \]

(16)

The LHS is decreasing and the RHS is increasing in \( v \). Moreover, the LHS is positive and the RHS negative when evaluated at \( v=0 \). Hence there exists a unique cutoff \( v^*>0 \) above which \( s^R(\sigma) = 1 \) is an equilibrium. The cutoff value \( v^* \) is defined by expression (16) holding with equality.

Uniqueness follows from Lemma 1 and the fact that \( \lambda < v^* < \nu^* \). To see that this inequality must hold, notice that the LHS of expressions (14) and (16) coincides and is monotone decreasing in \( v \). At the same time, the RHS of Eq. (14) exceeds that of Eq. (16),

\[ v(1+p\lambda) - \left[ p\lambda(1-p)\frac{\lambda(1-v)}{1-\lambda v} \right] \geq v(\lambda + p) - 1, \]

because the term in square brackets is smaller than 1 and \( 1+p\lambda > \lambda + (1-\lambda)p < 1 \).

For values \( \nu^* < v < \nu^* \) the equilibrium is in mixed strategies, where \( s^R(\sigma) = s^B(\nu) \equiv (0,1) \). Type \( \theta_l \)'s equilibrium probability of playing \( a_1 \), \( s^B(\nu) \), is determined by equating Eqs. (3) and (4), or

\[ \Delta(v) = \frac{v\lambda}{\lambda + (1-\lambda)s^B(v)} - \frac{(1-p)\lambda(1-v)}{\lambda(1-v) + (1-\lambda)(1-s^B(v))} - \frac{p\lambda(1-v)}{\lambda + (1-\lambda)(1-s^B(v))}. \]

(17)

Next, we prove the claimed monotonicity property of \( s^B(\nu) \) by applying the implicit function theorem. Define \( f \equiv LHS - RHS \) of Eq. (17).

We then have \( \frac{ds^B}{d\nu} = -\frac{df}{dv} \). It is straightforward to see that \( \frac{df}{d\nu} > 0 \). Hence, \( ds^B/d\nu > 0 \).

We finally show that, given the voters' beliefs, it is indeed optimal for the high-ability politician to choose the policy corresponding to \( \omega \). Consider first type \( (\theta_h, 0) \). He prefers \( a_0 \) since

\[ \Delta(0) + \left[ \frac{(1-p)\lambda(1-v)}{\lambda(1-v) + (1-\lambda)(1-s^B(\sigma))} + \frac{p\lambda}{\lambda + (1-\lambda)(1-s^B(\sigma))} \right] > 0 \]

(18)

for any \( s^B(\sigma) \). Now consider type \( (\theta_h, 1) \). The condition for him to prefer \( a_1 \) to \( a_0 \) is

\[ \Delta(1) \leq \frac{\lambda}{\lambda + (1-\lambda)s^B(\sigma)} - \frac{(1-p)\lambda(1-v)}{\lambda(1-v) + (1-\lambda)(1-s^B(\sigma))}. \]

(19)

Clearly, \( \Delta(1) < 0 \). There are three different cases. If \( v < \nu^L \) so that \( s^B(\sigma) = 0 \), type \( (\theta_h, 1) \) has a strict preference for \( a_1 \) because \( \Delta(1) < 1 - \lambda + p\lambda(1-v) \). If \( \nu^L < v < \nu^H \) so that \( s^B(\sigma) = 1 \), he prefers \( a_1 \) because \( \Delta(1) < \lambda + p - 1 \) is a necessary condition for the low type to play a pure strategy with \( s(\sigma) = 1 \); see Eq. (16). If \( \nu^H < v < \nu^* \) we are in a mixed strategy equilibrium where \( s^B(\sigma) = s^B(\nu) \). Type \( (\theta_h, 1) \) strictly prefers \( a_1 \) since \( \Delta(1) < \frac{(1-p)\lambda(1-v)}{\lambda(1-v) + (1-\lambda)(1-s^B(\nu))} \) follows from Eq. (17).

Proof of Proposition 1. Solving Eq. (16) for \( v^* \) yields

\[ v^* = \frac{\lambda(1-\lambda)s^B(\nu) + (1-\phi)(1-p)\lambda(1-v)}{\phi + (1-\phi)\lambda + p}. \]

The numerator of this expression is larger than that of \( v^* \) (it is a convex combination of \( p(1-\phi)\kappa \) and 1). The denominator is smaller than that of \( v^* \) (because \( \phi + (1-\phi)\lambda < 1 \)). Hence, \( v^* < \nu^* \). The RHS of Eq. (14) is monotone decreasing in \( v \) and becomes zero at \( v = \nu^* \). The LHS is monotone increasing in \( v \) since its derivative with respect to \( v \) is

\[ 1 + p\lambda + \frac{\lambda(1-\lambda)(1-p)}{(1-\lambda v)^2} > 0. \]

Thus, a necessary and sufficient condition for \( v^* > \nu^* \) is that the LHS of Eq. (14) is greater than zero when evaluated at \( v = v^* \). That is,

\[ v^* - \left[ p(1-v^*)\lambda + \frac{(1-p)\lambda(1-v^*)}{1-\lambda v^*} \right] > 0 \]

\[ \implies pv^*(1-v^*)^2 - (1-v^*)(1-v^*) > 0. \]

(20)

The LHS of Eq. (20) is a quadratic function of \( \lambda \) whose minimum is attained at \( \lambda = \frac{1}{2} \), which is greater or equal to 3/2. Therefore, the relevant condition is that \( \lambda < K \) defined in Eq. (7). The expression under the square root is nonnegative since \( 1-v^*(1-v^*)^2 - 4p(1-v^*)^2(1-v^*)^2 - 4(1-v^*)^2(1-v^*) = (1-v^*(1+v^*)^2) \). Finally, evaluating Eq. (7) at \( p = 1 \) (which implies \( v^* = 1/2 \)), we have \( K = 1 \).

Proof of Lemma 3. By Lemma 1, any equilibrium, if it exists, must have the high-ability politician choosing the welfare-maximizing policy. We thus look for an equilibrium in which this is the case and derive conditions for pure and mixed strategies on the part of the low-ability politician. We then show that, given the low type's behavior and voters' beliefs, the high-ability politician indeed finds it optimal to follow the equilibrium strategy.

Pure strategies. Consider first the \( \sigma_0 \) subgame. A necessary and sufficient condition for a pure-strategy equilibrium with \( s^R(\sigma_0) = 0 \) is that type \( \theta_l \)'s payoff from playing \( a_0 \), given by Eq. (5), is greater than
his payoff from $a_1$, given by Eq. (8), when evaluating both of these expressions at $s^B(t_0) = 0$. That is,

$$
\phi[p(1-v_0) + (1-p)\nu] + (1-\phi) \left[ p\lambda(1-v_0) + \frac{(1-p)\lambda(1-v_0)}{1-\lambda v_0} \right] \geq \phi v_0 \\
+ (1-\phi) \frac{v_0\lambda}{\lambda + (1-\lambda)s^B(t_0)} \\
\Leftrightarrow \Delta(v_0) \geq \frac{v_0\lambda}{\lambda + (1-\lambda)s^B(t_0)} - p\lambda(1-v_0) - \frac{(1-p)\lambda(1-v_0)}{1-\lambda v_0}.
$$

(21)

The LHS is decreasing in $v_0$. The RHS is increasing in $v_0$ if $s^B(t_1)$ is decreasing in $v_0$, which we will show to be the case below. Moreover, $\Delta(0)=0$ and the RHS is negative when evaluated at $v_0 = 0$. Therefore, for a given $v_1$, there exists a unique cutoff $\nu^*_{0}$ below which $s^B(t_0) = 0$ is an equilibrium. (The cutoff may be greater than 1/2.)

The condition for a pure-strategy equilibrium with $s^B(t_0) = 1$ is that type $t_0$’s payoff from $a_0$ is smaller than his payoff from $a_1$ when both are evaluated at $s^B(t_1) = 1$, that is,

$$
\phi[p(1-v_0) + (1-p)\nu] + (1-\phi) \left[ p\lambda(1-v_0) + \frac{(1-p)\lambda(1-v_0)}{1-\lambda v_0} \right] \leq \phi v_0 + (1-\phi) \frac{v_0\lambda}{\lambda + (1-\lambda)s^B(t_0)} \\
\Leftrightarrow \Delta(v_0) \leq \frac{v_0\lambda}{\lambda + (1-\lambda)s^B(t_0)} - p\lambda(1-v_0).
$$

(22)

Again, the LHS is decreasing and the RHS increasing in $v_0$ if $s^B(t_1)$ is decreasing in $v_0$. Therefore, for a given $v_1$, there exists a unique cutoff $\nu^*_{0}$ above which $s^B(t_0) = 1$ is an equilibrium. Note that for $s^B(t_1) = 1$, Eq. (22) is the same as the corresponding expression in the rational case, Eq. (16), defining $\nu^*_{0}$; note also that the RHS of Eq. (22) is decreasing in $s^B(t_1)$, implying that $\nu^*_{0}$ must equal $\nu^*$ for $s^B(t_1) = 1$ and would have to be strictly less than $\nu^*$ for $s^B(t_1) < 1$. Since, as we will show below, consistency requires $s^B(t_0) \leq s^B(t_1)$ for any $(v_0,v_1)$ satisfying Assumption 1, we conclude that there cannot be a value of $v_0 > \nu^*_{0}$ such that $s^B(t_0) = 1$. This would require that for some $v_1 > v_0$, $s^B(t_1) < 1$, a contradiction. Hence, $\nu^*_{0} = \nu^*$.

Now consider the $t_1$ subgroup. A necessary and sufficient condition for a pure-strategy equilibrium with $s^B(t_1) = 0$ is that type $t_0$’s payoff from playing $a_0$, given by Eq. (9), is greater than his payoff from $a_1$, given by Eq. (6), when evaluating both of these expressions at $s^B(t_1) = 0$. That is,

$$
\phi[p(1-v_1) + (1-p)\nu] + (1-\phi) \left[ p\lambda(1-v_1) + \frac{(1-p)\lambda(1-v_1)}{1-\lambda v_1} \right] \\
\geq \phi v_1 + (1-\phi) v_1 \\
\Leftrightarrow \Delta(v_1) \geq v_1 - \left[ \frac{p\lambda(1-v_1)}{\lambda + (1-\lambda)s^B(t_0)} + \frac{(1-p)\lambda(1-v_1)}{1-\lambda v_1} \right].
$$

(23)

The LHS is decreasing in $v_1$. The RHS is increasing in $v_1$ if $s^B(t_0)$ is decreasing in $v_1$, which we will show to be the case below. Therefore, for a given $v_0$, there exists a unique cutoff $\nu^*_{1}$ below which $s^B(t_1) = 0$ is an equilibrium. (The cutoff may be smaller than 1/2.) Note that for $s^B(t_1) = 0$, Eq. (23) is the same as the corresponding expression in the rational case, Eq. (14), defining $\nu^*_{1}$; note also that the RHS of Eq. (23) is increasing in $s^B(t_0)$, implying that $\nu^*_{1}$ must equal $\nu^*$ for $s^B(t_0) = 0$ and would have to be strictly greater than $\nu^*$ for $s^B(t_1) < 1$. Since, as we will show below, consistency requires $s^B(t_0) \leq s^B(t_1)$ for any $(v_0,v_1)$ satisfying Assumption 1, we conclude that there cannot be a value of $v_1 < \nu^*_{1}$ such that $s^B(t_1) = 0$. This would require that for some $v_0 > v_1$, $s^B(t_1) > 0$, a contradiction. Hence, $\nu^*_{1} = \nu^*$.

The condition for a pure-strategy equilibrium with $s^B(t_1) = 1$ is that type $t_0$’s payoff from $a_0$ is smaller than his payoff from $a_1$ when both are evaluated at $s^B(t_1) = 1$, that is,

$$
\phi[p(1-v_1) + (1-p)\nu] + (1-\phi) \left[ p\lambda(1-v_1) + \frac{(1-p)\lambda(1-v_1)}{1-\lambda v_1} \right] \leq \phi v_1 + (1-\phi) v_1 \\
\Leftrightarrow \Delta(v_1) \leq v_1 - \left[ \frac{p\lambda(1-v_1)}{\lambda + (1-\lambda)s^B(t_0)} + \frac{(1-p)\lambda(1-v_1)}{1-\lambda v_1} \right].
$$

(24)

Again, the LHS is decreasing and the RHS increasing in $v_1$ if $s^B(t_0)$ is decreasing in $v_1$. Therefore, for a given $v_0$, there exists a unique cutoff $\nu^*_{1}$ above which $s^B(t_1) = 1$ is an equilibrium. (This cutoff may not be strictly less than 1.)

Uniqueness. Uniqueness of the equilibrium follows from the fact that (a) the RHS of Eq. (21) is greater than that of Eq. (22) for any $v_0$ as

$$1-pv_0\leq\lambda(1-v_0) \left( p + \frac{1-p}{1-\lambda v_0} \right) \implies 1-pv_0(1+\lambda(1-v_0)) \geq 0,
$$

implying $\nu^*_{0} \leq \nu^*_{0}$, and (b) the RHS of Eq. (21) is greater than that of Eq. (22) for any $v_1$ as

$$v_1-\frac{1}{1-\lambda v_1} \geq v_1 - (1-p) \implies v_1 \geq (1-p) \left( \frac{1}{1-\lambda v_1} \right),
$$

implying $\nu^*_{1} \leq \nu^*_{1}$.

Mixed strategies. In a mixed strategy equilibrium, we have $s^B(t_0) = S^B(\nu_0,v_1)$ and $s^B(t_1) = S^B(\nu_1,v_0)$, where $S^B_0$ and $S^B_1$ solve the following system, obtained by equating Eq. (5) with Eq. (8), and Eq. (9) with Eq. (6):

$$
\Delta(v_0) = \frac{v_0\lambda}{\lambda + (1-\lambda)s^B} - \frac{p\lambda(1-v_0)}{\lambda + (1-\lambda)(1-s^B)} - \frac{(1-p)\lambda(1-v_0)}{\lambda(1-v_0) + (1-\lambda)(1-s^B)}.
$$

(25)

$$
\Delta(v_1) = \frac{v_1\lambda}{\lambda + (1-\lambda)s^B} - \frac{p\lambda(1-v_1)}{\lambda + (1-\lambda)(1-s^B)} - \frac{(1-p)\lambda(1-v_1)}{\lambda(1-v_1) + (1-\lambda)(1-s^B)}.
$$

(26)

To determine when there is mixing in at least one of the subgames, we need to define the thresholds $\nu^*_{B}$ and $\nu^*_{B}$ as a function of $v_1$ and $v_0$, respectively. Let $\bar{v}$ denote the value of $v_0$ that solves Eq. (21) with equality for $s(t_1) = 1$, i.e., $\Delta(\bar{v}) = \bar{v}\lambda - p\lambda(1-\bar{v}) - (1-p)\lambda(1-\bar{v})$. Similarly, let $\bar{v}$ denote the value of $v_1$ that solves Eq. (24) with equality for $s(t_0) = 0$, i.e., $\Delta(\bar{v}) = \bar{v}\lambda - p\lambda(1-\bar{v}) - (1-p)\lambda(1-\bar{v})$. Notice that, by definition of $\nu^*_{B}$ and $\nu^*_{B}$, $\nu^*_{B}(v_0,v_1)$ is the solution to Eq. (26) fixing $\nu^*_{B} = 0$. Likewise, by definition of $\nu^*_{B}$, $S^B_0(\nu_0,\nu^*_{B})$ is the solution to Eq. (25) fixing $\nu^*_{B} = 1$. Let $V_0(v_1)$ be defined as the solution to

$$
\Delta(V_0) = \frac{V_0\lambda}{\lambda + (1-\lambda)s^B} - p\lambda(1-V_0) - \frac{(1-p)\lambda(1-V_0)}{1-\lambda V_0}.
$$

(27)
and \( V_1(v_0) \) as the solution to
\[
\Delta(V_1) = V_1(\lambda - \frac{\rho(1-V_1)}{\lambda + (1-\lambda)(1-S^0(v_0, p^0))}) - (1-p).
\] (28)

Then, we have
\[
\nu^0 \equiv \left\{ \begin{array}{ll}
\check{v}^0 & \text{for } \check{v}^0 \leq v \leq \check{v}^0 \\
\check{v}^0 & \text{for } v > \check{v}^0 
\end{array} \right.
\]
and
\[
\nu^1 \equiv \left\{ \begin{array}{ll}
\check{v}^1 & \text{for } v \leq \check{v}^1 \\
\check{v}^1 & \text{for } v > \check{v}^1 
\end{array} \right.
\]

Clearly, \( \nu^0 \leq \nu_0(v_0) \leq \check{v}^0 \) for any \( v_0 \), and \( \check{v}^0 < \nu_1(v_0) < \nu^0 \) for any \( v_0 \).

**Monotonicity properties of \( S^0 \).** We now prove the claimed monotonicity properties of \( S^0 \) and \( S^t \). Let
\[
f_0 \equiv \Delta(v_0) = \frac{v_0 \lambda}{\lambda + (1-\lambda)(1-S^0(v_0, p^0))} + \frac{(1-p)(1-v_0)}{\lambda(1-v_0) + (1-\lambda)(1-S^0(v_0, p^0))}
\]
\[
f_1 \equiv \Delta(v_1) = \frac{v_1 \lambda}{\lambda + (1-\lambda)(1-S^1)} + \frac{(1-p)(1-v_1)}{\lambda(1-v_1) + (1-\lambda)(1-S^1)}
\]

Suppose that \((S^0, S^1)\) is an equilibrium for some \((v_0, v_1)\), i.e., that it solves
\[
f_0(S^0, S^1, v_0, v_1) = 0
\]
\[
f_1(S^0, S^1, v_0, v_1) = 0.
\]

Totally differentiating, we have, in matrix notation,
\[
\begin{pmatrix}
\frac{\partial f_0}{\partial S^0} & \frac{\partial f_0}{\partial S^1} \\
\frac{\partial f_1}{\partial S^0} & \frac{\partial f_1}{\partial S^1}
\end{pmatrix}
\begin{pmatrix}
\frac{\partial S^0}{\partial S^0} & \frac{\partial S^0}{\partial S^1} \\
\frac{\partial S^1}{\partial S^0} & \frac{\partial S^1}{\partial S^1}
\end{pmatrix}
\begin{pmatrix}
\frac{\partial S^0}{\partial v_0} & \frac{\partial S^0}{\partial v_1} \\
\frac{\partial S^1}{\partial v_0} & \frac{\partial S^1}{\partial v_1}
\end{pmatrix}
= \begin{pmatrix}
\frac{\partial f_0}{\partial v_0} & \frac{\partial f_0}{\partial v_1} \\
\frac{\partial f_1}{\partial v_0} & \frac{\partial f_1}{\partial v_1}
\end{pmatrix}.
\] (29)

Clearly, \( \partial f_0/\partial S_\sigma > 0 \) for all \( \sigma \) and \( \sigma' \), while \( \partial f_0/\partial \nu_\sigma < 0 \) for all \( \sigma = \sigma' \) and \( \partial f_0/\partial \nu_\sigma' = 0 \) for all \( \sigma \neq \sigma' \). Let
\[
M \equiv \det \begin{pmatrix}
\frac{\partial f_0}{\partial S^0} & \frac{\partial f_0}{\partial S^1} \\
\frac{\partial f_1}{\partial S^0} & \frac{\partial f_1}{\partial S^1}
\end{pmatrix}
\begin{pmatrix}
\frac{\partial S^0}{\partial v_0} & \frac{\partial S^0}{\partial v_1} \\
\frac{\partial S^1}{\partial v_0} & \frac{\partial S^1}{\partial v_1}
\end{pmatrix}
= \frac{\partial f_0}{\partial S^0} \frac{\partial f_1}{\partial S^1} - \frac{\partial f_0}{\partial S^1} \frac{\partial f_1}{\partial S^0}.
\]

Computation yields that \( M > 0 \) if and only if
\[
\begin{pmatrix}
\frac{\rho(1-v_0)}{\lambda + (1-\lambda)(1-S^0(v_0, p^0))} & \frac{(1-p)(1-v_0)}{\lambda(1-v_0) + (1-\lambda)(1-S^0(v_0, p^0))} \\
\lambda(1-v_0) + (1-\lambda)(1-S^0(v_0, p^0)) & \lambda + (1-\lambda)(1-S^0(v_0, p^0))
\end{pmatrix} \equiv A
\]
\[
\begin{pmatrix}
\frac{v_1}{\lambda + (1-\lambda)(1-S^1)} & \frac{(1-p)(1-v_1)}{\lambda(1-v_1) + (1-\lambda)(1-S^1)} \\
\lambda(1-v_1) + (1-\lambda)(1-S^1) & \lambda + (1-\lambda)(1-S^1)
\end{pmatrix} \equiv C
\]
\[
\frac{v_0}{\lambda + (1-\lambda)(1-S^0(v_0, p^0))} \frac{(1-p)(1-v_0)}{\lambda(1-v_0) + (1-\lambda)(1-S^0(v_0, p^0))} \equiv E
\]
\[
\frac{v_1}{\lambda + (1-\lambda)(1-S^1)} \frac{(1-p)(1-v_1)}{\lambda(1-v_1) + (1-\lambda)(1-S^1)} \equiv F.
\]

Under Assumption 1, \( A \geq F \) and \( C \geq E \), while \( B, D \geq 0 \). Therefore, \( M > 0 \), and we can invert Eq. (29) to obtain
\[
\begin{pmatrix}
\frac{dS_0}{dv_0} \\
\frac{dS_1}{dv_0}
\end{pmatrix} = \frac{1}{M} \begin{pmatrix}
\frac{\partial f_0}{\partial S^0} & -\frac{\partial f_0}{\partial S^1} \\
-\frac{\partial f_1}{\partial S^0} & \frac{\partial f_1}{\partial S^1}
\end{pmatrix} \begin{pmatrix}
\frac{\partial f_0}{\partial v_0} & \frac{\partial f_0}{\partial v_1} \\
\frac{\partial f_1}{\partial v_0} & \frac{\partial f_1}{\partial v_1}
\end{pmatrix}
\]
\] (31)

This implies
\[
\frac{dS_0}{dv_0} = \frac{1}{M} \frac{\partial f_0}{\partial S^0} \frac{\partial f_0}{\partial v_0} > 0
\]
\[
\frac{dS_0}{dv_1} = \frac{1}{M} \frac{\partial f_0}{\partial S^0} \frac{\partial f_0}{\partial v_1} < 0
\]
\[
\frac{dS_1}{dv_0} = \frac{1}{M} \frac{\partial f_1}{\partial S^0} \frac{\partial f_1}{\partial v_0} < 0
\]
\[
\frac{dS_1}{dv_1} = \frac{1}{M} \frac{\partial f_1}{\partial S^0} \frac{\partial f_1}{\partial v_1} > 0.
\]

establishing the claimed monotonicity properties.

**Consistency.** Next, we turn to the consistency condition according to which \( s^0(\alpha_0) \leq s^0(\alpha_1) \) for any pair \((\nu_0, v_1)\). Suppose first \( v_0 \leq \nu^0 \). Then, \( s^0(\alpha_0) = 0 \). Similarly, suppose \( v_1 \geq \nu^0 \). Then, \( s^0(\alpha_1) = 1 \). In both cases consistency is trivially satisfied. Next suppose \( v_0 > \nu^0 \) and \( v_1 < \nu^0 \), so that Eq. (25) holds with \( \leq \) and Eq. (26) holds with \( \geq \). Subtracting Eq. (26) from Eq. (25), we then have, after simplifying,
\[
(v_1 - v_0) \left[ \frac{\rho(1-v_0)}{\lambda + (1-\lambda)(1-s^0(\alpha_0))} + \frac{\lambda}{\lambda + (1-\lambda)(1-s^0(\alpha_1))} + \frac{\phi}{1-\phi} (1+p) \right]
\leq \frac{(1-p)(1-v_1)}{\lambda(1-v_1) + (1-\lambda)(1-s^0(\alpha_1))} - \frac{(1-p)(1-v_0)}{\lambda(1-v_0) + (1-\lambda)(1-s^0(\alpha_0))}.
\] (36)

The LHS is strictly positive because \( v_1 > v_0 \) by Assumption 1. Thus, a necessary condition for the inequality to hold is that the RHS be strictly positive as well. Suppose that contrary to the consistency requirement we have \( s^0(\alpha_0) > s^0(\alpha_1) \). This implies \((1-v_1)(1-\lambda)\)
(1−s^B(\sigma_0))<(1−v_0)(1−\lambda)(1−s^B(\sigma_1)). Adding \lambda(1−v_0)(1−v_1) to both sides of the inequality, and rearranging, we obtain

\[
\frac{1−v_1}{\lambda(1−v_1) + (1−\lambda)(1−s^B(\sigma_1))} \leq \frac{1−v_0}{\lambda(1−v_0) + (1−\lambda)(1−s^B(\sigma_0))},
\]

a contradiction with the RHS of Eq. (36) being positive.

The high-ability politician. Finally, we examine the high-ability politician’s incentive to adhere to the prescribed equilibrium strategy. Consider type (\theta_H, 0). He prefers

\[
\phi(p + (1−p)\sigma) + (1−\phi)\frac{p\lambda}{\lambda + (1−\lambda)(1−s^B(\sigma_0))} + (1−p)\frac{\lambda}{\lambda + (1−\lambda)(1−s^B(\sigma_1))} \geq 0
\]

for any s^R(\sigma_0). Next, consider type (\theta_H, 1). The condition for him to prefer a_1 to a_0 is

\[
\phi(1−p)\lambda + (1−\phi)\frac{1−v_1}{\lambda(1−v_1) + (1−\lambda)(1−s^B(\sigma_1))} \leq \phi
\]

The equilibrium under hindsight-biased evaluation is determined by the following expression:

\[
\frac{p\lambda(1−v_0)}{\lambda(1−v_0) + (1−\lambda)(1−s^B(\sigma_0))} + \frac{(1−p)\lambda(1−v_1)}{\lambda(1−v_1) + (1−\lambda)(1−s^B(\sigma_1))} + \Delta(v_0) - \frac{v_0\lambda}{\lambda + (1−\lambda)s^B(\sigma_1)}
\]

(38)

Fig. 4, which plots the left- and RHSs of expressions (38) and (39) against s(\sigma_0), illustrates the logic of the argument that follows. The LHS of Eqs. (38) and (39) coincides and is monotone increasing in s(\sigma_0). Under rational evaluation, the RHS, denoted RHS_R, in the figure, is monotone decreasing in s(\sigma_0). The equilibrium strategy s^B(\sigma_0) lies at the intersection of the LHS with the RHS_R curve. Under hindsight-biased evaluation, the RHS is constant with respect to s(\sigma_0); its value is obtained by evaluating RHS_R at s^B(\sigma_1), yielding the horizontal line denoted RHS_R in the figure. The equilibrium strategy s^B(\sigma_1) lies at the intersection of the LHS with the RHS_R curve if such an intersection exists. If LHS \geq RHS_R for all s(\sigma_0), then s^B(\sigma_0) = 0. If LHS \leq RHS_R for all s(\sigma_0), then s^B(\sigma_1) = 1. As the figure clearly shows, the monotonicity properties of the LHS and RHS expressions imply that the claimed relationship must hold.

Proof of Proposition 2. We know from the proof of Lemma 3 that s^B = s^L = s^\pi \leq s^R and s^R \leq \pi^R = \pi^L. Thus, if \upsilon \leq s^B, then s^L(\upsilon) = s^B(\upsilon) = 0, and if \upsilon \geq \pi^L, then s^L(\upsilon) = s^L(\upsilon) = 1. For the rest of the proof, we only have to consider values of \upsilon in the interval \((s^B, s^R).\)

Claim 1. Suppose \upsilon^E \leq \upsilon \leq \upsilon^L. Then, s^B(\sigma_0) \leq s^B(\sigma_1) if and only if s^B(\sigma_1) \geq s^B(\upsilon).

When \upsilon^E < \upsilon \leq \upsilon^L, the rational-evaluation equilibrium in the \sigma_1 subgame is in mixed strategies, i.e., s^B(\sigma)=s^R(\upsilon) where s^R=(0,1) is determined by Eq. (17); see Lemma 2. Writing out Eq. (17) for \upsilon = \upsilon_0 and rearranging, we have

\[
\frac{p\lambda(1−v_0)}{\lambda(1−v_0) + (1−\lambda)(1−s^B(\sigma_0))} + \frac{(1−p)\lambda(1−v_1)}{\lambda(1−v_1) + (1−\lambda)(1−s^B(\sigma_1))} + \Delta(v_0) - \frac{v_0\lambda}{\lambda + (1−\lambda)s^B(\sigma_1)}
\]

(39)

The equilibrium under hindsight-biased evaluation is determined by the following expression:

\[
\frac{p\lambda(1−v_0)}{\lambda(1−v_0) + (1−\lambda)(1−s^B(\sigma_0))} + \frac{(1−p)\lambda(1−v_1)}{\lambda(1−v_1) + (1−\lambda)(1−s^B(\sigma_1))} + \Delta(v_0) \leq \frac{v_0\lambda}{\lambda + (1−\lambda)s^B(\sigma_1)}
\]

(40)

The RHS of Eqs. (40) and (41) coincides and is monotone decreasing in s(\sigma_1). The LHS of Eq. (40) is monotone increasing in s(\sigma_1). The LHS of Eq. (41) is constant with respect to s(\sigma_1); its value is obtained by evaluating the RHS of Eq. (40) at s^B(\sigma_0). An analogous argument to the one used in the proof of Claim 1 establishes Claim 2. Combining Claims 1 and 2 with the consistency result from the proof of Lemma 3, we must have s^B(\sigma_0) \leq s^B(\upsilon) \leq s^B(\sigma_1), \upsilon = \upsilon_0, \upsilon_1. Given that s^B(\sigma_0) \leq s^B(\sigma_1) by Lemma 2 and Assumption 1, the only possible ordering of equilibrium strategies thus is s^B(\sigma_0) \leq s^B(\upsilon) \leq s^B(\sigma_1) ≤ s^B(\sigma_1).

Proof of Proposition 3. Suppose \upsilon_0 \leq \upsilon \leq \upsilon_1. Then, expected welfare in the first period is decreasing in s(\sigma_0) and increasing in s(\sigma_1).
Because by Proposition 2, $s_B^0(\sigma_0) \leq s_B^0(\sigma_0)$ and $s_B^0(\sigma_1) \geq s_B^0(\sigma_1)$, hindsight bias increases first-period welfare. From the definition of $v^*_s$,

$$v_s^0 \leq v^*_s \leq v_s^1 \implies \frac{v_s^0(1 + p) - p}{1 - p} = \kappa \leq \frac{v_s^1(1 + p) - p}{1 - p} = \bar{\kappa}.$$

Now suppose $v_s^0 < v_s^1 < v^*_s \iff \bar{\kappa} > \kappa$. Then, first-period welfare is decreasing in both $s(\sigma_0)$ and $s(\sigma_1)$. If $p > 0$, hindsight bias has a positive effect in the $\sigma_0$ subgame but a negative effect in the $\sigma_1$ subgame; the overall effect is ambiguous. If $p = 0$, however, the term in $s(\sigma_0)$ and $s(\sigma_1)$. If $p > 0$, hindsight bias has a negative effect in the $\sigma_0$ subgame but a positive effect in the $\sigma_1$ subgame; the overall effect is ambiguous. If $p = 0$, $s_B^0(\sigma_1) = s_B^0(\sigma_1)$, so hindsight bias has no effect in the $\sigma_1$ subgame; its overall effect is negative. \hfill $\square$

Appendix B. Sophisticated voters and reliability

Denote the probability that the state of the world is 1 by $r$ and the probability that the signal matches the underlying state of the world by $x_0 \equiv Pr(x_0 | \sigma_0)$. Since $v_0 = \frac{1}{\pi(1 - x_1)} \frac{\pi(1 - x_1) + (1 - \pi)x_0}{\pi x_1 + (1 - \pi)(1 - x_0)}$ to be consistent with Assumption 1, $x_0, x_1, \pi$ and $\pi$ must satisfy $(x_0, x_1, \pi) \in (0,1)^3$ and $1 - x_1 \cdot \pi < x_0 \cdot \frac{1}{1 - x_0}$ We can apply Bayes’ rule to obtain

$$r_0 = \frac{x_0(\lambda + (1 - \lambda)s(\sigma_0))}{x_0(\lambda + (1 - \lambda)s(\sigma_0)) + (1 - x_0)(\lambda + (1 - \lambda)s(\sigma_1))},$$

$$r_1 = \frac{x_1(\lambda + (1 - \lambda)s(\sigma_1))}{x_1(\lambda + (1 - \lambda)s(\sigma_1)) + (1 - x_1)(\lambda + (1 - \lambda)s(\sigma_0))}.$$

Clearly, $0 < r_0 < 1$, $0 = 0$, implying that the politician’s reputation is a convex combination of those under rational and naive hindsight-biased evaluation and is strictly different from his reputation with either rational or naive hindsight-biased voters.

References


