

# Information Revelation and (Anti-)Pandering in Elections\*

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## Abstract

We study a Downsian model of elections in which two candidates who are primarily office-motivated have policy-relevant private information. A conventional intuition is that electoral competition benefits voters by inducing candidates to choose (constrained-)efficient platforms. A countering perspective is that inefficiencies obtain because candidates distort their platforms toward the voters' prior beliefs, i.e. they pander. We find that both intuitions are incorrect for familiar classes of information structures. In our model, office-motivated candidates have an incentive to exaggerate their private information, i.e. to anti-pander. While platforms can still reveal information, equilibrium voter welfare is limited. Our main result is that voter welfare in the Downsian game cannot be any higher than under “dictatorship” by a single non-ideological politician; furthermore, if both candidates have a positive probability of winning in the Downsian game, voter welfare is strictly lower. Normatively, we also show that pandering would improve efficiency; while this is incompatible with office-motivated candidates, it would be an equilibrium were candidates benevolent.

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# 1 Introduction

Candidates who run for political office are generally better informed than voters about policy-relevant variables.<sup>1</sup> Among various reasons for this, one is that candidates and their parties have broad access to policy experts while voters have limited resources and/or incentives to invest in information acquisition. The asymmetric information between candidates and voters implies that a candidate's electoral platform may serve as a signal to voters about his policy-relevant private information. Consequently, the efficiency of a representative democracy depends on whether elections efficiently aggregate politicians' private information. The issue can be decomposed into two (related) questions: to what extent do politicians reveal their policy-relevant information through their platforms, and does any information revelation occur without creating policy distortions?

There are competing intuitions about answers to these questions. One conjecture is that political competition benefits the electorate by pushing each candidate to propose policies that are in the electorate's best interest given his private information, or more generally, to policy platforms that are constrained-efficient. On the other hand, a countering intuition is that the desire to appeal to the electorate would generate inefficient *pandering* from candidates, systematically biasing their policies toward the electorate's ex-ante beliefs about optimal policy.

This paper proposes a simple model of Downsian electoral competition to examine these issues; in a nutshell, we find that both the above intuitions are robustly incomplete or even incorrect. The baseline model developed in [Section 2](#) features two purely office-motivated candidates, each of whom receives a noisy private signal about some policy-relevant but unobservable state of the world. A (median) voter prefers policies that are closest to the expected state. For concreteness, we initially suppose the state is drawn from a mean-zero normal distribution and each candidate's private signal

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<sup>1</sup>This is consistent with the notion that voters are initially uncertain and ambivalent on issues, and learn or refine their preferences during the course of an election. Supporting evidence is found in studies on experiments on deliberative polling (e.g. [Fishkin, 1997](#)), and empirical studies on information effects on opinions (e.g. [Zaller, 1992](#); [Althaus, 1998](#); [Gilens, 2001](#)). Further evidence that the electorate is often ill-informed about policy is obtained in studies on framing in polls (e.g. [Schuman and Presser, 1981](#)) and experiments on priming (e.g. [Iyengar and Kinder, 1987](#)).

is the true state plus a mean-zero random shock that is also normally distributed.<sup>2</sup> Both candidates simultaneously commit to policy platforms, whereafter the voter updates her beliefs about the true state and elects one of the two candidates. Finally, the elected candidate implements his platform. We study the (Perfect Bayesian) equilibria of this electoral game.

Given that the voter dislikes policies that are further from the expected state, a benchmark strategy for each candidate is to choose a platform that is his best estimate of the state given his private signal; call this an *unbiased* (or naive, or truthful) strategy. Our first result in [Section 3](#) — [Proposition 1](#) — is that both candidates cannot play unbiased strategies in equilibrium. Perhaps surprisingly, this is not because candidates have incentives to distort their platforms toward the prior expected state (i.e., to pander to the voter’s prior beliefs); rather, a profitable deviation comes from *overreacting* to information by choosing a platform that puts more weight on the private signal than what is prescribed by the best Bayesian estimate. This deviation incentive arises because if both candidates were to use unbiased strategies, it would be optimal for the voter to elect the candidate whose platform is more extreme (i.e. larger in absolute value), and hence a candidate could increase his probability of winning by choosing a more extreme platform than he is supposed to. The intuition for why the voter would choose the more extreme candidate is that she is able to infer two signals about the state from the candidates’ pair of platforms, and hence her posterior on the state puts less weight on the prior than does either candidate’s individual unbiased estimate; consequently, the expected state following any two platforms is more extreme than the average of the two platforms.<sup>3</sup>

Nevertheless, we find that it is possible for candidates to reveal information through their platforms. In particular, [Proposition 2](#) constructs a *fully-revealing equilibrium* in which both candidates overreact to their private information. In other words, this is an equilibrium in which the voter is able to infer each candidate’s signal from his platform, but candidates engage in just the opposite of pandering. The existence of a fully-revealing equilibrium does not imply (constrained-)efficiency,

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<sup>2</sup>We discuss subsequently why this particular statistical structure is not essential.

<sup>3</sup>[Sobel \(2006\)](#) and [Glaeser and Sunstein \(2009\)](#) identify the same implication of Bayesian updating in the context of non-strategic group decision-making.

however, because platforms are commitments to policy in the Downsian framework. We find that the overreaction in the above fully-revealing equilibrium entails a distortion in policies that has stringent welfare consequences. Specifically, this equilibrium is dominated in terms of the voter’s welfare (i.e. ex-ante expected utility) by “*unbiased dictatorship*” equilibria, which are asymmetric equilibria in which one candidate adopts an unbiased strategy and is always elected.

Our main result, [Proposition 4](#), is that the voter’s welfare from an unbiased dictatorship equilibrium cannot be improved upon by any equilibrium of the Downsian election, and moreover that any “*competitive equilibrium*” — one in which both candidates have an ex-ante positive probability of winning — provides strictly lower voter welfare. Since an unbiased dictatorship equilibrium does not use the information of one candidate at all, we conclude that competition between office-motivated candidates cannot improve upon dictatorship by a non-ideological politician, and can even be worse.

The driving force behind this negative welfare result is that an election between office-motivated candidates is a constant-sum game in terms of their payoffs. We prove that in any *informative* equilibrium of our model — one in which platforms reveal some information to the voter — the winning probability for either candidate has to be independent of their vector of signals.<sup>4</sup> Hence, in any informative equilibrium, the voter’s welfare is the same as if one of the two candidates were always elected. Clearly then, the voter’s welfare is bounded above by having a single candidate who plays the unbiased strategy.

We also study the normative question of how platforms should be chosen to maximize constrained-efficiency by considering an auxiliary game in which candidates are benevolent (i.e. maximize the voter’s utility) rather than office-motivated. [Proposition 5](#) shows that benevolent candidates would optimally deviate from unbiased platforms by pandering! To see the intuition, recall that if both candidates were to play unbiased strategies, the voter would elect the candidate whose platform —

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<sup>4</sup>This, in turn, is shown by proving a general property about correlated equilibria of complete-information two-player constant-sum games. We leverage this result by observing that a (Nash) equilibrium of the Bayesian game between office-motivated candidates that is induced by a voter’s strategy corresponds to a correlated equilibrium of a complete-information game in which the candidates have no private information.

and hence signal — is more extreme. Since a benevolent candidate chooses policies that would be optimal for the voter when he conditions on winning, such a candidate would moderate his platforms relative to an unbiased platform due to a “winner’s curse”. [Proposition 5](#) also shows that there is an equilibrium in the game with benevolent candidates in which both candidates pander. Furthermore, [Proposition 6](#) establishes that, at least under some assumptions, this equilibrium represents the socially-efficient way to aggregate information in the Downsian game form.

It is important to emphasize that the main implications of our analysis are robust in two senses: first, to departures from the particular Normal-Normal statistical structure, and second, to candidates not being purely office-motivated. [Section 4](#) explains why the welfare dominance of unbiased dictatorship over competitive equilibria holds very generally across information structures: roughly speaking, all it requires is that each candidate’s signal should be informative about his opponent’s signal. We also show through a formal continuity result that this welfare comparison is valid when candidates put a small weight on policy outcomes, so long as their policy preferences are close to the voter’s. Furthermore, the incentive that office-motivated candidates have to overreact to private information holds for a wide class of statistical structures, in particular when the distribution of signals given the state is in the Exponential family and the prior is a conjugate prior.<sup>5</sup>

On the other hand, it should also be noted that we take the Downsian game form in which candidates commit to platforms as given, as opposed to adopting a mechanism design approach.<sup>6</sup> Our goal in the current paper is to understand how candidates’ policy-relevant private information affects the canonical model of a prevalent electoral institution. In this regard, our findings suggest a rethinking of common intuitions. First, competition between primarily office-motivated candidates

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<sup>5</sup>This family includes a variety of familiar discrete and continuous distributions with bounded and unbounded supports, such as normal, exponential, gamma, beta, chi-squared, binomial, Dirichlet, and Poisson.

<sup>6</sup>It is simple to derive alternative game forms that yield full information aggregation when candidates are purely office-motivated. For example, if platforms were instead completely non-binding announcements, then there would exist an equilibrium in which announcements are truthful, both candidates are elected with probability 1/2 no matter the announcements, and the elected candidate implements the socially optimal policy given the vector of announcements. However, matters are not so simple when candidates have even small degrees of ideological motivation. Optimal mechanism design in such contexts is an interesting question but outside the current scope (cf. [Li et al., 2001](#)).

may generate incentives to overreact to private information rather than to pander to the electorate's prior. Second, despite more information being socially available, competition between two candidates cannot improve efficiency relative to dictatorship by a non-ideological politician, and may even worsen it. Finally, from a normative perspective, pandering is not necessarily harmful to the electorate: an appropriate degree of pandering may be the constrained-efficient way to aggregate the candidates' private information.

Our work ties most closely into the literature on electoral competition when candidates have policy-relevant private information.<sup>7</sup> A useful comparison is with a nice paper by [Heidhues and Lagerlof \(2003\)](#). Their main insight is to illustrate that candidates may have an incentive to pander to the electorate's prior belief; their setting is one with binary policies, binary states, and binary signals. The message of our [Proposition 1](#) is that in richer settings, precisely the opposite is true for a broad class of informational structures. Plainly, with binary policies, one cannot see the logic of why and how candidates may wish to overreact to private information. [Loertscher \(2012\)](#) maintains the binary signal and state structure, but introduces a continuum policy space. His results are more nuanced, but at least when signals are sufficiently precise, the conclusions are similar to [Heidhues and Lagerlof \(2003\)](#).<sup>8</sup>

In a model that is otherwise similar to [Heidhues and Lagerlof \(2003\)](#), [Laslier and Van de Straeten \(2004\)](#) show that if voters have sufficiently precise private information about the policy-relevant state, then there are equilibria in which candidates fully reveal their private information; see also [Gratton \(2010\)](#) and [Klumpp \(2011\)](#). By contrast, we are interested in settings in which any information that voters have that candidates do not have is relatively imprecise. While we make the extreme assumption that voters have no private information, the main themes are robust to small variations

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<sup>7</sup>There are, of course, contexts where candidates have private information that is not policy relevant for voters. For instance, the strategic effects of private information about the location of the median voter is studied by [Chan \(2001\)](#), [Ottaviani and Sorensen \(2006\)](#), and [Bernhardt et al. \(2007, 2009\)](#).

<sup>8</sup>In [Appendix D](#), we provide an example with a binary signal but where the policies and the state lie in the unit interval (the prior on the state has a Beta distribution) and explicitly show that there is also an incentive to overreact or anti-pander here. This is a special case of the aforementioned Exponential family, but allows a closer comparison with the setting of [Heidhues and Lagerlof \(2003\)](#) and [Loertscher \(2012\)](#).

on this dimension.

[Schultz \(1996\)](#) studies a model in which two candidates are perfectly informed about the policy-relevant state and are ideologically motivated. He finds that when the candidates' ideological preferences are sufficiently extreme, platforms cannot reveal the true state; however, because of the perfect information assumption (and no uncertainty about the median voter's preferences), full revelation can be sustained when ideological preferences are not too extreme. [Martinelli \(2001\)](#) shows that even extreme ideologies can permit full revelation if voters have their own private information. Alternatively, [Martinelli and Matsui \(2002\)](#) show that if the ideologically-motivated parties are risk averse over policy, then the assumption of perfect information can be exploited to induce information revelation even if voters do not have their own private information.

There are other models of signaling through policy distortions that are less directly related to the current paper because their mechanisms are “career concerns” reputations about either competence or preference.<sup>9</sup> While most of these papers focus on pandering toward the electorate's prior, anti-pandering arises in [Prendergast and Stole \(1996\)](#) and [Levy \(2004\)](#). Also worth noting is that, building on [Kartik and McAfee \(2007\)](#), [Honryo \(2011\)](#) studies Downsian electoral competition when some candidates are perfectly informed about a policy-relevant state while others have no information; this leads to candidates trying to signal their competence through their platforms and can generate overreaction or polarization.

## 2 A Model of Expert Politicians

An electorate is represented in reduced-form by a single median voter, whose preferences depend upon the implemented policy,  $y \in \mathbb{R}$ , and an unknown state of the world,  $\theta \in \mathbb{R}$ . We assume that the voter's preferences can be represented by a von-Neumann utility function,  $U(y, \theta) = -(y - \theta)^2$ . The

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<sup>9</sup>[Harrington \(1993\)](#) and [Cukierman and Tommasi \(1998\)](#) are early contributions in this vein; see also [Canes-Wrone, Herron and Shotts \(2001\)](#), [Majumdar and Mukand \(2004\)](#), [Maskin and Tirole \(2004\)](#), [Prat \(2005\)](#), and more recently, [Morelli and van Weelden \(2011a,b\)](#).

state  $\theta$  is drawn from a Normal distribution with mean 0 and a finite precision  $\alpha > 0$  (i.e. variance  $1/\alpha$ ). There are two candidates:  $A$  and  $B$ , each of whom gets a utility of 1 if elected and 0 otherwise; hence they are purely office motivated and maximize the probability of winning the election. Each candidate  $i$  privately observes a signal  $\theta_i = \theta + \varepsilon_i$ , where each  $\varepsilon_i$  is drawn independently of any other random variable from a Normal distribution with mean 0 and finite precision  $\beta > 0$ .<sup>10</sup>

After privately observing their signals, both candidates simultaneously choose platforms,  $y_A \in \mathbb{R}$  and  $y_B \in \mathbb{R}$  respectively. Upon observing the pair of platforms, the median voter updates her belief about the state and then elects one of the two candidates. The elected candidate implements his platform as final policy, i.e., platforms are policy commitments in the Downsian tradition. All aspects of the model except the candidates' privately observed signals are common knowledge, and players are expected-utility maximizers.

With some abuse of notation, a pure strategy for a candidate  $i$  will be denoted as a (measurable) function  $y_i(\cdot) : \mathbb{R} \rightarrow \mathbb{R}$ , so that  $y_i(\theta_i)$  is the platform chosen by  $i$  when his signal is  $\theta_i$ . A mixed strategy for the voter is a (measurable) function  $p : \mathbb{R}^2 \rightarrow [0, 1]$ , where  $p(y_A, y_B)$  represents the probability with which candidate  $A$  is elected when the platforms are  $y_A$  and  $y_B$ . We are interested in perfect Bayesian equilibria of the electoral game (including those in which candidates play mixed strategies), which implies that the voter elects candidate  $i$  if  $y_i$  is strictly preferred to  $y_{-i}$ , where the subscript  $-i$  refers to candidate  $i$ 's opponent. As is common, we require that the voter randomize with equal probability between the two candidates if she is indifferent between  $y_A$  and  $y_B$ .<sup>11</sup> Furthermore, for technical reasons, we restrict to attention to equilibria in which for any given policy of one candidate, say  $y_A$ , the voting function  $p(y_A, \cdot)$  has at most a countable number of discontinuities,

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<sup>10</sup>The Normal-Normal structure is a well-known family of conjugate distributions. We discuss later how results apply for broader classes of distributions, particularly in [Subsection 4.2](#). The assumption that both candidates receive equally precise signals is for expositional simplicity only; the results extend to the case in which one candidate is known to receive a more precise signal than the other. Such an asymmetric ‘‘competence’’ can serve to capture incumbency advantage.

<sup>11</sup>This does not play a significant role but simplifies matters as it pins down voter behavior on any equilibrium path. Moreover, in a full-fledged model with voters of heterogenous ideologies, this property would be necessary whenever the platforms are distinct and yet median voter is indifferent between them.



and analogously for  $p(\cdot, y_B)$  for any  $y_B$ .

The notion of welfare we use is the voter's ex-ante expected utility.

## 2.1 Terminology and Preliminaries

A pure strategy  $y_i(\cdot)$  is *informative* if it is not constant, and it is *fully revealing* if it is a one-to-one function, i.e. if the candidate's signal can be inferred from his platform.<sup>12</sup> As is well known (Degroot, 1970), the Normality assumptions imply that the expected value of  $\theta$  given a single signal  $\theta_i$  is:

$$\mathbb{E}[\theta|\theta_i] = \frac{\beta}{\alpha + \beta}\theta_i, \quad (1)$$

whereas conditional on both signals, we have

$$\mathbb{E}[\theta|\theta_A, \theta_B] = \frac{2\beta}{\alpha + 2\beta} \left( \frac{\theta_A + \theta_B}{2} \right). \quad (2)$$

Because of quadratic utility, the optimal policy for the voter is the conditional expectation of the state given all available information. Since the only information a candidate has when he selects his platform is his own signal, we refer to the strategy  $y_i(\theta_i) = \mathbb{E}[\theta|\theta_i] = \frac{\beta}{\alpha + \beta}\theta_i$  as the *unbiased strategy*. Plainly, this strategy is full revealing. We say that a strategy  $y_i(\cdot)$  displays *pandering* to the voter's beliefs if it is informative, and yet for all  $\theta_i \neq 0$ ,  $y_i(\theta_i)$  is in between 0 and  $\mathbb{E}[\theta|\theta_i]$ .<sup>13</sup> In other words, a candidate panders if his platform conveys some information to the voter about his signals, but his platform is systematically distorted from his unbiased estimate of the best policy toward the voter's prior beliefs. Similarly, we say that  $y_i(\cdot)$  displays *overreaction* to private information if for all  $\theta_i \neq 0$ ,  $y_i(\theta_i)$  is more extreme than  $\mathbb{E}[\theta|\theta_i]$  relative to 0.<sup>14</sup>

An equilibrium is informative if one of the candidates uses an informative strategy; it is fully

<sup>12</sup>There are straightforward generalizations of these notions to mixed strategies.

<sup>13</sup>More precisely, we require that for  $\theta_i < 0$ ,  $y_i(\theta_i) \in (\mathbb{E}[\theta|\theta_i], 0]$ , while for  $\theta_i > 0$ ,  $y_i(\theta_i) \in [0, \mathbb{E}[\theta|\theta_i]]$ . Note that a constant strategy of  $y_i(\cdot) = 0$  is not pandering according to our terminology, because it is uninformative. For any uninformative pure strategy, there is an equilibrium in which both candidates use that pure strategy, due to the latitude in specifying off-path beliefs.

<sup>14</sup>In other words, for  $\theta_i < 0$ ,  $y_i(\theta_i) < \mathbb{E}[\theta|\theta_i]$ , while for  $\theta_i > 0$ ,  $y_i(\theta_i) > \mathbb{E}[\theta|\theta_i]$ .

revealing if both candidates' strategies are fully revealing. An equilibrium is *symmetric* if both candidates use the same strategy, and it is *linear* if both candidates play linear pure strategies. An equilibrium is *competitive* if both candidates have an ex-ante positive probability of winning; it has *dictatorship* if one candidate wins with ex-ante probability one.

A technical note is that because of the continuum policy space, various statements in the analysis and proofs (e.g. about uniqueness of equilibria) should be understood to hold subject to “almost all” qualifiers; we suppress such caveats unless essential.

### 3 Main Results

Given that the voter desires policies as close as possible to the true state, and that a candidate's only information when choosing his policy is his private signal, one might conjecture that a candidate can do no better than playing an unbiased strategy, particularly if the opponent is also using an unbiased strategy. However:

**Proposition 1.** *The profile of unbiased strategies is not an equilibrium: candidates would deviate by overreacting to their information.*

(The proof of this result, and all others not in the text, are in the Appendices.)

The incentive to overreact arises because if both candidates were to play unbiased strategies, the voter would optimally select the candidate with a more extreme platform. Why? Since unbiased strategies are fully revealing, the voter would infer both candidates' signals from their platforms, and accordingly, form a posterior expectation that has the same sign as the average of the two candidates' individual posterior expectations but that is more extreme, i.e. has a larger magnitude. This is a direct implication of equations (1) and (2).<sup>15</sup> Since the candidate whose platform is closer to the

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<sup>15</sup>Indeed, the voter's posterior mean can be larger in magnitude than both candidates' platforms (rather than just their average); this is always the case when  $\theta_A$  and  $\theta_B$  are sufficiently close, since the posterior mean is continuous in signals and for any  $\hat{\theta}$ ,  $|\mathbb{E}[\theta|\theta_A = \theta_B = \hat{\theta}]| = \frac{2\beta}{\alpha+2\beta}|\hat{\theta}| > |\mathbb{E}[\theta|\theta_A = \hat{\theta}]| = \frac{\beta}{\alpha+\beta}|\hat{\theta}|$ .

voter's posterior expectation is elected, it follows that the voter would elect  $i$  if and only if  $|y_i| > |y_{-i}|$ . Hence, each candidate would like to raise his probability of playing the more extreme platform, which can be achieved by placing more weight on his private signal than what is prescribed by the unbiased strategy. Consequently, a profitable deviation involves overreaction rather than pandering.<sup>16</sup>

Despite the incentive to overreact, can information be revealed in equilibrium? Perhaps surprisingly, we find that an appropriate degree of overreaction can support full revelation of information. To state the next result, say that a (possibly mixed) strategy for candidate  $i$  is *locally pure* at  $\theta_i$  if types in a neighborhood of  $\theta_i$  do not mix, and hence it is meaningful to write  $y_i(\cdot)$  in a neighborhood of  $\theta_i$ . A strategy that is locally pure at  $\theta_i$  is also *locally revealing* at  $\theta_i$  if there is a neighborhood of  $\theta_i$  within which there is a well-defined inverse function  $y^{-1}(y_i(\theta_i))$ ; i.e., local revelation requires that the voter be able to infer a candidate's signal from his platform for some interval of signals. Finally, a strategy that is locally pure at  $\theta_i$  is also *locally continuous* at  $\theta_i$  if  $y_i(\cdot)$  is continuous in some neighborhood of  $\theta_i$ .

**Proposition 2.** *There is a symmetric and fully revealing equilibrium with overreaction where both candidates play*

$$y(\theta_i) = \mathbb{E}[\theta | \theta_i, \theta_{-i} = \theta_i] = \frac{2\beta}{\alpha + 2\beta} \theta_i. \quad (3)$$

*In this equilibrium, each candidate is elected with probability 1/2 regardless of the signal realizations  $\theta_A$  and  $\theta_B$ . Furthermore, this is the unique symmetric equilibrium with the property that for some signal, the (common) candidates' strategy is locally pure, revealing, and continuous at that signal.*

*Proof.* For existence, it suffices to show that the voter is indifferent between the two candidates for any pair of platforms when they each play the strategy given by (3), because then each candidate is

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<sup>16</sup>A different way of seeing this is to note that when the voter conjectures that candidates are using unbiased strategies, then (2) implies that for any platform of candidate  $-i$ , an increase in candidate  $i$ 's platform by  $\varepsilon > 0$  would raise the voter's posterior by  $\frac{2\beta}{\alpha+2\beta} \left( \frac{\alpha+\beta}{\beta} \frac{\varepsilon}{2} \right) > \frac{\varepsilon}{2}$ . Thus, increasing (resp. decreasing) his platform would benefit candidate  $i$  when he is located to the right (resp. the left) of  $-i$ . Since under unbiased strategies a candidate's expectation of his opponent's platform is in between 0 and his own unbiased platform, pandering would reduce the probability of winning while overreacting would increase it.

elected with probability 1/2 regardless of the pair of platforms and hence has no profitable deviation. Since the candidates' strategies are fully revealing, the voter correctly infers the candidates' signals from any on-path platform pair. Furthermore, since the strategies are onto functions, there are no off-path platform pairs. Therefore, it suffices to show that for any  $\theta_A$  and  $\theta_B$ ,  $-\mathbb{E}[(y(\theta_A) - \theta)^2 | \theta_A, \theta_B] = -\mathbb{E}[(y(\theta_B) - \theta)^2 | \theta_A, \theta_B]$ , or equivalently that  $(y(\theta_A) - \mathbb{E}[\theta | \theta_A, \theta_B])^2 = (y(\theta_B) - \mathbb{E}[\theta | \theta_A, \theta_B])^2$ .<sup>17</sup> Using (2) and (3), this latter equality can be rewritten as

$$\left( \frac{2\beta}{\alpha + 2\beta} \theta_A - \frac{2\beta}{\alpha + 2\beta} \left( \frac{\theta_A + \theta_B}{2} \right) \right)^2 = \left( \frac{2\beta}{\alpha + 2\beta} \theta_B - \frac{2\beta}{\alpha + 2\beta} \left( \frac{\theta_A + \theta_B}{2} \right) \right)^2,$$

which is obviously true for any  $\theta_A, \theta_B$ .

The proof of the uniqueness claim is [relegated](#) to the Appendix. □

An implication of [Proposition 2](#) is that the equilibrium it identifies is the unique symmetric equilibrium in which both candidates use fully-revealing and continuous pure strategies.<sup>18</sup> Observe that the strategy given by (3) requires a candidate  $i$  to choose his platform to be the Bayesian estimate of the state assuming his opponent has received the same signal. This is an overreaction because he anticipates that, in expectation, his opponent's signal will be more moderate than his own, as the expectation of the opponent's signal equals his unbiased estimate of the state,  $\frac{\beta}{\alpha + \beta} \theta_i$ . When the voter believes that both candidates overreact to this degree, platforms do not affect winning probabilities because whenever candidate  $i$  increases his platform by  $\varepsilon > 0$ , equation (2) implies that the voter's posterior increases by  $\frac{2\beta}{\alpha + 2\beta} \left( \frac{\alpha + 2\beta}{2\beta} \frac{\varepsilon}{2} \right) = \varepsilon/2$ , and thus she remains indifferent between the two platforms (cf. [fn. 16](#)).

<sup>17</sup>That this latter equality is equivalent to the former follows from a standard mean-variance decomposition under quadratic loss utility; details are provided in the [proof of Proposition 1](#).

<sup>18</sup>In fact, the [proof of the Proposition](#) establishes something stronger: there is a class of fully-revealing equilibria in which each candidate wins with probability 1/2 regardless of the signal realizations. The class is defined as follows: for any constant  $c \in \mathbb{R}$ , one candidate  $i$  plays  $y_i(\theta_i) = \frac{2\beta}{\alpha + 2\beta} \theta_i + c$  and the other candidate plays  $y_{-i}(\theta_{-i}) = \frac{2\beta}{\alpha + 2\beta} \theta_{-i} - c$ . Furthermore, any competitive equilibrium in which for each candidate  $i$  there is some  $\theta_i$  such that  $i$ 's strategy is locally pure, revealing, and continuous at  $\theta_i$  belongs to this class of equilibria (note that a symmetric equilibrium is necessarily competitive since candidates have must equal ex-ante probability of winning). Plainly, within this class of equilibria, the only symmetric equilibrium obtains when  $c = 0$ , i.e. when both candidates play (3), which is the equilibrium of [Proposition 2](#). It is straightforward to check that in this class of equilibria, any of the asymmetric equilibria are dominated in voter welfare by the symmetric equilibrium.

Although the linear coefficient in (3) is increasing in  $\beta$  and decreasing in  $\alpha$ , the same is true for the unbiased strategy’s coefficient,  $\frac{\beta}{\alpha+\beta}$ . The degree of overreaction in the above equilibrium, as measured by  $\frac{2\beta}{\alpha+2\beta} - \frac{\beta}{\alpha+\beta}$ , is non-monotonic in the parameters: it is increasing in  $\beta$  (resp. decreasing in  $\alpha$ ) when  $\beta < \alpha$  and decreasing in  $\beta$  (resp. increasing in  $\alpha$ ) when  $\beta > \alpha$ . The degree of overreaction vanishes as either  $\alpha$  or  $\beta$  tend to either 0 or  $\infty$ .

Despite fully revealing information, the overreaction in this equilibrium suggests some inefficiency. But since revealing and using both candidates information would appear desirable for voter welfare, and Proposition 2 severely constrains the set of competitive fully revealing equilibria, perhaps this is the best equilibrium in terms of welfare?

To address this issue, we first demonstrate existence of a different kind of equilibrium. Recall that an equilibrium has *dictatorship* if one candidate — the “dictator” — is always elected on the equilibrium path. We will say that a dictatorship equilibrium has *unbiased dictatorship* if the dictator uses an unbiased strategy. While Proposition 1 indicates that unbiased dictatorship cannot be supported in a symmetric equilibrium, the following result shows that it can be supported by asymmetric strategies even when both candidates are fully revealing their information.

**Proposition 3.** *There is a fully revealing equilibrium with unbiased dictatorship: candidate  $i$  plays  $y_i(\theta_i) = \frac{\beta}{\alpha+\beta}\theta_i$  and the candidate  $-i$  plays  $y_{-i}(\theta_{-i}) = \theta_{-i}$ ; candidate  $i$  is elected no matter the pair of realized platforms. Up to permuting the candidates, this is the unique equilibrium with unbiased dictatorship and fully revealing strategies.*

Note that all platform pairs are on the equilibrium path in the above construction, and hence there is no issue of off-path beliefs for the voter.<sup>19</sup> Nevertheless, the fact that the losing candidate

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<sup>19</sup>It is easy to sustain unbiased dictatorship in pure strategy equilibria in which the losing candidate  $-i$  plays an uninformative strategy, e.g.  $y_{-i}(\theta_{-i}) = 0$ . But such a construction may be unconvincing because it raises questions about what beliefs are “reasonable” for the voter if she were to observe a deviation by candidate  $-i$  to some off-path platform. If one is content with mixed-strategy equilibria, then unbiased dictatorship can be supported by having the losing candidate play a distribution of platforms that is independent of his signal and has support equal to  $\mathbb{R}$ . The construction in Proposition 3 obviates concerns about using strategies that are mixed, uninformative, or don’t have full range.

fully reveals his signal is irrelevant for voter welfare: in any unbiased dictatorship equilibrium, the voter’s welfare is the same as if there were just a single candidate who plays an unbiased strategy. In other words, in any unbiased dictatorship equilibrium, one signal is efficiently aggregated.

One can compute that the voter’s welfare in an unbiased dictatorship equilibrium is actually higher than the welfare obtained in the competitive equilibrium of [Proposition 2](#).<sup>20</sup> This is not a coincidence; our main result is that unbiased dictatorship is a tight upper bound on the voter’s welfare:

**Proposition 4.** *There is no equilibrium that yields the voter a higher ex-ante expected utility than an unbiased dictatorship equilibrium. Furthermore, any competitive equilibrium yields the voter a strictly lower ex-ante expected utility.*

As the proof is somewhat involved but the result is central, we will sketch the main steps of the argument. The key insight is [Lemma A.2](#) in the Appendix: any equilibrium must have the property that for any on-path platform of a candidate  $i$ , the probability with which  $i$  expects to win when playing that platform cannot depend on what signal  $i$  has received. This is proved by viewing any equilibrium as having a corresponding correlated equilibrium in a complete-information two-player constant-sum game between the candidates (where  $A$ ’s payoff is given by the voter’s strategy,  $p(y_A, y_B)$ , and  $B$ ’s payoff is given by  $1 - p(y_A, y_B)$ ). We derive a very general property about correlated equilibria of such games: any pure strategy that a player may be “recommended” to play, say  $s_i$ , must be a best response against his opponent’s marginal distribution given any other strategy,  $s'_i$ , that  $i$  could have been recommended to play ([Proposition C.1](#)).

Building on [Lemma A.2](#), the proof of [Proposition 4](#) shows that if an equilibrium is *informative*, then it must be an *ex-post* equilibrium in the sense that the voter’s strategy,  $p(y_A, y_B)$  must be constant across all on-path platform pairs, and hence a candidate would have no incentive to deviate

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<sup>20</sup>The voter’s ex-ante expected utility in the former is  $-\frac{1}{\alpha+\beta}$ , while it is  $-\frac{4\beta^2+\alpha^2+5\beta\alpha}{(\alpha+2\beta)^2(\alpha+\beta)}$  in the latter. Both expressions converge to 0 as either  $\beta \rightarrow \infty$  or  $\alpha \rightarrow 0$ ; hence, both equilibria are welfare equivalent in these limiting cases. However, the welfare difference between the two equilibria is not monotonic in the parameters.

even if he observed his opponent’s platform before making his choice. Note, in particular, that this property is satisfied by the equilibria of [Proposition 2](#) and [Proposition 3](#). An intuition for this step is as follows: since at least one candidate’s platform depends non-degenerately on his signal in an informative equilibrium, and since, regardless of strategies, each candidate’s signal provides him information about his opponent’s signal, any informative equilibrium has the property that at least one candidate’s signal provides him non-degenerate information about his opponent’s platform. But then, the only way the interim probability of winning for a candidate can be independent of his signal (as required by [Lemma A.2](#)) is that the winning probability must be independent of the chosen platforms on the equilibrium path.<sup>21</sup>

This ex-post property then implies that in any informative equilibrium, either there is a dictator or the equilibrium is competitive and the voter is indifferent between both candidates for all pairs of on-path platforms. In the former case, clearly the voter’s ex-ante welfare cannot be higher than if the dictator played an unbiased strategy. In the latter case, the voter’s utility can be evaluated by treating *either* candidate as the dictator (holding fixed the candidates’ strategies). Since we know from [Proposition 1](#) that both candidates cannot be using unbiased strategies, the voter’s ex-ante welfare in such an equilibrium must be strictly lower than under unbiased dictatorship.<sup>22</sup>

[Proposition 4](#) provides a clear sense in which competition between candidates does not help voter welfare compared to having just one non-ideological politician (and selecting the Pareto-dominant outcome in that setting); it may even hurt, particularly if competitive equilibria are viewed as more plausible than unbiased dictatorship equilibria.

Having established that office-motivated candidates have incentives to overreact to information

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<sup>21</sup>We do not rule out the possibility that this property fails in uninformative equilibria, because information about the opponent’s signal does not provide any information about the opponent’s platform if the opponent’s strategy is uninformative. For example, if the voter is not required to randomize 50-50 when indifferent, there are uninformative equilibria with the flavor of “matching pennies”: both candidates randomize uniformly over  $\{-x, x\}$  for some  $x > 0$ , and the voter elects candidate  $A$  if  $y_A = y_B$  while she elects candidate  $B$  if  $y_A = -y_B$ . But uninformative equilibria are obviously dominated in voter welfare by unbiased dictatorship equilibria.

<sup>22</sup>Notice that this argument holds even without the assumption that the voter must elect both candidates with equal probability when indifferent.

and that competition does not promote efficiency, we now explain why an appropriate degree of pandering would actually be beneficial for voter welfare. To this end, consider an auxiliary *benevolent candidates* game, which has the same game form as we have studied so far and the same payoff function for the voter; the difference is that candidates are not office-motivated but rather maximize the voter's utility. Plainly, this auxiliary game is a team problem and equilibria therefore bear a connection to the problem of a social planner who can choose candidates' strategies to maximize voter welfare but is constrained by the Downsian game form and the requirement that each candidate's strategy can only depend on his own signal. In particular, the Pareto-dominant equilibrium of the benevolent candidates game is equivalent to the constrained planner's solution.

**Proposition 5.** *In the benevolent candidates game:*

1. *Unbiased strategies are not an equilibrium because candidates would deviate by pandering;*
2. *There is a symmetric fully revealing (non-linear) equilibrium with pandering, in which each candidate plays*

$$y(\theta_i) = \mathbb{E}[\theta | \theta_i, |\theta_{-i}| < |\theta_i|], \quad (4)$$

and the voter elects candidate  $i$  when  $|y_i| > |y_{-i}|$ , or equivalently from (4),  $i$  wins when  $|\theta_i| > |\theta_{-i}|$ .<sup>23</sup>

The first part of [Proposition 5](#) reaches the same conclusion for benevolent candidates as [Proposition 1](#) does for office-motivated candidates, but for precisely the opposite reason! Recall from the discussion following [Proposition 1](#) that if candidates were to play unbiased strategies, the voter would

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<sup>23</sup>Using the well-known closed-form expression for truncated Normal distributions, equation (4) can be expressed as

$$y(\theta_i) = \frac{\beta}{\alpha + \beta} \theta_i - \sigma \frac{\beta}{\alpha + 2\beta} \frac{\phi\left(\frac{1}{\sigma} \frac{\alpha}{\alpha + \beta} \theta_i\right) - \phi\left(-\frac{1}{\sigma} \frac{\alpha + 2\beta}{\alpha + \beta} \theta_i\right)}{\Phi\left(\frac{1}{\sigma} \frac{\alpha}{\alpha + \beta} \theta_i\right) - \Phi\left(-\frac{1}{\sigma} \frac{\alpha + 2\beta}{\alpha + \beta} \theta_i\right)},$$

where  $\sigma = \sqrt{\frac{\alpha + 2\beta}{(\alpha + \beta)\beta}}$ , and  $\phi(\cdot)$  and  $\Phi(\cdot)$  are respectively the density and cumulative distributions of the standard normal distribution,  $\mathcal{N}(0, 1)$ . To see that this strategy has pandering, consider any  $\theta_i > 0$  (with a symmetric argument for  $\theta_i < 0$ ). Then  $0 < y(\theta_i) < \frac{\beta}{\alpha + \beta} \theta_i$  because  $\phi\left(\frac{1}{\sigma} \frac{\alpha}{\alpha + \beta} \theta_i\right) > \phi\left(\frac{1}{\sigma} \frac{\alpha + 2\beta}{\alpha + \beta} \theta_i\right) > 0$  and  $\Phi\left(\frac{1}{\sigma} \frac{\alpha}{\alpha + \beta} \theta_i\right) > \Phi\left(-\frac{1}{\sigma} \frac{\alpha + 2\beta}{\alpha + \beta} \theta_i\right) > 0$ .



elect the candidate whose platform (and hence signal) is more extreme. While this induces office-motivated candidates to overreact in order to increase their winning probabilities, it has the opposite effect on benevolent candidates, because of a “winner’s curse”: since a benevolent candidate cares about his platform choice (only) in the event of winning, conditioning on winning informs him that his opponent’s signal is more moderate than his own, and hence he should moderate his policy platform, i.e. he should pander.

This logic suggests why pandering is desirable. The second part of [Proposition 5](#) shows that there indeed is a symmetric and fully-revealing equilibrium with pandering in which the candidate with the more extreme platform (or signal) would win. It can be checked that the welfare in this equilibrium is strictly higher than in unbiased dictatorship, and hence strictly higher than in any equilibrium of the game with office-motivated candidates.<sup>24</sup> It is worth noting that as  $\theta_i \rightarrow \{-\infty, +\infty\}$ , the strategy in (4) becomes approximately the unbiased strategy,  $\frac{\beta}{\alpha+\beta}\theta_i$ . The reason is that the distribution of  $\theta_{-i}|\theta_i$  is Normal with mean  $\mathbb{E}[\theta|\theta_i] = \frac{\beta}{\alpha+\beta}\theta_i$ , and hence as  $\theta_i \rightarrow \infty$  (resp.  $-\infty$ ), conditioning on winning becomes uninformative as  $\theta - \mathbb{E}[\theta|\theta_i] = \frac{\alpha}{\alpha+\beta}\theta_i \rightarrow \infty$  (resp.  $-\infty$ ).

A candidate  $i$  wins in the pandering equilibrium above when  $|\theta_i| > |\theta_{-i}|$ , just as he would if the voter believed that candidates were using unbiased strategies. While we conjecture that this “win-area” property must hold in a Pareto-dominant equilibrium of the benevolent candidates game (and hence in the solution to the constrained-planner’s problem), a complete proof has been elusive. Instead, we establish the following:

**Proposition 6.** *In the benevolent candidates game, the equilibrium identified in [Proposition 5](#) maximizes voter welfare among all equilibria where candidate  $i$  wins whenever  $|\theta_i| > |\theta_{-i}|$ .*

Thus, at least under the requirement that a candidate should win when he has the more extreme signal, the optimal way to aggregate information in the Downsian game form is for candidates to pander according to (4). To interpret better the “win-area” requirement and see some intuition for

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<sup>24</sup>As  $\beta \rightarrow \infty$ , the welfare difference vanishes since the welfare in both converges to 0.

why it is unlikely to be restrictive, consider any symmetric strategy profile where both candidates play  $y(\cdot)$  that is symmetric around 0. For the unbiased strategy,  $y(\theta_i) = \mathbb{E}[\theta|\theta_i]$ , we have  $y'(\cdot) = \frac{\beta}{\beta+\alpha}$ ; for the overreaction strategy identified in [Proposition 2](#),  $y(\theta_i) = \mathbb{E}[\theta|\theta_i, \theta_{-i} = \theta_i]$ , we have  $y'(\cdot) = \frac{2\beta}{\alpha+2\beta}$ . One can verify that whenever  $y'(\cdot) \in [0, \frac{2\beta}{\alpha+2\beta}]$  (presuming differentiability), it would be optimal for the voter to elect the candidate with the more extreme platform and hence the more extreme signal.<sup>25</sup> Thus, roughly speaking, the win-area requirement in [Proposition 6](#) requires only that neither candidate should overreact by more than he would when conditioning on the opponent having received the same signal as he.

## 4 Discussion

### 4.1 Ideological Motivation

We now allow for broader set of candidate motivations, including a mixture of ideological and office motivation. Specifically, each candidate  $i$  has an ideology  $b_i$  such that his payoff when the final policy is  $y$ , the state is  $\theta$ , and the winner of the election is  $W \in \{A, B\}$  is:

$$u_i(y, \theta, W) = -\rho_i(y - \theta - b_i)^2 + (1 - \rho_i)\mathbb{1}_{\{W=i\}}.$$

Here,  $\rho_i \in [0, 1]$  measures how policy-motivated candidate  $i$  is, while  $b_i \in \mathbb{R}$  measures his preference conflict with the voter over policies. These parameters are common knowledge. Plainly, if  $b_i = \rho_i = 0$  then candidate  $i$  is purely office-motivated. A benevolent candidate is one with  $b_i = 0$  and  $\rho_i = 1$ . A candidate with  $\rho_i = 1$  and  $b_i \neq 0$  is a purely policy-motivated but ideologically-biased candidate.

In this more general context, we say that an equilibrium has *unbiased dictatorship* if candidate  $i$

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<sup>25</sup>In fact, one can establish that the only equilibrium of the benevolent candidates game in which both candidates use the same differentiable strategy  $y(\cdot)$  that is symmetric around 0 and satisfies  $y'(\cdot) \in [0, \frac{2\beta}{\alpha+2\beta}]$  is the pandering equilibrium identified in [Proposition 5](#).

is always elected (on the equilibrium path) and uses the strategy

$$y_i(\theta_i) = \frac{\beta}{\alpha + \beta} \theta_i + b_i. \quad (5)$$

Note that in this case, the “dictator”  $i$  who always wins is choosing a policy that is unbiased with respect to *his* preferences as opposed to the voter’s.

**Proposition 7.** *Assume candidates have mixed motivations. There is a fully revealing unbiased dictatorship equilibrium in which one candidate  $i$  plays (5), the other candidate  $-i$  plays*

$$y_{-i}(\theta_{-i}) = \theta_{-i} - \frac{\alpha + \beta}{\beta} b_i, \quad (6)$$

*and the voter elects candidate  $i$  no matter the pair of platforms. Furthermore, this is the unique equilibrium with unbiased dictatorship and full revealing strategies.*

*Proof.* Without loss of generality, let  $i = A$ . Given the strategies (5) and (6), it follows that

$$\mathbb{E}[\theta|y_A, y_B] = \frac{\beta(y_A - b_A) \frac{\alpha + \beta}{\beta} + \beta \left( y_B + \frac{\alpha + \beta}{\beta} b_A \right)}{\alpha + 2\beta} = \frac{\alpha y_A + \beta(y_A + y_B)}{\alpha + 2\beta}.$$

Straightforward algebra then verifies that for any  $y_A$  and  $y_B$ ,

$$(y_A - \mathbb{E}[\theta|y_A, y_B])^2 < (y_B - \mathbb{E}[\theta|y_A, y_B])^2 \iff \beta < \alpha + \beta.$$

Hence it is optimal for the voter to always elect candidate  $A$ ; clearly the candidates are playing optimally given this strategy for the voter. The proof of uniqueness is relegated to the Appendix.  $\square$

As the equilibrium constructed above is invariant to  $\rho_A$  and  $\rho_B$ , it has a number of interesting implications. First, the equilibrium exists when candidates are purely policy-motivated. Second, for  $\rho_A = \rho_B = b_A = b_B = 0$ , this equilibrium reduces to that of [Proposition 3](#).<sup>26</sup> Moreover, by taking

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<sup>26</sup>[Proposition 7](#) shows that there are in fact a continuum of fully revealing linear dictatorship equilibria with purely office-motivated candidates, because when  $\rho_A = \rho_B = 0$ , one may substitute any constant in place of  $b_i$  in (5) and (6) and produce a new dictatorship equilibrium. However, among these, only the equilibrium in which the constant is zero is an unbiased dictatorship equilibrium for  $\rho_A = \rho_B = 0 = b_A = b_B = 0$ .

$b_A = b_B = 0$  and  $\rho_A = \rho_B = 1$ , we see that there is also an unbiased dictatorship equilibrium when both candidates are benevolent.<sup>27</sup> Hence, the equilibrium of [Proposition 7](#) continuously spans all three polar cases of candidate motivation.

Building on the previous Proposition, we can now formalize the robustness of the conclusions of [Proposition 4](#) to small departures from pure office-motivation. Let an arbitrary Downsian game with mixed-motivated candidates be parameterized by  $(\boldsymbol{\rho}, \mathbf{b})$ , where  $\boldsymbol{\rho} = (\rho_A, \rho_B)$  and  $\mathbf{b} = (b_A, b_B)$ . Given any equilibrium,  $\sigma$ , of a mixed-motivations game, let  $U_V(\sigma)$  be the voter's welfare (i.e. ex-ante expected utility) in this equilibrium; note that this welfare depends only on the strategies used and not directly on the candidates' motivations. For any  $\varepsilon \in [0, 1/2]$ , let  $\Sigma^\varepsilon(\boldsymbol{\rho}, \mathbf{b})$  be the set of equilibria in a mixed-motivations game where each candidate wins with ex-ante probability at least  $\varepsilon$ . Let  $U_V^\varepsilon(\boldsymbol{\rho}, \mathbf{b}) := \sup_{\sigma \in \Sigma^\varepsilon(\boldsymbol{\rho}, \mathbf{b})} U_V(\sigma)$  be the highest welfare for the voter across all equilibria in which each candidate wins with probability at least  $\varepsilon \in [0, 1/2]$ , given candidates' motivations  $(\boldsymbol{\rho}, \mathbf{b})$ ; in particular,  $U_V^0(\boldsymbol{\rho}, \mathbf{b})$  is the highest welfare across all equilibria for the given candidates' motivations.

**Proposition 8.** *Assume candidates have mixed motivations. Then,*

1. As  $(\boldsymbol{\rho}, \mathbf{b}) \rightarrow (\mathbf{0}, \mathbf{0})$ ,  $U_V^0(\boldsymbol{\rho}, \mathbf{b}) \rightarrow U_V^0(\mathbf{0}, \mathbf{0})$ .
2. For any  $\varepsilon > 0$ , there exists  $\delta > 0$  such that for all  $(\boldsymbol{\rho}, \mathbf{b})$  close enough to  $(\mathbf{0}, \mathbf{0})$ ,<sup>28</sup> it holds that  $U_V^\varepsilon(\boldsymbol{\rho}, \mathbf{b}) < U_V^0(\boldsymbol{\rho}, \mathbf{b}) - \delta$ .

To interpret this result, let  $\sigma^{UD}(\boldsymbol{\rho}, \mathbf{b})$  be the unbiased dictatorship equilibrium identified in [Proposition 7](#) where, without loss,  $A$  is the dictator. We know from [Proposition 4](#) that  $U_V^0(\mathbf{0}, \mathbf{0}) = U_V(\sigma^{UD}(\mathbf{0}, \mathbf{0}))$ . Since [Proposition 7](#) assures that  $\sigma^{UD}(\boldsymbol{\rho}, \mathbf{b}) \in \Sigma^0(\boldsymbol{\rho}, \mathbf{b})$ , the first part of [Proposition 8](#) implies that when candidates are close to purely office-motivated, the unbiased dictatorship equilibrium provides close to the maximal possible equilibrium welfare to the voter. In this sense, the conclusion in [Proposition 4](#) that unbiased dictatorship maximizes welfare is robust to candidates

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<sup>27</sup>Of course, by [Proposition 5](#), this is Pareto-dominated when the candidates are benevolent.

<sup>28</sup>I.e. if for each  $i$ ,  $\rho_i \in [0, 1]$  and  $b_i \in \mathbb{R}$  are both close enough to zero.

having mixed motivations. We remark that one cannot just invoke the Theorem of the Maximum here; in fact, because the policy space is not compact, the equilibrium correspondence fails to be upper hemi-continuous.<sup>29</sup> However, the proof shows that any sequence of voter-welfare-maximizing equilibria must converge in welfare.

The second part of [Proposition 8](#) shows that the second part of [Proposition 4](#) is also robust. It says that given any  $\varepsilon > 0$ , there is a bound  $\delta > 0$  such that any equilibrium in which both candidates win with ex-ante probability greater than  $\varepsilon$  and are almost entirely office-motivated will provide welfare that is bounded away from  $U_V^0(\mathbf{0}, \mathbf{0})$  by  $\delta$ . Combined with the first part of [Proposition 8](#), it follows that once candidates are primarily office-motivated, any equilibrium that maximizes the voter’s welfare must have one candidate winning with ex-ante probability close to one and hence be almost non-competitive.

It is important to recognize that because we use a constructive lower hemi-continuity of unbiased dictatorship ([Proposition 7](#)) to prove both parts of [Proposition 8](#), our notion of a candidate  $i$  being primarily office-motivated involves not only  $\rho_i \approx 0$  but also  $b_i \approx 0$ . It is likely that in a game in which  $\rho_A$  and  $\rho_B$  are both approximately zero but neither  $b_A$  nor  $b_B$  are, the maximum equilibrium welfare for the voter will not be close to  $U_V^0(\mathbf{0}, \mathbf{0})$ . In particular, observe that if  $|b_i|$  were sufficiently large, then having only a single policy-maker  $i$  with  $\rho_i > 0$  would be welfare-dominated by some equilibria of the Downsian game with two candidates.<sup>30</sup> Hence, competition between candidates can have a beneficial “disciplining effect” in the presence of large ideological biases.<sup>31</sup> The point, however, is that ideological biases would have to be large enough for this effect to outweigh the welfare loss we identify from information distortion in competitive equilibria when office-motivation is large.

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<sup>29</sup>To see this, note that for any candidates’ motivations  $(\boldsymbol{\rho}, \mathbf{b})$  in which  $b_A > 0$ , there is an equilibrium where both candidates use the constant strategy  $y(\cdot) = 1/b_A$ ; this is supported by suitable off-path beliefs for the voter such that any candidate whose platform differs from  $b_A$  loses for sure. As  $b_A \downarrow 0$ , this sequence of equilibria does not converge to a limit equilibrium.

<sup>30</sup>Because in the former, the policy-maker would always choose  $\frac{\alpha}{\alpha+\beta}\theta_i + b_i$ ; whereas in the latter, there is an equilibrium in which the implemented platform is always zero, as the voter could simply not elect a candidate who does not offer policy zero.

<sup>31</sup>This is standard when candidates have mixed-motivations, e.g. in [Calvert \(1985\)](#) and [Wittman \(1977\)](#).

## 4.2 Information Structures

While we have developed the model with a Normal-Normal information structure to ease exposition and develop closed-form solutions and comparative statics, we now discuss why the main themes are more general.

The anti-pandering incentive extends directly to a family of statistical structures known as the Exponential family with conjugate priors, which includes a variety of familiar distributions (see [fn. 5](#)); indeed, in [Appendix D](#), we provide a Beta-Bernoulli example whose structure is quite different from the Normal-Normal structure and yet has similar forces at work. The important property within the Exponential family is that the posterior expectation of the state  $\theta$  given a prior mean parameter, say  $\theta_0$ , and any number of signal realizations,  $\theta_1, \dots, \theta_n$ , takes a linear form:  $\mathbb{E}[\theta|\theta_1, \dots, \theta_n] = \frac{\sum_{i=0}^n \theta_i w_i}{\sum_{i=0}^n w_i}$ , for some positive coefficients  $w_0, \dots, w_n$  ([Jewel, 1974](#); [Kass et al., 1997](#)). When the distribution of each  $\theta_i|\theta$  is identical for  $i = 1, \dots, n$ ,<sup>32</sup> one can take  $w_i = w_1$  for all  $i = 1, \dots, n$ , and hence  $\mathbb{E}[\theta|\theta_1, \dots, \theta_n] = \frac{w_0}{w_0 + nw_1} \theta_0 + \frac{nw_1}{w_0 + nw_1} \frac{\sum_{i=1}^n \theta_i}{n}$ . Therefore,

$$\mathbb{E}[\theta|\theta_1, \dots, \theta_n] - \theta_0 = \frac{nw_1}{w_0 + nw_1} \left( \frac{\sum_{i=1}^n \theta_i}{n} - \theta_0 \right), \quad (7)$$

while

$$\frac{\sum_{i=1}^n \mathbb{E}[\theta|\theta_i]}{n} - \theta_0 = \frac{\sum_{i=1}^n \left( \frac{w_0}{w_0 + w_1} \theta_0 + \frac{w_1}{w_0 + w_1} \theta_i \right)}{n} - \theta_0 = \frac{w_1}{w_0 + w_1} \left( \frac{\sum_{i=1}^n \theta_i}{n} - \theta_0 \right). \quad (8)$$

It is immediate from (7) and (8) that for any  $n > 1$  and any vector of signal realizations, when one compares the average of the individual posterior expectations with the posterior expectation given the average signal, both shift in the same direction relative to the prior mean, but the latter does so by a larger magnitude. It is this property that underlies the incentive to overreact in an

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<sup>32</sup>The points made below hold even when this is not the case, but this simplification makes the argument transparent.

unbiased strategy profile ([Proposition 1](#)), and hence the logic of anti-pandering applies here.<sup>33,34</sup> The following generalization of [Proposition 2](#) can be verified: there is always an overreaction equilibrium in which both candidates play  $y(\theta_i) = \frac{2w_1}{w_0+2w_1}\theta_i + \frac{w_0}{w_0+2w_1}\theta_0$ , with the voter being indifferent between them after observing any pair of on-path platforms.<sup>35</sup> Moreover, these arguments suggest that the “winner’s curse” intuition underlying [Proposition 5](#) — if both candidates use unbiased strategies, winning indicates that one received the more extreme signal — holds more generally and hence so should the conclusion that benevolent candidates would optimally pander.

Finally, and arguably most importantly, our main result identifying lack of welfare benefit (and even welfare loss) from competition — [Proposition 4](#) — holds for a very general set of statistical structures. An inspection of the [Proposition’s proof](#) shows that the only juncture at which the Normal-Normal structure plays any role is to ensure that if a candidate  $i$ ’s strategy is informative, then the distribution of  $i$ ’s platforms from the point of view of his opponent,  $-i$ , is not linear in  $\theta_{-i}$ . Plainly, this is a property that typically holds in any information structure in which  $\theta_A$  and  $\theta_B$  are imperfectly correlated with each other through the true state  $\theta$ . As long as this property is satisfied, [Proposition 4](#) would hold regardless of whether and how candidates wish to deviate from the unbiased strategy profile (and, as mentioned in [fn. 22](#), even if the voter could randomize arbitrarily when indifferent between candidates). For example, the result applies to the models of [Heidhues and Lagerlof \(2003\)](#) and [Loertscher \(2012\)](#), thereby generalizing some of those authors observations.

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<sup>33</sup>Note that because the prior density need not be symmetric any longer around the mean (unlike with a Normal prior) and signals may be bounded (unlike with Normally distributed signals), the appropriate definitions of overreaction and pandering have to be broadened from earlier. We now say that a strategy  $y_i(\cdot)$  displays pandering if it is informative, and for all  $\theta_i$ ,  $|y_i(\theta_i) - \mathbb{E}[\theta]| \leq |\mathbb{E}[\theta|\theta_i] - \mathbb{E}[\theta]|$  with strict inequality for some  $\theta_i$ . Analogously,  $y_i(\cdot)$  has overreaction if it is informative, and for all  $\theta_i$ ,  $|y_i(\theta_i) - \mathbb{E}[\theta]| \geq |\mathbb{E}[\theta|\theta_i] - \mathbb{E}[\theta]|$  with strict inequality for some  $\theta_i$ .

<sup>34</sup>The focus on posterior expectations of the state is, of course, because the voter has a quadratic loss function. While this also can be generalized to a class of symmetric loss functions, see [Sobel \(2006\)](#) for some discussion of how asymmetric loss functions would affect the conclusions.

<sup>35</sup>If any off-path platforms exist, suitable reasonable beliefs for the voter can be used to support the candidates’ equilibrium behavior.

## 5 Conclusion

This paper has studied Downsian electoral competition between two candidates who have socially-valuable private information about some policy-relevant state. A candidate's platform is now a signal about his private information. Contrary to common intuitions about pandering to the electorate's prior belief, we find that office-motivated candidates may have incentives to overreact to their information, i.e. to anti-pander. While information revelation is still possible, it involves policy distortions. The essentially unique equilibrium outcome that maximizes voter welfare involves "un-biased dictatorship", in which one candidate always wins the election and chooses a platform that is socially optimal based on his information alone; any equilibrium in which both candidates win with positive ex-ante probability is strictly worse in terms of voter welfare. In this sense, competition between office-motivated candidates harms the electorate. These conclusions are robust to small degrees of policy motivation so long as the candidates' policy preferences are not too dissimilar from the voter's. From a normative perspective, we also find that an appropriate degree of pandering by candidates would be beneficial in the sense of improving voter welfare within the Downsian institution; while this is incompatible with office-motivated candidates, it would be an equilibrium if candidates were benevolent.

As in most formal models of spatial electoral competition, we have restricted attention to two candidates and assumed that their information is exogenously given. Relaxing both these assumptions are interesting topics for future research.



## A Proofs for Section 3

*Proof of Proposition 1.* Assume both candidates use the unbiased strategy, i.e.  $y_i(\theta_i) = \frac{\beta}{\alpha+\beta}\theta_i$ . Since this strategy is fully revealing, the voter correctly infers  $\theta_A, \theta_B$  for all signal realizations. The voter's expected utility from a platform  $y$  given signal realizations  $\theta_A$  and  $\theta_B$  has the standard mean-variance decomposition:

$$\begin{aligned}\mathbb{E}[U(y, \theta) | \theta_A, \theta_B] &= -\mathbb{E}[(y - \theta)^2 | \theta_A, \theta_B] \\ &= -[y^2 + \mathbb{E}(\theta^2 | \theta_A, \theta_B) - 2y\mathbb{E}(\theta | \theta_A, \theta_B)] \\ &= -[y^2 + \mathbb{E}(\theta | \theta_A, \theta_B)^2 - 2y\mathbb{E}(\theta | \theta_A, \theta_B)] - \mathbb{E}(\theta^2 | \theta_A, \theta_B) + \mathbb{E}(\theta | \theta_A, \theta_B)^2 \\ &= -[y - \mathbb{E}(\theta | \theta_A, \theta_B)]^2 - \text{Var}(\theta | \theta_A, \theta_B).\end{aligned}$$

This pins down the voter's strategy; in particular, the voter must elect candidate  $i$  rather than  $j$  if  $y_i$  is closer to  $\mathbb{E}[\theta | \theta_A, \theta_B]$  than is  $y_j$ .

We now argue that for any  $\theta_A$ , candidate  $A$  can profitably deviate from the unbiased strategy prescription. To show this, note that against any realization of  $\theta_B$ ,  $A$  wins if

$$(y_B(\theta_B) - \mathbb{E}[\theta | \theta_B, \theta_A])^2 > (y_A(\theta_A) - \mathbb{E}[\theta | \theta_B, \theta_A])^2.$$

Substituting from the formula for the unbiased strategy and from (2), this is equivalent to

$$\left(\frac{\beta}{\alpha+\beta}\theta_B - \frac{\beta}{\alpha+2\beta}(\theta_A + \theta_B)\right)^2 > \left(\frac{\beta}{\alpha+\beta}\theta_A - \frac{\beta}{\alpha+2\beta}(\theta_A + \theta_B)\right)^2,$$

or after algebraic simplification,

$$2\beta(\theta_A^2 - \theta_B^2) > \theta_B^2 - \theta_A^2.$$

Clearly, for any  $\theta_B$ , the above inequality holds when  $|\theta_A|$  is sufficiently large. Hence, for any  $\theta_A$ , candidate  $A$  strictly increases his win probability by mimicking a sufficiently extreme type.  $\square$

The following Lemma will be used in the proofs of Proposition 2 and Proposition 3.

**Lemma A.1.** *Pick any equilibrium in which candidate  $i$  is always elected, plays a pure strategy  $y_i(\cdot)$  that is a continuous function, fully revealing, and has range  $[y_i(\cdot)] = \mathbb{R}$ . Then, for any on-path platform  $y$  of candidate  $-i$ , it must hold that  $\mathbb{E}[\theta | y_i = y_{-i} = y] = y$ .*

*Proof.* Suppose, to contradiction, that  $\mathbb{E}[\theta | y_i = y_{-i} = y] > y$  for some  $y \in \text{range}[y_{-i}(\cdot)]$ ; the case of reverse inequality is analogous. Since  $y_i(\theta_i)$  is continuous and fully revealing,  $\mathbb{E}[\theta | y_i = y - \varepsilon, y_{-i} = y]$  is continuous in  $\varepsilon$ . Thus, for small enough  $\varepsilon > 0$ ,  $\mathbb{E}[\theta | y_i = y - \varepsilon, y_{-i} = y] > y$ . It follows that for small enough  $\varepsilon > 0$ , the voter must elect candidate  $-i$  upon seeing  $y_i = y - \varepsilon$  and  $y_{-i} = y$ . This contradicts the hypothesis that  $i$  is always elected.  $\square$

*Proof of Proposition 2.* Since existence was verified in the text, it remains to prove the uniqueness claim. We prove a stronger claim: any competitive equilibrium in which for each candidate  $i$  there is some  $\theta_i$  such that  $i$ 's strategy is locally pure, revealing, and continuous at  $\theta_i$  must be such that for some  $i \in \{A, B\}$  and  $c \in \mathbb{R}$ :

$$\begin{aligned} y_i(\theta_i) &= \frac{2\beta}{\alpha + 2\beta} \theta_i + c, \\ y_{-i}(\theta_{-i}) &= \frac{2\beta}{\alpha + 2\beta} \theta_{-i} - c. \end{aligned}$$

Note that this is stronger than the uniqueness claim of Proposition 2 because each candidate wins with ex-ante probability 1/2 in any symmetric equilibrium, hence a symmetric equilibrium is competitive. It is straightforward to verify that given the above strategies with any  $c$ , the voter is indifferent between the candidates after observing any pair of platforms (so elects both candidates with equal probability) and hence these strategies constitute an equilibrium.

Accordingly, fix a competitive equilibrium such that each candidate  $i$ 's strategy is locally continuous, revealing, and pure in some neighborhood of some point,  $\theta_i$ ; it is then well-defined to write  $y_i(\cdot)$  in the neighborhood. It also follows that for each  $i$  there is a non-empty, open, and convex set  $Y_i \subseteq \text{range}[y_i(\cdot)]$  such that the set of platforms in  $Y_i$  has positive probability under  $y_i(\cdot)$  and  $y_i(\cdot)$  is invertible over  $Y_i$ . Hence, for any  $y_i \in Y_i$ ,  $\theta_i(y_i) := y_i^{-1}(y_i)$  is well defined. Since the equilibrium is informative (by local revelation) and competitive, it follows from the argument used in proving Proposition 4 that the voter randomizes 50-50 for all on-path platform pairs. This implies that for any  $y'_A \in Y_A$  and  $y'_B \in Y_B$ , we must have  $\mathbb{E}[\theta|y'_A, y'_B] = \frac{y'_A + y'_B}{2}$ , which implies  $\frac{\beta}{\alpha + 2\beta}(\theta_A(y'_A) + \theta_B(y'_B)) = \frac{y'_A + y'_B}{2}$ , or equivalently

$$\theta_B(y'_B) = \frac{\alpha + 2\beta}{2\beta} (y'_A + y'_B) - \theta_A(y'_A). \quad (\text{A.1})$$

Now observe that since each  $Y_i$  is an open set, given any  $y_A \in Y_A$  and  $y_B \in Y_B$ , the same argument can also be made for platforms  $y_A + \varepsilon$  and  $y_B - \varepsilon$  for all  $\varepsilon$  that are small enough in absolute value. Hence,

$$\theta_B(y_B - \varepsilon) = \frac{\alpha + 2\beta}{2\beta} (y_A + y_B) - \theta_A(y_A + \varepsilon). \quad (\text{A.2})$$

Substituting into (A.2) from (A.1) with  $y'_B = y_B - \varepsilon$  and  $y'_A = y_A$  yields

$$\frac{\alpha + 2\beta}{2\beta} (y_A + y_B - \varepsilon) - \theta_A(y_A) = \frac{\alpha + 2\beta}{2\beta} (y_A + y_B) - \theta_A(y_A + \varepsilon),$$

or equivalently,

$$\theta_A(y_A + \varepsilon) = \frac{\alpha + 2\beta}{2\beta} \varepsilon + \theta_A(y_A). \quad (\text{A.3})$$

Since  $y_A$  and  $\varepsilon$  were arbitrary (so long as  $y_A \in Y_A$  and  $|\varepsilon|$  is small), the equality in (A.3) requires that for some constant  $c_A \in \mathbb{R}$ ,  $\theta_A(y_A) = \frac{\alpha+2\beta}{2\beta}y_A + c_A$  for all  $y_A \in Y_A$ , or equivalently  $y_A(\theta_A) = \frac{2\beta}{\alpha+2\beta}\theta_A + c_A$ . A symmetric argument also establishes the analog for  $y_B(\theta_B)$ , with some constant  $c_B$ . But then, to satisfy (A.1), it must be that  $c_B = -c_A$ . Finally, the two strategies must be pure and linear on the entire domain, because otherwise, given the linearity on a subset of the domain, there will be a positive-probability set of on-path platform pairs, say  $(y_A, y_B)$ , for which  $\mathbb{E}[\theta|y_A, y_B] \neq \frac{y_A+y_B}{2}$ , contradicting the voter randomizing between candidates for such platform pairs.  $\square$

*Proof of Proposition 3.* This is a special case of the proof of Proposition 7, with  $b_A = b_B = 0$ .  $\square$

The following Lemma is used in the proof of Proposition 4. To state it, we need some notation. Given any equilibrium (which may have mixing by candidates), let  $\Pi_i(y_i; \theta_i)$  denote the expected utility (i.e. win probability) for candidate  $i$  when his type is  $\theta_i$  and he plays platform  $y_i$ , and let  $Y_i$  denote the set of platforms that  $i$  plays with strictly positive ex-ante probability. Given any equilibrium, when we refer to “for almost all on-path platforms”, we mean for all but a set of platforms that have ex-ante probability zero with respect to the prior over types and the equilibrium strategies. Similarly for statements about generic platforms.

**Lemma A.2.** *Given any equilibrium and any  $i$ , for almost all on-path platforms,  $y_i, y'_i$ , and almost all types  $\theta_i, \theta'_i$ ,*

$$\Pi_i(y_i; \theta_i) = \Pi_i(y'_i; \theta'_i).$$

*Proof.* Fix any equilibrium. Given the voter’s strategy,  $p(y_A, y_B)$ , the induced game between the two candidates is a constant-sum Bayesian game. Any equilibrium of this Bayesian game between the candidates is clearly a correlated equilibrium of a complete-information constant-sum game between the two candidates where each chooses an action  $y_i \in \mathbb{R}$  and for any profile  $(y_A, y_B)$ , the payoff to candidate  $A$  is  $p(y_A, y_B)$  while the payoff to candidate  $B$  is  $1 - p(y_A, y_B)$ . The Lemma follows from a general fact about constant-sum games that is stated and proved as Proposition C.1 in Appendix C.  $\square$

*Proof of Proposition 4.* Any uninformative equilibrium obviously provides the voter a strictly lower welfare than the unbiased dictatorship equilibrium. Therefore, it suffices to show that in any informative equilibrium,  $p(y_A, y_B)$  is constant over almost all on-path platforms, because of the argument given in the text in the paragraph following Proposition 4. So fix any equilibrium where, without loss of generality, candidate  $B$  is playing an informative strategy. We will show that for a generic platform of candidate  $A$ ,  $A$ ’s winning probability is almost-everywhere constant over  $B$ ’s platforms. Pick an arbitrary *finite* partition of the range of player  $B$ ’s on-path platforms,  $\{Y_B^1, \dots, Y_B^m\}$ , where each  $Y_B^j$  is a convex set. Without loss, we may take  $m > 1$  since  $B$ ’s strategy is informative.

For a generic on-path platform of player  $A$ ,  $\bar{y}_A$ , [Lemma A.2](#) implies that there is some  $v_A^*$  such that

$$v_A^* = \Pi_A(\bar{y}_A; \theta_A) = \Pi_A(\bar{y}_A; \theta'_A) \quad \text{for almost all } \theta_A, \theta'_A.$$

Let  $q(Y_B^j | \theta_A)$  be the probability that  $B$  plays a platform in the set  $Y_B^j$  given his possibly-mixed strategy  $\sigma_B(\cdot)$  and that his type is distributed according to the conditional distribution given  $\theta_A$ , i.e.  $\theta_B | \theta_A \sim \mathcal{N}\left(\frac{\beta_A}{\alpha + \beta_A} \theta_i, \frac{\beta_A}{\alpha + \beta_A} + \frac{1}{\beta_B}\right)$ . Let  $p(\bar{y}_A | Y_B^j; \theta_A)$  be the probability with which  $A$  of type  $\theta_A$  expects to win when he chooses platform  $y_A$  given that the opponent's platform falls in the set  $Y_B$ ; notice that because  $p(\cdot, \cdot)$  is locally constant (as our restriction is to equilibria where  $p(\bar{y}_A, \cdot)$  has only at most a countable number of discontinuities), the dependence on  $\theta_A$  can be dropped if each  $Y_B^j$  has been chosen as a sufficiently small interval, because then the distribution of  $B$ 's platforms within  $Y_B^j$  is irrelevant. Therefore, with the understanding that each  $Y_B^j$  is a small enough interval, we write  $p(\bar{y}_A | Y_B^j)$ .

Therefore, for any generic  $m$  types of player  $A$ ,  $(\theta_A^1, \dots, \theta_A^m)$ , we have

$$\begin{pmatrix} q(Y_B^1 | \theta_A^1) & \cdots & q(Y_B^m | \theta_A^1) \\ \vdots & & \vdots \\ q(Y_B^1 | \theta_A^m) & \cdots & q(Y_B^m | \theta_A^m) \end{pmatrix} \begin{pmatrix} p(\bar{y}_A | Y_B^1) \\ \vdots \\ p(\bar{y}_A | Y_B^m) \end{pmatrix} = \begin{pmatrix} v_A^* \\ \vdots \\ v_A^* \end{pmatrix}.$$

The unknowns above are  $p(\bar{y}_A | Y_B^j)$ ; clearly one solution is for each  $p(\bar{y}_A, Y_B^j) = v_A^*$  (which requires  $v_A^* \in \{0, 1/2, 1\}$ ). If we prove that this is the unique solution for some generic choice of  $(\theta_A^1, \dots, \theta_A^m)$ , we are done, because  $\bar{y}_A$  was a generic platform for  $A$  and the partition  $\{Y_B^1, \dots, Y_B^m\}$  was arbitrary (subject to each  $Y_B^j$  being a small enough interval). The Rouché-Capelli Theorem implies that it suffices to show that for some choice of  $(\theta_A^1, \dots, \theta_A^m)$ , the coefficient matrix of  $q(\cdot | \cdot)$  above has non-zero determinant. Suppose that for some selection of distinct types  $(\theta_A^1, \dots, \theta_A^m)$ , the coefficient matrix has zero determinant. Since  $q(\cdot | \theta_A^j)$  changes non-linearly in  $\theta_A^j$  (because  $B$ 's strategy is informative and  $\theta_B | \theta_A^j$  is normally distributed), it follows that the determinant cannot remain zero for all perturbations of  $(\theta_A^1, \dots, \theta_A^m)$ .  $\square$

*Proof of [Proposition 5](#).* For the first part of the proposition, it is routine to verify that if candidates were to use unbiased strategies and the voter best responded accordingly, then candidate  $i$  wins when  $|y_i| > |y_{-i}|$ , or equivalently, when  $|\theta_i| > |\theta_{-i}|$ . (This is also proved below under the more general condition [\(A.4\)](#).) It can then be verified — as also shown below — that optimality for a benevolent candidate  $i$  requires  $y_i(\theta_i) = \mathbb{E}[\theta | \theta_i, |\theta_i| > |\theta_{-i}|]$ . As explained in [fn. 23](#), this is an expectation of a truncated normal distribution whose closed-form expression shows that if  $\theta_i > 0$  then  $\mathbb{E}[\theta | \theta_i, -\theta_i < \theta_{-i} < \theta_i] \in (0, \mathbb{E}[\theta | \theta_i])$ , whereas if  $\theta_i < 0$  then  $\mathbb{E}[\theta | \theta_i, \theta_i < \theta_{-i} < -\theta_i] \in (0, \mathbb{E}[\theta | \theta_i])$ . Therefore, a benevolent candidate would profitably deviate by pandering.

For the second part, we first show that the voter's best response to both candidates playing [\(4\)](#)

is to elect the candidate with the more extreme platform. One can check from (4) that for any  $\theta_i$ ,

$$0 < y'(\theta_i) < \frac{2\beta}{\alpha + 2\beta} \quad \text{and} \quad y(\theta_i) = -y(-\theta_i), \quad (\text{A.4})$$

although we omit the tedious calculation.<sup>36</sup> Now assume without loss that the voter observes platforms  $y_i \geq y_{-i}$ . Since the strategy (4) is fully revealing and has range  $\mathbb{R}$ , the voter elects  $i$  with probability one if and only if  $\frac{y_i + y_{-i}}{2} \leq \frac{2\beta}{\alpha + 2\beta} \left( \frac{y^{-1}(y_i) + y^{-1}(y_{-i})}{2} \right)$ , or equivalently if and only if

$$y_i - \frac{2\beta}{\alpha + 2\beta} y^{-1}(y_i) < - \left( y_{-i} - \frac{2\beta}{\alpha + 2\beta} y^{-1}(y_{-i}) \right). \quad (\text{A.5})$$

It follows from (A.4) and (A.5) that given  $y_i \geq y_{-i}$ ,  $i$  wins with probability one if and only if  $y_i > 0$  and  $|y_{-i}| < y_i$ . Consequently, the voter's best response is to elect candidate  $i$  whenever  $|y_i| > |y_{-i}|$ . Combined with (A.5) and the second condition in (A.4), this implies that in equilibrium,  $i$  wins when  $|\theta_i| > |\theta_{-i}|$ .

It remains to verify that (4) is a best response for a benevolent candidate  $i$  when the opponent uses (4) and the voter elects the candidate with the more extreme platform. Since (4) is bijective, we can formulate the problem for candidate  $i$  with type  $\theta_i$  as picking a type  $\theta'_i$  to “report” by playing  $y(\theta'_i)$ . Letting  $f(\cdot|\theta_i)$  denote the density of  $\theta_{-i}$  given  $\theta_i$ ,<sup>37</sup> the other players' strategies imply that the optimal type  $\theta'_i$  for  $\theta_i$  to “report” is the solution to

$$\begin{aligned} \min_{\theta'_i} & \left[ \int_{-\infty}^{-|\theta'_i|} (y(\theta_{-i}) - \mathbb{E}[\theta|\theta_i, \theta_{-i}])^2 f(\theta_{-i}|\theta_i) d\theta_{-i} + \int_{|\theta'_i|}^{\infty} (y(\theta_{-i}) - \mathbb{E}[\theta|\theta_i, \theta_{-i}])^2 f(\theta_{-i}|\theta_i) d\theta_{-i} \right. \\ & \left. + \int_{-|\theta'_i|}^{|\theta'_i|} (y(\theta'_i) - \mathbb{E}[\theta|\theta_i, \theta_{-i}])^2 f(\theta_{-i}|\theta_i) d\theta_{-i} \right], \end{aligned} \quad (\text{A.6})$$

where we have used a mean-variance decomposition as in the [proof of Proposition 1](#). Differentiating (A.6) with respect to  $\theta'_i$  and then simplifying using the fact that  $y(\theta'_i) = -y(-\theta'_i)$  yields the following first-order condition:

$$0 = -4f(-\theta'_i|\theta_i)\mathbb{E}[\theta|\theta_i, \theta_{-i} = -\theta'_i]y(|\theta'_i|) + 2y'(\theta'_i) \int_{-|\theta'_i|}^{|\theta'_i|} (y(\theta'_i) - \mathbb{E}[\theta|\theta_i, \theta_{-i}]) f(\theta_{-i}|\theta_i) d\theta_{-i}. \quad (\text{A.7})$$

Since  $y(\theta_i) = \mathbb{E}[\theta|\theta_i, |\theta_i| > |\theta_{-i}|]$  and  $\mathbb{E}[\theta|\theta_i, \theta_{-i} = -\theta_i] = 0$ , it follows that  $\theta'_i = \theta_i$  solves (A.7). One can check that the second-order condition is also satisfied, hence it is indeed optimal for each type  $\theta_i$  to report  $\theta_i$ , i.e. to play  $y(\theta_i)$ .  $\square$

*Proof of Proposition 6.* We will show that both candidates playing (4) maximizes the voter's ex-ante

<sup>36</sup>A proof is available on request.

<sup>37</sup>This is a normal distribution with mean  $\frac{\beta}{\alpha+\beta}\theta_i$  and variance  $\frac{\alpha+2\beta}{(\alpha+\beta)\beta}$ .

utility subject to the “win-area” requirement that each candidate  $i$  wins when  $|\theta_i| > |\theta_{-i}|$ . This is sufficient to prove the proposition because Part 2 of [Proposition 5](#) has already established that (i) the voter’s best response to both candidates using (4) induces the required “win area”, and (ii) it is a best response for each candidate to play (4) given the voter’s strategy and the other candidate’s play of (4).

By the law of iterated expectations, the voter’s ex-ante utility can be expressed as

$$\begin{aligned} \mathbb{E}[U] = -\mathbb{E} \left[ (y - \theta)^2 \right] &= -\mathbb{E} \left[ \mathbb{E} \left[ (y - \theta)^2 \mid \theta_A, \theta_B \right] \right] = -\mathbb{E} \left[ \left( y - \frac{\beta(\theta_A + \theta_B)}{\alpha + 2\beta} \right)^2 \right] - \frac{1}{\alpha + 2\beta} \\ &= -\Pr(A \text{ wins}) \mathbb{E} \left[ \left( y_A - \frac{\beta(\theta_A + \theta_B)}{\alpha + 2\beta} \right)^2 \mid A \text{ wins} \right] \\ &\quad - \Pr(B \text{ wins}) \mathbb{E} \left[ \left( y_B - \frac{\beta(\theta_A + \theta_B)}{\alpha + 2\beta} \right)^2 \mid B \text{ wins} \right] - \frac{1}{\alpha + 2\beta}. \end{aligned} \quad (\text{A.8})$$

It is convenient to define  $h_i(\theta_i) := \mathbb{E}[\theta_{-i} \mid \theta_i, i \text{ wins}]$ . Using iterated expectations again and a mean-variance decomposition as in the [proof of Proposition 1](#), it also holds that for any  $i \in \{A, B\}$ ,

$$\begin{aligned} \mathbb{E} \left[ \left( y_i - \frac{\beta(\theta_A + \theta_B)}{\alpha + 2\beta} \right)^2 \mid i \text{ wins} \right] &= \mathbb{E} \left[ \mathbb{E} \left[ \left( y_i - \frac{\beta(\theta_A + \theta_B)}{\alpha + 2\beta} \right)^2 \mid \theta_i, i \text{ wins} \right] \mid i \text{ wins} \right] \\ &= \mathbb{E} \left[ \left( y_i - \frac{\beta(\theta_i + h(\theta_i))}{\alpha + 2\beta} \right)^2 \mid i \text{ wins} \right] \\ &\quad + \left( \frac{\beta}{\alpha + 2\beta} \right)^2 \mathbb{E} \left[ \text{Var} [\theta_{-i} \mid \theta_i, i \text{ wins}] \mid i \text{ wins} \right]. \end{aligned} \quad (\text{A.9})$$

(A.8) and (A.9) imply

$$\mathbb{E}[U] = - \left( \frac{\beta}{\alpha + 2\beta} \right)^2 L_V - L_E - \frac{1}{\alpha + 2\beta}, \quad (\text{A.10})$$

where

$$L_V := \sum_{i=A,B} \Pr(i \text{ wins}) \mathbb{E} \left[ \text{Var} [\theta_{-i} \mid \theta_i, i \text{ wins}] \mid i \text{ wins} \right], \quad (\text{A.11})$$

$$L_E := \sum_{i=A,B} \Pr(i \text{ wins}) \mathbb{E} \left[ \left( y_i(\theta_i) - \frac{\beta(\theta_i + h(\theta_i))}{\alpha + 2\beta} \right)^2 \mid i \text{ wins} \right]. \quad (\text{A.12})$$

Our problem is to maximize (A.10) subject to  $i$  winning when  $|\theta_i| > |\theta_{-i}|$ . Since (A.11) does not

depend on platforms while (A.12) is bounded below by 0, a solution must satisfy for each  $i$ :

$$y_i(\theta_i) = \frac{\beta(\theta_i + h(\theta_i))}{\alpha + 2\beta} = \mathbb{E}[\theta | \theta_i, i \text{ wins}].$$

Since the constraint is that  $i$  wins when  $|\theta_i| > |\theta_{-i}|$ , it follows immediately that the solution is for each candidate to use the strategy (4).  $\square$

## B Proofs for Section 4

*Proof of Proposition 7.* Since the equilibrium was verified in the main text, it remains only to prove uniqueness. Fix any fully revealing unbiased dictatorship equilibrium in which  $i$  always wins. For any on-path platform of candidate  $-i$ , say  $y$ , let  $\theta_{-i}(y)$  denote the unique type that uses platform  $y$ . Note that Lemma A.1 holds just as well when candidates have mixed motivations. Thus, for any on-path platform  $y$  of candidate  $-i$ , we must have  $\mathbb{E}[\theta | y_i = y_{-i} = y] = \frac{\beta}{\alpha + 2\beta} \left( \frac{\alpha + \beta}{\beta} (y - b_i) + \theta_{-i}(y) \right) = y$ . Rearranging and simplifying yields  $\theta_{-i}(y) = y + \frac{\alpha + \beta}{\beta} b_i$ . Since this is true for any on-path platform of  $-i$ , candidate  $-i$  must be using the pure strategy  $y_{-i}(\theta_{-i}) = \theta_{-i} - \frac{\alpha + \beta}{\beta} b_i$ .  $\square$

We now state and prove a sequence of lemmas that are needed to prove Proposition 8. We begin with some notation. Recall that  $\Sigma^\varepsilon(\boldsymbol{\rho}, \mathbf{b})$  is the set of equilibria where each candidate wins with ex-ante probability at least  $\varepsilon$ . Define

$$\Sigma^*(\boldsymbol{\rho}, \mathbf{b}) := \{\sigma \in \Sigma^0(\boldsymbol{\rho}, \mathbf{b}) : U_V(\sigma) = U_V^0(\boldsymbol{\rho}, \mathbf{b})\}$$

as the set of voter-welfare-maximizing equilibria given  $(\boldsymbol{\rho}, \mathbf{b})$ .<sup>38</sup> Say that a sequence of strategy profiles  $\sigma^n \rightarrow \sigma$  if: (1) for each  $i$  and  $\theta_i$ ,  $y_i^n(\theta_i) \rightarrow y_i(\theta_i)$ ; and (2) for each pair  $(y_A, y_B) \in \mathbb{R}^2$ ,  $v^n(y_A, y_B) \rightarrow v(y_A, y_B)$ .<sup>39</sup> In other words, convergence of strategies is point-wise. Despite using point-wise convergence, observe that because the ex-ante probability of  $\{\theta_i : \theta_i \notin [-k, k]\}$  can be made arbitrarily small by choosing  $k > 0$  arbitrarily large, it follows that if  $\sigma^n \rightarrow \sigma$  then  $U_V(\sigma^n) \rightarrow U_V(\sigma)$ .

**Lemma B.1.** *For any  $(\boldsymbol{\rho}, \mathbf{b})$ , there is an equilibrium where both candidates play  $y_i(\cdot) = 0$ .*

*Proof.* Immediate.  $\square$

<sup>38</sup> In what follows, we will proceed as if  $\Sigma^*(\boldsymbol{\rho}, \mathbf{b})$  is non-empty for all  $(\boldsymbol{\rho}, \mathbf{b})$ . If this is not the case, one can proceed almost identically, just by defining for any  $\varepsilon > 0$ ,  $\Sigma_\varepsilon^*(\boldsymbol{\rho}, \mathbf{b}) := \{\sigma \in \Sigma^0(\boldsymbol{\rho}, \mathbf{b}) : U_V(\sigma) \geq U_V^*(\boldsymbol{\rho}, \mathbf{b}) - \varepsilon\}$ , and then applying the subsequent arguments for a sequence of  $\varepsilon \rightarrow 0$ .

<sup>39</sup> Here,  $y_i^n$  and  $v^n$  are the components of  $\sigma^n$  and similarly for the limit; a similar convention is used subsequently. Note that this supposes that candidates are playing pure strategies in equilibrium; this is for notational simplicity only, as it can be verified that the arguments go through for equilibria in which candidates may mix, with the notion of convergence being that of the weak topology.

Given a strategy profile  $\sigma$ , let  $W^\sigma(\theta_A, \theta_B)$  denote the set of candidates who win positive probability when the signal realizations are  $\theta_A, \theta_B$ ; note that given  $\sigma$ , this is independent of  $(\boldsymbol{\rho}, \mathbf{b})$ .

**Lemma B.2.** *For any  $(\theta_A, \theta_B)$ , there exists  $k > 0$  such that for any  $(\boldsymbol{\rho}, \mathbf{b})$ , if  $\sigma \in \Sigma^*(\boldsymbol{\rho}, \mathbf{b})$  and  $i \in W^\sigma(\theta_A, \theta_B)$ , then  $|y_i(\theta_i)| < k$ .<sup>40</sup>*

*Proof.* Lemma B.1 implies that for any  $(\boldsymbol{\rho}, \mathbf{b})$ ,  $U_V^0(\boldsymbol{\rho}, \mathbf{b}) > -\text{Var}(\theta) = -1/\alpha$ . Now fix any  $(\theta_A, \theta_B)$  and note that  $\mathbb{E}[\theta|\theta_A, \theta_B]$  does not depend on  $(\boldsymbol{\rho}, \mathbf{b})$ . Hence, for any  $x > 0$ , there exists  $k > 0$  such that for any  $\sigma$ , if  $i \in W^\sigma(\theta_A, \theta_B)$  and  $|y_i(\theta_i)| > k$ , then the voter's utility from  $\sigma$  conditional on the realization of  $(\theta_A, \theta_B)$  is less than  $-x$  (using the fact that the range of  $v(\cdot)$  is  $\{0, 1/2, 1\}$ ). Since the voter's utility conditional on any signal profile is bounded above by zero, it follows that there is some  $x > 0$  such that the voter's utility from  $\sigma$  conditional on  $(\sigma_A, \sigma_B)$  being realized cannot be less than  $-x$  if  $\sigma \in \Sigma^*(\boldsymbol{\rho})$ , no matter what  $(\boldsymbol{\rho}, \mathbf{b})$  is. The desired conclusion now follows.  $\square$

**Lemma B.3.** *Fix any sequence of voter-welfare-maximizing equilibria as  $(\boldsymbol{\rho}, \mathbf{b}) \rightarrow (\mathbf{0}, \mathbf{0})$ ,  $\sigma^{\boldsymbol{\rho}, \mathbf{b}} \in \Sigma^*(\boldsymbol{\rho}, \mathbf{b})$ .*

*Then either:*

- (1) *for some  $i$ ,  $\Pr(i \text{ wins in } \sigma^{\boldsymbol{\rho}, \mathbf{b}}) \rightarrow 0$  as  $(\boldsymbol{\rho}, \mathbf{b}) \rightarrow \mathbf{0}$ ; or*
- (2) *for any  $i$  and  $\theta_i$ , there exists  $k > 0$  such that  $|y_i^{\boldsymbol{\rho}, \mathbf{b}}(\theta_i)| < k$ .*

*Proof.* Suppose the lemma is false. Then, without loss, there is a type  $\bar{\theta}_A$ , a number  $\delta > 0$ , and a (sub)sequence of  $(\boldsymbol{\rho}, \mathbf{b}) \rightarrow (\mathbf{0}, \mathbf{0})$  with equilibria  $\sigma^{\boldsymbol{\rho}, \mathbf{b}} \in \Sigma^*(\boldsymbol{\rho}, \mathbf{b})$  such that: (i) for all  $(\boldsymbol{\rho}, \mathbf{b})$  and  $i \in \{A, B\}$ ,  $\Pr(i \text{ wins in } \sigma^{\boldsymbol{\rho}, \mathbf{b}}) > \delta$ ; and (ii) either  $y_A^{\boldsymbol{\rho}, \mathbf{b}}(\bar{\theta}_A) \rightarrow +\infty$  or  $y_A^{\boldsymbol{\rho}, \mathbf{b}}(\bar{\theta}_A) \rightarrow -\infty$ . Lemma B.2 implies for any  $k > 0$ , there exists  $(\hat{\boldsymbol{\rho}}, \hat{\mathbf{b}}) > \mathbf{0}$  such for any  $(\boldsymbol{\rho}, \mathbf{b}) < (\hat{\boldsymbol{\rho}}, \hat{\mathbf{b}})$  if  $|\theta_B| < k$  then  $A \notin W^{\sigma^{\boldsymbol{\rho}, \mathbf{b}}}(\bar{\theta}_A, \theta_B)$ . (Intuitively, as  $(\boldsymbol{\rho}, \mathbf{b}) \rightarrow \mathbf{0}$ , since  $y_A^{\boldsymbol{\rho}, \mathbf{b}}(\bar{\theta}_A)$  explodes, it must be that type  $\bar{\theta}_A$  wins only against at most a set of  $\theta_B$ 's that have vanishing prior probability.) Since the distribution of  $\theta_B|\bar{\theta}_A$  does not change with  $(\boldsymbol{\rho}, \mathbf{b})$ , it follows that

$$\text{for any } \varepsilon > 0, \text{ if } (\boldsymbol{\rho}, \mathbf{b}) \text{ is small enough then } U_A(\bar{\theta}_A; \sigma^{\boldsymbol{\rho}, \mathbf{b}}) < \varepsilon, \quad (\text{B.1})$$

where  $U_A(\theta_A; \sigma, m)$  is the expected utility for candidate  $A$  when his type is  $\theta_A$  in an equilibrium  $\sigma$  given candidate motivations  $(\boldsymbol{\rho}, \mathbf{b})$ . However, notice that by point (i) above, it must be that there is a bounded set, say  $\Theta_A \subset \mathbb{R}$ , such that for any  $(\boldsymbol{\rho}, \mathbf{b})$ ,  $\Pr(i \text{ wins in } \sigma^{\boldsymbol{\rho}, \mathbf{b}} | \theta_A \in \Theta_A)$  is bounded below by some positive number.<sup>41</sup> But then, type  $\bar{\theta}_A$  can mimic the play of types in  $\Theta_A$  (e.g. mix uniformly over their strategies) to get a strictly positive probability of winning for all  $(\boldsymbol{\rho}, \mathbf{b})$ , which given (B.1) would be a profitable deviation for small enough  $(\boldsymbol{\rho}, \mathbf{b})$ .  $\square$

*Proof of Proposition 8.* Recall that  $\sigma^{UD}(\boldsymbol{\rho}, \mathbf{b})$  is the the unbiased dictatorship equilibrium identified in Proposition 7 where, without loss,  $A$  is the dictator. We prove each part of Proposition 8 in turn.

<sup>40</sup>Recall that we suppress "almost all" qualifiers.

<sup>41</sup>The reason  $\Theta_A$  must be a bounded set is because types in the tails have vanishing prior probability.



1. Let  $\sigma^{\rho, \mathbf{b}} \in \Sigma^*(\rho, \mathbf{b})$  be an arbitrary sequence of voter-welfare-maximizing equilibria as  $(\rho, \mathbf{b}) \rightarrow (\mathbf{0}, \mathbf{0})$ .<sup>42</sup> Applying [Lemma B.3](#) to this sequence, there are two exhaustive cases:
  - (a) If Case 1 of [Lemma B.3](#) holds, then it is straightforward to verify that  $U_V(\sigma^{\rho, \mathbf{b}}) \rightarrow U_V^0(\mathbf{0}, \mathbf{0})$  (intuitively because if  $i$  is winning with ex-ante probability approximately zero, then the voter's welfare cannot be much higher than if  $-i$  is an unbiased dictator).
  - (b) If Case 2 of [Lemma B.3](#) holds, pick any subsequence of  $\sigma^{\rho, \mathbf{b}}$  that converges (at least one exists) and denote the limit by  $\sigma^{\mathbf{0}, \mathbf{0}}$ . Since payoffs are continuous, it can be verified using standard arguments that  $\sigma^{\mathbf{0}, \mathbf{0}}$  is an equilibrium of the limit pure-office-motivation game (intuitively, if any type of a candidate or the voter has a profitable deviation, there would also have been a profitable deviation from  $\sigma^\rho$  for small enough  $\rho > 0$ ; just as one argues in the proof of the Theorem of the Maximum). This implies that  $\lim_{(\rho, \mathbf{b}) \rightarrow (\mathbf{0}, \mathbf{0})} U_V(\sigma^{\rho, \mathbf{b}}) = U_V(\sigma^{\mathbf{0}, \mathbf{0}}) \leq U_V^0(\mathbf{0}, \mathbf{0})$ . Since  $U_V(\sigma^{\rho, \mathbf{b}}) \geq U_V(\sigma^{UD}(\rho, \mathbf{b}))$  for all  $(\rho, \mathbf{b})$ , it follows from [Proposition 7](#) that in fact  $\lim_{(\rho, \mathbf{b}) \rightarrow (\mathbf{0}, \mathbf{0})} U_V(\sigma^{\rho, \mathbf{b}}) = U_V(\sigma^{\mathbf{0}, \mathbf{0}}) = U_V^0(\mathbf{0}, \mathbf{0})$ .
2. Suppose the statement is false. Then, in light of the first part just proved above, there is a sequence of equilibria  $\sigma^{\rho, \mathbf{b}}$  as  $(\rho, \mathbf{b}) \rightarrow (\mathbf{0}, \mathbf{0})$  such that  $U_V(\sigma^{\rho, \mathbf{b}}) \rightarrow U_V^0(\mathbf{0}, \mathbf{0})$  and

$$\text{for all } \varepsilon > 0, \text{ a subsequence } (\rho, \mathbf{b})_\varepsilon \rightarrow (\mathbf{0}, \mathbf{0}) \text{ where } \sigma^{(\rho, \mathbf{b})_\varepsilon} \in \Sigma^\varepsilon(\rho, \mathbf{b}).^{43} \quad (\text{B.2})$$

Applying [Lemma B.3](#), it follows that for any  $\varepsilon > 0$ ,  $i$ , and  $\theta_i$ , there exists  $k > 0$  such that  $|y_i^{(\rho, \mathbf{b})_\varepsilon}(\theta_i)| < k$ . But then, as in the first part above,  $\sigma^{\rho, \mathbf{b}}$  must converge (in subsequence) to some  $\sigma^{\mathbf{0}, \mathbf{0}}$ . Since  $U_V(\sigma^{\rho, \mathbf{b}}) \rightarrow U_V^0(\mathbf{0}, \mathbf{0})$ , it follows that  $\sigma^{\mathbf{0}, \mathbf{0}}$  must have dictatorship. But this implies that for any  $\varepsilon > 0$ , there exists  $\delta > 0$  such that if  $(\rho, \mathbf{b})$  is in a  $\delta$ -neighborhood of  $(\mathbf{0}, \mathbf{0})$ , then  $\sigma^{\rho, \mathbf{b}} \notin \Sigma^\varepsilon(\rho, \mathbf{b})$ , which contradicts [\(B.2\)](#).  $\square$

## C Correlated Equilibria of Two-Player Constant-Sum Games

In this Appendix, we state and prove a key auxiliary result, [Proposition C.1](#) below, that is used in the proof of [Proposition 4](#). As we are not aware of this result being proved elsewhere, we state it in some generality.

A two-player constant-sum game is given by  $(S, u_1, u_2)$  where  $S := S_1 \times S_2$  with each  $S_i$  a topological action (i.e. pure strategy) space for player  $i$ , and each  $u_i : S \rightarrow \mathbb{R}$  is a bounded utility function for player  $i$  such that for  $s \in S$ ,  $u_1(s) = -u_2(s)$ .<sup>44</sup> We write  $\Delta(S_i)$  and  $\Delta(S)$  as the spaces

<sup>42</sup>The same caveat as fn. 38 applies.

<sup>43</sup>Recall that  $\Sigma^\varepsilon(\rho, \mathbf{b})$  is the set of equilibria where each candidate wins with ex-ante probability at least  $\varepsilon$ .

<sup>44</sup>Strictly speaking, this defines a zero-sum game rather than a constant-sum game, but this entails no loss of generality.

of mixed strategies and mixed strategy profiles respectively,<sup>45</sup> and extend payoffs to mixed strategies as usual. For any  $\mu \in \Delta(S)$ , we write  $\mu(\cdot|s_i) \in \Delta(S_{-i})$  as the conditional distribution of  $\mu$  over  $S_{-i}$  given  $s_i$ .

$\mu \in \Delta(S)$  is a **correlated equilibrium** of this game if for any  $i$  and  $s_i \in \text{supp}[\mu]$ ,

$$u_i(s_i, \mu(\cdot|s_i)) = \sup_{s'_i \in S_i} u_i(s'_i, \mu(\cdot|s_i)).$$

The game has a **value** if there exists

$$v_1^* := \max_{\sigma_1} \min_{\sigma_2} u_1(\sigma_1, \sigma_2) = \min_{\sigma_2} \max_{\sigma_1} u_1(\sigma_1, \sigma_2).$$

We say that  $v_1^*$  is player 1's value and that any solution to the above maxmin problem is an **optimal strategy** for player 1. Analogously,  $v_2^* = -v_1^*$  is player 2's value (and solves the analogous version of the above minmax problem).

Throughout the rest of this Appendix, we fix an arbitrary two-player constant-sum game defined above.

**Lemma C.1.** *If  $\mu$  is a correlated equilibrium, then the game has a value, and each player's payoff from  $\mu$  is his value. Moreover, the marginal induced by  $\mu$  for each player is an optimal strategy for that player.*

*Proof.* Let  $v_i = u_i(\mu)$  be player  $i$ 's payoff in the correlated equilibrium; clearly  $v_1 = -v_2$ . Let  $\sigma_i \in \Delta(S_i)$  be the marginal distribution over player  $i$ 's actions induced by  $\mu$ . Since  $\mu$  is a correlated equilibrium, it must be that for any  $s_1 \in S_1$ ,  $u_1(s_1, \sigma_2) \leq v_1$  (otherwise, for some recommendation,  $s_1$  would be a profitable deviation), and hence  $u_2(s_1, \sigma_2) \geq -v_1 = v_2$ . So player 2 has a strategy that guarantees him at least  $v_2$ . By a symmetric argument, player 1 has a strategy that guarantees him at least  $v_1 = -v_2$ . It follows that  $(v_1, v_2)$  is the value of the game; furthermore, each  $\sigma_i$  is an optimal strategy.  $\square$

**Lemma C.2.** *If  $\mu$  is a correlated equilibrium, then for  $\mu$ -a.e.  $s_i$ ,  $u_i(s_i, \mu(\cdot|s_i)) = v_i^*$ .*

*Proof.* By [Lemma C.1](#), the game has a value and each player has an optimal strategy. Since any  $s_i \in \text{supp}[s_i]$  must be a best response against  $\mu(\cdot|s_i)$ , it follows that

$$\text{for any } s_i \in \text{supp}[\mu], u_i(s_i, \mu(\cdot|s_i)) \geq v_i^*. \tag{C.1}$$

But this implies that under  $\mu$ , neither player can have a positive-probability set of actions that all yield him an expected payoff strictly larger than  $v_i^*$ , because then by [\(C.1\)](#) his expected payoff

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<sup>45</sup>More precisely: each  $S_i$  is viewed as a measurable space with its Borel sigma-field and  $\Delta(S_i)$  is the space of Borel probability measures on  $S_i$ . The product space  $S$  is endowed with the product topology.

from  $\mu$  would be strictly larger than  $v_i^*$ , implying that the opponent's payoff from  $\mu$  is strictly lower than  $v_{-i}^*$ , a contradiction.  $\square$

**Lemma C.3.** *If  $\mu$  is a correlated equilibrium, then for  $\mu$ -a.e.  $s_i$ ,  $\mu(\cdot|s_i)$  is an optimal strategy for player  $-i$ .*

*Proof.* Wlog, assume  $i = 1$ . By Lemma C.2,  $u_1(s_1, \mu(\cdot|s_1)) = v_1^*$  for  $\mu$ -a.e.  $s_1$ . Hence, by best responses in a correlated equilibrium, it follows that for  $\mu$ -a.e.  $s_1$ ,

$$v_1^* = \max_{s'_1} u_1(s'_1, \mu(\cdot|s_1)) = -\min_{s'_1} (-u_1(s'_1, \mu(\cdot|s_1))) = -\min_{s'_1} u_2(s'_1, \mu(\cdot|s_1)).$$

Since  $v_1^* = -v_2^*$ , we conclude that for  $\mu$ -a.e.  $s_1$ ,  $v_2^* = \min_{s'_1} u_2(s'_1, \mu(\cdot|s_1))$ , i.e.  $\mu(\cdot|s_1)$  guarantees player 2 a payoff of  $v_2^*$ , hence  $\mu(\cdot|s_1)$  is an optimal strategy for player 2.  $\square$

**Proposition C.1.** *If  $\mu$  is a correlated equilibrium, then for  $\mu$ -a.e.  $s_i$  and  $s'_i$ ,  $u_i(s'_i, \mu(\cdot|s_i)) = v_i^*$  (and hence  $s'_i$  is a best response to  $\mu(\cdot|s_i)$ ).*

*Proof.* Wlog, let  $i = 1$ . Fix any  $s_1$  that is generic w.r.t. the measure  $\mu$ . From Lemma C.3, we have that for any  $s'_1$ ,  $u_1(s'_1, \mu(\cdot|s_1)) \leq v_1^*$ . So suppose that there is a set,  $S'_1$ , such that  $\mu(S'_1) > 0$  and for each  $s'_1 \in S'_1$ ,  $u_1(s'_1, \mu(\cdot|s_1)) < v_1^*$ , or equivalently that  $u_2(s'_1, \mu(\cdot|s_1)) > v_2^*$ . Then, there must be some set  $S'_2$  such that  $\mu(S'_2) > 0$  and  $\mu(S'_1|S'_2) > 0$ . By playing  $\mu(\cdot|s_1)$  whenever  $\mu$  recommends any  $s_2 \in S'_2$ , player 2 has an expected payoff strictly larger than  $v_2^*$  for a positive-probability set of recommendations, a contradiction with Lemma C.2.  $\square$

## D A Beta-Bernoulli Example

This appendix provides an example when the state follows a Beta distribution and each candidate gets a binary signal drawn from a Bernoulli distribution; the feasible set of policies remains  $\mathbb{R}$ . This statistical structure is a member of the Exponential family with conjugate priors discussed in Subsection 4.2 of the main text. Aside from illustrating how the incentives to overreact exist even when the state distribution may not be unimodal and may be skewed, signals are discrete, etc., it also provides a closer comparison with the setting of Heidhues and Lagerlof (2003) and Loertscher (2012) than does our baseline Normal-Normal model.

Assume the prior distribution of  $\theta$  is  $Be(\alpha, \beta)$ , which is the Beta distribution with parameters  $\alpha, \beta > 0$  whose density is given by  $f(\theta) = \frac{\theta^{\alpha-1}(1-\theta)^{\beta-1}}{B(\alpha, \beta)}$ , where  $B(\cdot, \cdot)$  is the Beta function.<sup>46</sup> Thus  $\theta$  has support  $[0, 1]$  and  $\mathbb{E}[\theta] = \frac{\alpha}{\alpha+\beta}$ . For reasons explained later, we assume  $\alpha \neq \beta$ .<sup>47</sup> Each candidate

<sup>46</sup>If  $\alpha$  and  $\beta$  are positive integers then  $B(\alpha, \beta) = \frac{(\alpha-1)!(\beta-1)!}{(\alpha+\beta-1)!}$ .

<sup>47</sup>This rules out a uniform prior, which corresponds to  $\alpha = \beta = 1$ .

$i \in \{A, B\}$  observes a private signal  $\theta_i \in \{0, 1\}$ ; conditional on  $\theta$ , signals are drawn independently from the same Bernoulli distribution with  $\Pr(\theta_i = 1|\theta) = \theta$ . The policy space continues to be  $\mathbb{R}$ .

It is well-known that the posterior distribution of the state given signal 1 is now  $Be(\alpha + 1, \beta)$  (i.e. has density  $f(\theta|\theta_i = 1) = \frac{\theta^\alpha(1-\theta)^{\beta-1}}{B(\alpha+1, \beta)}$ ); similarly the posterior given signal 0 is  $Be(\alpha, \beta + 1)$ . It is also straightforward to check that the posterior distribution of the state given two signals is as follows: if both  $\theta_i = \theta_{-i} = 1$ , it is  $Be(\alpha + 2, \beta)$ ; if  $\theta_i = 0$  and  $\theta_{-i} = 1$ , it is  $Be(\alpha + 1, \beta + 1)$ ; and if  $\theta_i = \theta_{-i} = 0$ , it is  $Be(\alpha, \beta + 2)$ .

It follows that:

$$\begin{aligned}\mathbb{E}[\theta|\theta_i = 1] &= \frac{\alpha + 1}{\alpha + \beta + 1}, \\ \mathbb{E}[\theta|\theta_i = 0] &= \frac{\alpha}{\alpha + \beta + 1}, \\ \mathbb{E}[\theta|\theta_i = \theta_{-i} = 1] &= \frac{\alpha + 2}{\alpha + \beta + 2}, \\ \mathbb{E}[\theta|\theta_i = \theta_{-i} = 0] &= \frac{\alpha}{\alpha + \beta + 2}, \\ \mathbb{E}[\theta|\theta_i = 1, \theta_{-i} = 0] &= \frac{\alpha + 1}{\alpha + \beta + 2}.\end{aligned}$$

The above formulae imply that for any realization  $(\theta_A, \theta_B)$ ,

$$\begin{aligned}\text{sign}(\mathbb{E}[\theta|\theta_A, \theta_B] - \mathbb{E}[\theta]) &= \text{sign}\left(\frac{\mathbb{E}[\theta|\theta_A] + \mathbb{E}[\theta|\theta_B]}{2} - \mathbb{E}[\theta]\right), \\ |\mathbb{E}[\theta|\theta_A, \theta_B] - \mathbb{E}[\theta]| &> \left|\frac{\mathbb{E}[\theta|\theta_A] + \mathbb{E}[\theta|\theta_B]}{2} - \mathbb{E}[\theta]\right|.\end{aligned}\tag{D.1}$$

In other words, both the posterior mean given two signals and the average of the individual posterior means shift in the same direction from the prior mean, but the former does so by a larger amount.

Consequently, if candidates were to play unbiased strategies and the voter best responds accordingly, then whenever  $\theta_A \neq \theta_B$  there is one candidate who wins with probability one: the candidate  $i$  with  $\theta_i = 1$  when  $\beta > \alpha$  and with  $\theta_i = 0$  when  $\beta < \alpha$ .<sup>48</sup> Of course, when  $\theta_A = \theta_B$ , both candidates would choose the same platform and win with equal probability. It is worth highlighting that when  $\theta_A \neq \theta_B$ , it is the candidate with the ex-ante *less* likely signal who wins, because ex-ante  $\Pr(\theta_i = 1) = \mathbb{E}[\theta] = \alpha/(\alpha + \beta)$ . This implies that unbiased strategies cannot form an equilibrium, but not because candidates would deviate when drawing the ex-ante less likely signal; rather, they would deviate when drawing the ex-ante *more* likely signal to the platform corresponding to the ex-ante less likely signal.<sup>49</sup> Notice that this profitable deviation given signal  $\theta_i$  is to a platform  $y_i$

<sup>48</sup>Were  $\alpha = \beta$ , the inequality in (D.1) would hold with equality when  $\theta_A \neq \theta_B$ , and hence the voter would be indifferent between the unbiased platforms in this event and elect both candidates with equal probability.

<sup>49</sup>See [Che et al. \(2011\)](#) for an analog where options that are “unconditionally better-looking” need not be “conditionally better-looking”.

such that  $|y_i - \mathbb{E}[\theta]| > |\mathbb{E}[\theta|\theta_i] - \mathbb{E}[\theta]|$ ; hence, it is a profitable deviation through overreaction rather than pandering (cf. [fn. 33](#) in the main text).

Finally, we observe there is symmetric fully revealing equilibrium with overreaction where both candidates play

$$y(1) = \frac{\alpha + 2}{\alpha + \beta + 2} \quad \text{and} \quad y(0) = \frac{\alpha}{\alpha + \beta + 2}.$$

This strategy displays overreaction because

$$y(0) < \mathbb{E}[\theta|\theta_i = 0] < \mathbb{E}[\theta] < \mathbb{E}[\theta|\theta_i = 1] < y(1).$$

It is readily verified that when both candidates use this strategy,  $\mathbb{E}[\theta|\theta_A, \theta_B] = \frac{y(\theta_A) + y(\theta_B)}{2}$  for all  $(\theta_A, \theta_B)$ , and hence each candidate would win with probability 1/2 for all on-path platform pairs; a variety of off-path beliefs can be used to support the equilibrium. Note that this overreaction equilibrium would exist even were  $\alpha = \beta$ .

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