A Theory of Anti-Pandering

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(Preliminary and Incomplete)

Abstract

We consider a two-period game between an incumbent politician and a voter. In each period, the incumbent faces a choice between a status quo and a risky reform policy. The incumbent can be either competent or incompetent, and the competent incumbent receives a private signal about the reform policy's outcome. The voter can observe the incumbent's action but not its outcome. We show that the equilibria exhibit "anti-pandering" behavior: To signal that she is competent, the incumbent chooses the reform action even when its outlook is not promising. The voter's welfare is nonmonotonic in the amount of electoral benefit: While such anti-pandering behavior prevents an efficient policy choice, it also helps the voter select the competent one. We also analyze the incumbent's ideological bias's effect and extend the model to a cheap-talk setting.

Keywords: Anti-pandering, electoral accountability, experimentation, reform

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1 Introduction

Leaders in political and corporate organizations often face a difficult choice between maintaining a status quo and implementing a risky alternative. Even when the status quo is not the optimal policy, the uncertainty regarding the risky alternative is often too large and takes too long to disappear. Furthermore, under the presence of agency problems in such organizations, the leader's incentive is distorted as she needs to signal her competency by her action. In this paper, we analyze a political agent's choice toward a risky policy with electoral incentives.

President Obama's attempt to push for green energy is a good example of the leader's choice in such environments. As part of his economic stimulus package, Obama aggressively promoted the alternative energy sector, even though there existed much uncertainty regarding the viability of its technology. On May 26, 2010, Obama visited Solyndra, a solar panel manufacturer based on an unconventional design, and said the company was the one "leading the way toward a brighter and more prosperous future."[1] After receiving $535 million of U.S. Department of Energy loan guarantee, Solyndra declares bankruptcy on September 1, 2011, creating the infamous "Solyndra scandal". To this day, however, it is not conclusive whether Obama's "Green New Deal" was a failure.[2]

With the presence of political agency problem, the following questions arise: How is the leader's behavior towards a risky reform policy affected by electoral incentives? Does it lead to over-experimentation or under-experimentation of the reform policy? Is the distortion (if it exists) by the electoral incentives beneficial or detrimental to the voter's welfare? How does the leader's behavior change when she has an ideological bias?

We develop a simple but rich enough framework that captures the electoral incentive problem with a reform policy to answer these questions. An incumbent politician and a voter play a two-period game. In each period, a policy issue is given, and the incumbent chooses whether to

[1] The Mercury News, "President Obama tours Fremont's Solyndra, promotes clean energy", https://www.mercurynews.com/2010/05/26/president-obama-tours-fremonts-solyndra-promotes-clean-energy-2/

[2] Quartz, "Biden could prove the Solyndra scandal wasn't a failure", https://qz.com/1968184/biden-could-prove-the-solyndra-scandal-wasnt-a-failure/

implement a status quo or a risky reform policy. While the outcome of the status quo is commonly known, the reform policy's outcome is unknown, and the prior variance of its outcome is high enough that the status quo is an ex-ante better option. The incumbent can be either high-type or low-type: the high-type incumbent receives a private and imperfect signal about the outcome of the reform; the low type does not receive a signal. The voter cannot observe the realized outcome if the incumbent chooses the reform policy. Therefore, the incumbent's action is the only information available at the time of voting.

In the equilibrium, we find an "anti-pandering" effect: the high-type incumbent has an additional incentive to choose an action that does not align with public consensus. The intuition is rather simple: First, observe that in the absence of an agency problem, the low type (who does not have additional information) chooses the status quo, but the high type chooses the reform policy when he receives a sufficiently good signal. From the voter's perspective, such behavior implies that the incumbent who chooses the reform policy is of high type. Given this, the high-type incumbent who receives a not-so-good signal also chooses the reform as doing so would increase the probability of reelection. However, the low type chooses the status quo as the lack of information implies that the risk from the uncertain reform is higher than electoral benefits. Such behavior of the incumbent gives the voter enough incentive to reelect the incumbent if and only if she chooses the reform policy, which in turn makes the incumbent's behavior optimal.

This anti-pandering behavior yields a nontrivial comparative statics result: The voter's welfare is nonmonotonic in the electoral benefit. While anti-pandering leads to an inefficient over-implementation of the reform policy, it also helps the voter select the high-type incumbent, who will then make a more informed decision in the second period. When the electoral benefit is small, the latter selection effect is stronger than the inefficiency in the first period. As electoral benefit becomes large, however, inefficiency dominates. This result implies that under the incomplete contract, the voter has to surrender efficient implementation to select the candidate better.

We show that except for the one with no electoral distortions (this equilibrium exists only when the incumbent's prior is sufficiently high), all types of equilibria exhibit some form of aforementioned anti-pandering behavior. Especially, we show that the equilibrium is unique as long as the incumbent's prior is not too high. When the electoral benefit is small, the equilibrium described in the previous paragraph uniquely exists. However, as the electoral benefit gets higher than a certain threshold, the low type begins to mimic the high type and chooses the reform policy with positive probability.

One advantage of our model is that it is easy to combine low-type and high-type biases. This provides us with the analytical framework to analyze various political and organizational contexts. We get the anti-pandering equilibrium if the competency difference between incumbent types dominates the bias difference, and the pandering equilibrium vice versa.

When the low type's bias is so strong that low type prefers the action different from the public consensus, the voter wants to screen out the low type. This motivates the voter to reelect the incumbent who chose the public consensus, which leads to the pandering equilibrium. If the biased low type's preferred action is aligned with the voter, the resulting equilibrium is the anti-pandering equilibrium, which nests the no-bias benchmark. Even if the bias is extremely strong, anti-pandering equilibrium arises if the sign of bias is opposite to that of the status quo outcome. It is the direction of bias that determines what type of equilibrium arises, not the absolute size of bias.

Introducing a high type's bias creates a trade-off: while the high type has more precise information than the low type, her preference is not aligned with the voter. We show there exists a cutoff over which the voter prefers the low type to the high type. In this case, the pandering equilibrium emerges due to the high type's incentive to mimic the low type. When the high type's bias is under the cutoff, the original anti-pandering equilibrium emerges.

Finally, we turn to two variations of the model. First, we examine the situation in which both types receive a private signal about the outcome of the reform policy. The two types only differ in that the low type is biased. Thus, this model focuses on the potential conflict of interest between the voter and the incumbent, rather than the potential lack of competency. Whether the resulting equilibrium is pandering or anti-pandering is determined according to the desirability of the status quo, the strength of electoral incentive, and the degree of the incumbent's bias. Here, the low type also distorts her action choice even without introducing mixed strategies. This shows the role of expertise perfectness. There exists a discontinuous difference between no expertise, imperfect expertise, and perfect expertise. Therefore, using the proper model of expertise which reflects the phenomenon of purpose is very important.

Secondly, we turn to the cheap talk setting. The expert now takes the advisory role rather than the office holder. She only recommends the policy, and the voter decides which policy to take. Such extension creates a babbling equilibrium where all experts are pooled at the policy recommendation opposite to the public consensus. This results from separating motivation, which results in no separation. The voter ignores the recommendation and chooses the public consensus. If the resulting equilibrium is informative, then the voter should be obedient to the expert's recommendation. This is because the voter's disobedience resolves the trade-off between utility from policy and electoral incentive that expert faces, which causes the collapse of anti-pandering equilibria. The informative equilibrium happens less compared to the office-holding setting. This shows the difficulty of information transmission through cheap talk even without the conflict of interest between the sender and the receiver.

Related Literature This paper belongs to a rich literature on electoral accountability (See Ashworth (2012) for an excellent survey). The seminal papers by Canes-Wrone et al. (2001) and Maskin and Tirole (2004) show that the agent facing electoral incentives tends to "pander" to the public belief. In this paper, we analyze an environment in which electoral incentives result in a different type of distortion.

The mechanism behind our anti-pandering behavior relates to that of Prat (2005). Prat analyzes the effect of transparency of the agent's action in an agency model and shows that the efficient outcome cannot be equilibrium in the observable action case as the agent has an incentive to separate by choosing different actions. In Prat (2005) such a separating incentives leads to a fully uninformative equilibrium. In contrast, this paper finds such behavior in equilibrium and derives several implications, such as its effect on voters' welfare and the effect of the incumbent's bias.

This paper also relates to the literature on the theory of experimentation under the presence of the agency problem. They typically consider an optimal contracting problem to motivate an agent to conduct an uncertain experiment (Bergemann and Hege, 1998; Manso, 2011; Hörner and Samuelson, 2013). Bowen et al. (2016) considers a dynamic model of experimentation of an incumbent politician and found that an incumbent gradually decreases his experimentation on the reform policy. Hwang (2021) considers an electoral competition model in which each party chooses between a status quo and two reform policies that are ideologically different. While the above papers assume symmetric uncertainty between principal and agent, we consider the effect of hidden expertise on the experiment behavior.

The rest of the paper is organized as follows. Section 2 describes the model. Section 3 analyzes a benchmark case with no electoral incentives. Section 4 characterizes the equilibria and presents comparative statics results. Section 5 analyzes the model in which the incumbent has a bias in her policy preferences. Section 6 discusses the two extensions of the model. All the omitted proofs are relegated to the Appendix.

2 Model

We consider a two-period game between an incumbent politician (she) and a voter (he). In each period, a policy issue is given and the incumbent chooses between a status-quo (s) and a risky reform (r). Let $\theta_a^t \in \mathbb{R}$ be the outcome of action $a \in \{s, r\}$ in period $t \in \{1, 2\}$. We assume that the outcome of the status quo is commonly known. However, the outcome of reform is uncertain: θ_r^t is determined according to a Gaussian distribution with mean m_r^t and precision h_0^t. We assume that the issues in each period are independent.

The incumbent can be either high type (H) or low type (L). Let p be the voter's prior belief that the incumbent is of high type. In each period, before deciding her action, the high-type incumbent receives a private signal σ_H^t about θ_r^t. Assume that σ_H^t is generated by a Gaussian distribution with mean θ_r^t and precision h_1. The low-type incumbent does not receive a signal. The incumbent's type is fixed across two periods.

After the incumbent's action, the voter decides whether to replace the incumbent or replace him with a challenger. Let π be the prior that the challenger is of high type. We assume that the voter only observes the incumbent's action but not its outcome at the time of decision.

The voter's payoff is given as a quadratic cost with zero as the ideal point. Additionally, the incumbent receives monetary payoff upon reelection. Formally, the voter's payoff is given by $-(\theta_a^1)^2 - (\theta_a^2)^2$, with zero as his ideal point in each period. The type-τ incumbent's payoff is $-(\theta_a^1 - \beta_\tau^1)^2 + B - (\theta_a^2 - \beta_\tau^2)^2$ when she is reelected, and $-(\theta_a^1 - \beta_\tau^1)^2 - (\theta_a^2 - \beta_\tau^2)^2$ when she is not reelected. β_τ^t captures the bias of type-τ incumbent for period-t issue.

We assume the following parametric assumptions:

Assumption 1. *For $t = 1, 2$,*
(1) (status quo as an ex-ante better option) $1/h_0^t > (\theta_s^t)^2 - (m_r^t)^2$*,*
(2) (non-trivial choice of the high type) $(\theta_s^t)^2 > \frac{1}{h_0+h_1}$.

Note that without additional information, the voter's expected stage payoff from the reform action is $-(m_r^t)^2 - 1/h_0^t$. Item 1 guarantees that the status quo is a strictly better option for the voter from an ex ante perspective. Item 2 rules out a trivial case in which the high-type incumbent always has a strict incentive to choose the status quo.

The history after the first period $\eta^1 \in \mathcal{H}^1 = \{s, r\} \times \mathbb{R}$ consists of the incumbent's action and its outcome. The high-type incumbent's strategy in each period is written as $\xi_H^1 : \mathbb{R} \to [0, 1]$ and $\xi_H^2 : \mathcal{H}^1 \times \mathbb{R} \to [0, 1]$, where $\xi_H^1(\sigma_H^1)$ and $\xi_H^2(\eta^1, \sigma_H^2)$ is the probability of choosing the reform policy in the first and second period, respectively. Similarly, define the low type's strategy as $\xi_L^1 \in [0, 1]$ and $\xi_L^2 : \mathcal{H}^1 \to [0, 1]$. The voter's strategy is $\alpha : \{s, r\} \to [0, 1]$, where $\alpha(a)$ is the probability that the voter reelects the incumbent after she chooses a. Our equilibrium concept is the perfect Bayesian equilibrium, which we simply call equilibrium hereafter.

3 Benchmark: No Agency

As a benchmark, let us analyze the incumbent's behavior in the first period when there is no agency problem, i.e., the incumbent is always reelected regarless of her action. For simplicity, we assume $\beta_H^t = \beta_L^t = 0$ for all $t = 1, 2$. Since the issue in each period is independent, it suffices to analyze the first-period behavior. Throughout the equilibrium analysis, we mostly focus on the incumbent's behavior at $t = 1$, and thus we omit the superscript t thereafter unless stated otherwise.

It is clear that the low-type incumbent always chooses the status quo, as her belief remains the same as the prior. However, the high-type incumbent updates her belief about θ_r upon receiving the signal σ. The well-known result on Gaussian process implies that her posterior follows a Gaussian distribution with mean μ' and precision h', where

$$\mu' = \frac{h_0 m_r + h_1 \sigma_H}{h_0 + h_1}, \qquad h' = h_0 + h_1. \tag{1}$$

Given this posterior, the high-type incumbent's expected payoff from the reform policy is given by $-\mu'^2 - \frac{1}{h'}$. Recall that choosing the status quo yields $-\theta_s^2$. Therefore, she chooses the reform policy if and only if[3]

$$-\frac{h_0}{h_1} m_r - \Gamma_0 \leq \sigma_H \leq -\frac{h_0}{h_1} m_r + \Gamma_0,$$

where

$$\Gamma_0 = \frac{h_0 + h_1}{h_1} \sqrt{\theta_s^2 - \frac{1}{h_0 + h_1}}, \tag{2}$$

is called the *reform bandwidth* of the high-type incumbent under no agency case.

The following proposition summarizes the above:

Proposition 1. *Suppose that there is no electoral incentive. Then the low-type incumbent always chooses the status quo, and the high-type incumbent chooses the reform policy if and only if*

$$-\frac{h_0}{h_1} m_r - \Gamma_0 < \sigma_H < -\frac{h_0}{h_1} m_r + \Gamma_0,$$

where Γ_0 *is defined in* (2).

Let u_τ be the ex-ante expected stage payoff of the type-τ incumbent with no agency problem, that is,

$$\begin{aligned} u_H =& -\int_{-\infty}^{-\frac{h_0}{h_1} m_r - \Gamma_0} \theta_s^2 dF(\sigma) - \int_{-\frac{h_0}{h_1} m_r - \Gamma_0}^{-\frac{h_0}{h_1} m_r + \Gamma_0} \left(\mu'^2 + \frac{1}{h'} \right) dF(\sigma) - \int_{-\frac{h_0}{h_1} m_r + \Gamma_0}^{\infty} \theta_s^2 dF(\sigma), \\ u_L =& -\theta_s^2, \end{aligned}$$

[3]We assume that the high-type incumbent chooses the reform policy when indifferent; assuming otherwise does not affect our analysis.

where F is the distribution function of the high-type's signal σ.

4 Equilibrium

In this section, we fully characterize the equilibria of the model with no bias ($\beta^t_H = \beta^t_L = 0$ for all $t = 1, 2$). Then we present some comparative statics result regarding the amount of experimentation and the voter's welfare.

First observe that the incumbent's action in the second period is identical to that of no agency case as she does not have any electoral incentives. This implies that, at the time of voting, the voter simply selects the candidate who has more likely to be a high type, i.e. he reelects the incumbent if the posterior belief about the incumbent's type is greater than one for the challenger's ($p > \pi$) and replace her when $p < \pi$. Thus, the only non-trivial analysis is the incumbent's behavior in the first period.

Note that there are two sources which affect the incumbent's incentive to be reelected. The first one is the direct benefit B from reelection. The second source comes from the second-period outcome: In case the incumbent is not reelected, she hands over control of the second-period action to the challenger, whose type is uncertain. To combine the two sources, let B_τ be the *gross* benefit of reelection for the type-τ incumbent. Then

$$B_H = (B + u_H) - (\pi u_H + (1 - \pi)u_L) = B + (1 - \pi)(u_H - u_L) = B + \Delta_H,$$
$$B_L = (B + u_L) - (\pi u_H + (1 - \pi)u_L) = B - \pi(u_H - u_L) = B - \Delta_L.$$

Note that B_τ does not depend on the previous history, so it can be regarded as a constant when we consider the incumbent's incentives in the first period. Also, we assume $B \geq \Delta_L$ to rule out pathological case where the low type does not want to be reelected.

There are several types of equilibria in this model. We first construct the equilibrium of main interest. We then present other equilibria of the model and discuss the uniqueness of equilibrium.

4.1 "Anti-pandering" equilibrium

Here we construct the equilibrium that exhibits the *anti-pandering* behavior of the incumbent in the most clear way. First, observe that given the incumbent's behavior when there is no electoral incentives (Proposition 1), upon observing that the incumbent chooses r, the voter clearly knows that she is of high type and would reelect her.

Suppose for now that the voter reelects the incumbent if and only if she chooses r. Then the reform policy would provide the incumbent an electoral benefit of B_τ. For the high type, this incentive would widen the equilibrium reform bandwidth. To see this, note that now the high-type's expected payoff from choosing the reform policy is $-\mu'^2 - \frac{1}{h'} + B_H$, where μ' and h' are defined in (1). Then the high type chooses r for

$$-\frac{h_0}{h_1}m_r - \Gamma(B_H) < \sigma_H < -\frac{h_0}{h_1}m_r + \Gamma(B_H),$$

where

$$\Gamma(B_H) = \frac{h_0 + h_1}{h_1}\sqrt{(\theta_s^2 + B_H) - \frac{1}{h_0 + h_1}}$$

is the high-type's reform bandwidth with the electoral incentive of B_H. Note that $\Gamma(B_H)$ strictly increases in B_H. Thus, with the presence of electoral incentives, the high-type incumbent chooses to implement the reform policy even when she receives a signal not promising enough to justify doing so.

In the anti-pandering equilibrium, a partial separation across the types occurs as the low type does not have enough incentive to choose r. A simple calculation shows that the low type chooses the status quo if $B_L \leq -\theta_s^2 + m_r^2 + \frac{1}{h_0}$. This condition imposes an upper bound on B for which this type of equilibrium exists.

Finally, let's consider the voter's belief consistency. It is clear that given the above behavior of incumbent, the voter's belief jumps to one upon observing r. Conversely, upon observing the status quo, the voter's posterior decreases. To calculate this, let $P_\tau(a)$ be the ex-ante probability that the type-τ incumbents chooses an action a. Then the voter's posterior is given by

$$p'(s) = \frac{pP_H(s)}{pP_H(s) + 1 - p},$$

where

$$P_H(s) = 1 - \Pr\left(-\frac{h_0}{h_1}m_r - \Gamma(B_H) < \sigma_H < -\frac{h_0}{h_1}m_r + \Gamma(B_H)\right).$$

Note that as B increases, $P_H(s)$ decreases, and thus $p'(s)$ decreases as well. Since it must be that $p'(s) < \pi$ to be consistent with the voter's behavior, the threshold on π decreases as B increases.

Below, we summarize our finding.

Proposition 2 (Anti-pandering)**.** *There exists $B^* > 0$ and $p^*(B) \in (p_1, p_2)$ such that for any $B < B^*$ and $p < p^*(B)$, the anti-pandering equilibrium exists. In the equilibrium, the high-type incumbent over-experiments on the reform policy, the low type chooses the status quo, and the voter reelects the incumbent only upon observing the reform action.*

4.2 Equilibrium Characterization

The following proposition present the full equilibrium characterization result, including other types of equilibria.

Proposition 3. *There exists $B^* > 0$, p_1, p_2 ($\pi < p_1 < p_2$), and $p^*(B) \in (p_1, p_2]$ where $p^*(B)$ is increasing for $B < B^*$ and decreasing for $B \geq B^*$ such that the following equilibria exist in this model:*

- *(Anti-pandering) If $B < B^*$ and $p < p^*(B)$, then the equilibrium described in Proposition 2 exists.*
- *(Mimicking) If $B > B^*$ and $p < p^*(B)$, a mimicking equilibrium exists. In the equilibrium, the low type mixes between the two policy options, and the high-type's reform bandwidth is higher than Γ_0 but lower than $\Gamma(B_H)$. The voter's behavior qualitatively differs depending on p: For $p \in [\pi, p^*(B))$, $\alpha(s) \in (0, 1)$ and $\alpha(r) = 1$; for $p < \pi$, $\alpha(s) = 0$ and $\alpha(r) \in (0, 1)$.*[4]
- *(Weak separation) If $p \in [p_1, p^*(B)]$, there exists an equilibrium in which the low type chooses the status quo, and the high-type's reform bandwidth is higher than Γ_0 but lower*

[4] In a non-generic case of $\pi = p$, the voter mixes upon observing any action, that is, $\alpha(s) \in (0, 1)$ and $\alpha(r) \in (0, 1)$.

than $\Gamma(B_H)$. The voter mixes after observing the status quo ($\alpha(s) \in (0,1)$) and always reelects after observing the reform action ($\alpha(r) = 1$).

- *(No distortion) If $p \geq p_1$, there exists an equilibrium in which the incumbent's behavior is the same as one in the no agency case (Proposition 1) and the voter always reelects the incumbent.*

There are four types of equilibria in the model. The most obvious one—"no distortion" equilibrium—exists when the prior about the challenger's type is sufficiently low relative to the incumbent. In this equilibrium, the incumbent behaves as if she has no electoral incentives (Proposition 1), and the voter does not find it necessary to replace the incumbent regardless of the incumbent's action.

All other types of equilibria involves some form of anti-pandering behavior. While players in the "anti-pandering" equilibrium (Proposition 2) only plays pure strategies, the other two types of equilibria exhibit mixed strategies of either the low type or the voter, or both.

The "mimicking" equilibrium exists when the benefit of office is high enough ($B > B^*$). Here, the low-type incumbent finds the electoral benefit sufficiently attractive to choose the reform despite the lack of information. But the complete pooling never occurs in our model, as there always exists a possibility that high-type observes a significantly bad signal and chooses the status quo. As a consequence, the low-type mixes between the the two options. The voter also plays a mixed strategy to satisfy the incentive conditions of the low type: depending on the challenger's prior, the voter mixes either upon observing $a = r$ or s (or both).

Last, the "weak separation" equilibrium only involves the voter's mixing. Here, the low type always chooses the status quo, but the high type's reform bandwidth is narrower than one in the anti-pandering equilibrium. By doing so, the voter's indifference condition ($p' = \pi$) is satisfied upon observing $a = s$. Since the voter reelects the incumbent with positive probability even when $a = s$, it reduces the high-type's electoral incentive to choose reform.

Figure 1 describes parameter ranges for which each type of equilibrium exists. Note that there exists a unique equilibrium for $p < p_1$: the anti-separating type for $B \leq B^*$ and the mimicking type for $B > B^*$. In fact, there is continuity of behavior across the two types of equilibria: As B

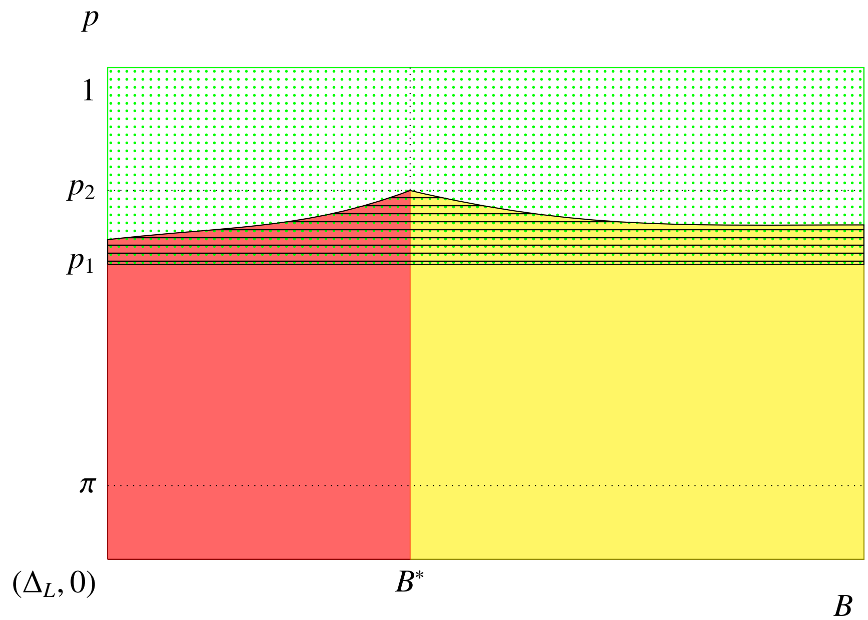

Figure 1: The parameter range for the existence of anti-pandering (red), mimicking (yellow), weak separation (dashed), and no distortion (dotted green) equilibria in Proposition 3.

goes above B^*, the low-type and the voter gradually increases the probability of choosing r and reelecting upon observing $a = s$, respectively.

4.3 Comparative Statics

How do the size of distortion and the voter welfare change according to the change in office-holding benefit? The comparative statics for the voter welfare requires to define the welfare function for each specific type of equilibrium. To focus on interesting cases, we assume that $\pi < p < p_1$ and $p < 1-\pi$. Then, for each B, there exists the unique equilibrium, either anti-pandering or mimicking. Multiple equilibria can occur only at $B = B^*$. Here, the low type is indifferent between the two equilibria, whereas the high type and voter prefers the anti-pandering to mimicking equilibrium. Thus, we select the anti-pandering equilibrium at $B = B^*$. For the concrete calculation of each welfare function and detailed proof of the next proposition, see the Appendix.

Proposition 4 (Comparative Statics)**.** *i) The size of reform bandwidth is non-monotonic in B. It increases in B when $B < B^*$ and decreases in B when $B > B^*$. The reform bandwidth is maximized at $B = B^*$.*
ii) The probability that the low type chooses the reform policy decreases in B if $B > B^*$.
iii) The voter welfare is non-monotonic in B. When $B < B^*$, it is either the inversed-U shape with maximum achieved at $B = B^a$ (if $B^a < B^*$) or the strictly increasing (if $B^a \geq B^*$). When $B > B^*$, it is strictly increasing.
iv) There exists the unique optimal office-holding benefit $B^{optimal} = min\{B^a, B^*\}$, which is strictly larger than the minimal office-holding benefit Δ_L.
v) As p or π increases, $B^{optimal} = B^a$ becomes more probable. As h_1 increases, $B^{optimal} = B^*$ becomes more probable.

The size of reform bandwidth is proportional to the high type's net electoral incentive, which is denoted as $t(B)$. In the anti-pandering equilibrium, $t(B) = B_H$ since there is no possibility after choosing the status quo. However, $t(B) = \frac{T^*}{B_L} B_H = T^*(1 + \frac{u_H - u_L}{B - \pi(u_H - u_L)})$ in the mimicking equilibrium since the voter reelects the incumbent with a positive probability after observing the status quo. It is striking that the net electoral incentive of the high type decreases in office-holding benefit in the mimicking equilibrium. This is because the high type's motivation to separate themselves from the low type is lessened due to the low type's mimicking behavior. Concretely, low type's mixed strategy makes it hard for the voter to discern the type of the incumbent after observing the action choice. This makes the voter to reelect the incumbent with a positive probability even after observing the status quo. Thus, the high type's net electoral incentive falls.

Low type uses the mixed strategy in the mimicking equilibrium, but $P_L(r)$ should make the voter's incumbent-type posterior after observing the status quo equal to challenger-type belief. Therefore, as $P_H(s)$ increases, $P_L(r)$ should decrease. This means that less experimentation is required for the low type to mimic the high type. However, there exists a positive asymptote that the $P_L(r)$ approaches to when $B \to \infty$: the low type cannot mimic the high type without mixing the policy choice.

We denote voter welfare given B as $w(B)$. In the anti-pandering equilibrium ($B \leq B^*$), the first-period voter welfare decreases in B since higher net electoral incentive induces high-type incumbent to distort more. However, the second-period voter welfare increases in B. This is because larger reform bandwidth makes the probability of type revelation through the reform policy choice higher. These two competing forces drive the inversed-U shape voter welfare curve.

The high type's behavior affects the voter welfare only through her net electoral incentive and the low type's behavior affects the voter welfare only through her probability to choose the reform policy. Since the low type's probability of choosing reform policy jumps at $B = B^*$ and high type's net electoral incentive function $t(B)$ is continuous at $B = B^*$, the voter welfare drops discontinuously at $B = B^*$.

In the mimicking equilibrium ($B > B^*$), the voter welfare is strictly increasing in electoral incentive B. The larger B is, the more the low type tries to mimic the high type, which results in the decreasing net electoral incentive of the high type. The voter is better off in that the distortion of high type decreases and worse off in that the incumbent type revelation becomes less probable. In contrast to the anti-pandering equilibrium, the low type also responds to the change in B. As the low type chooses the reform policy less often, both the first-period utility and type revelation possibility improve. These two positive forces more than offset the worse-off effect due to the high type's behavioral change. Together with the better-off effect due to the high type's behavioral change, the voter welfare strictly increases.

However, the voter welfare is bounded above. It asymptotically approaches to the particular level, which is lower than the maximum voter welfare achievable through the anti-pandering equilibria. This is because the low type distorts to some extent to mimic the high type. For any mimicking equilibrium, we can find an anti-pandering equilibrium where the high type's reform bandwidth is the same as in the mimicking equilibrium. However, due to low type's mimicking behavior without expertise, the mimicking one is inferior to the anti-pandering one regarding the voter's welfare.

Surprisingly, the optimal office-holding benefit B is strictly larger than the minimum Δ_L. The voter should make the stake of election high enough to discern who is a true expert. However, the stake of election should be low enough to discourage the low type from mimicking the high type. If $B^a \geq B^*$, then the optimal office-holding benefit is B^*, where the high type's distortion is maximized. This is because the detriments from high type's distortion rises slowly as the office holding benefit increases.

The optimal office-holding benefit is more likely to be lower than B^* if the voter becomes more optimistic about the incumbent or challenger's type. As the proportion of true experts increases in a society, the value of type revelation drops. In contrast, the optimal office-holding benefit is more likely to be B^* if the precision of high type's private signal increases. As the degree of expertise of each expert increases, the value of type revelation rises. Therefore, the effects of extensive and intensive margins are opposite to each other.

The high type's net electoral incentive, low type's probability of choosing the reform policy, and the voter welfare is illustrated in Figure 2 as a function of office-holding benefit B.

5 Incumbent's Bias

We introduce the incumbent's bias. Due to the bias, each type gets different utility from each type expert's policy choice in the second period. Concretely, denote the i-type incumbent's ($i = H$ for high-type, $i = L$ for low-type) second period flow utility when j-type chooses a policy as $u_i^2(j)$. Then, the difference in the each type's second period utility from reelection success and reelection failure (i.e. net electoral incentive) is

$$B_H \equiv [B + u_H^2(H)] - [\pi u_H^2(H) + (1-\pi)u_H^2(L)] = B + (1-\pi)(u_H^2(H) - u_H^2(L)),$$
$$B_L \equiv [B + u_L^2(L)] - [\pi u_L^2(H) + (1-\pi)u_L^2(L)] = B + \pi(u_L^2(L) - u_L^2(H)).$$

Since $u_i^2(j)$ does not depend on the first-period action choice for each i and j, B_H and B_L do not depend on the first-period action choice.

5.1 When low-type incumbent has bias

Suppose $b_H = 0$ and $b_L = b \in R - \{0\}$, i.e. only the low-type has a bias. Define $T_1 \equiv \frac{T^*}{2(m_r - \theta_s)}$.

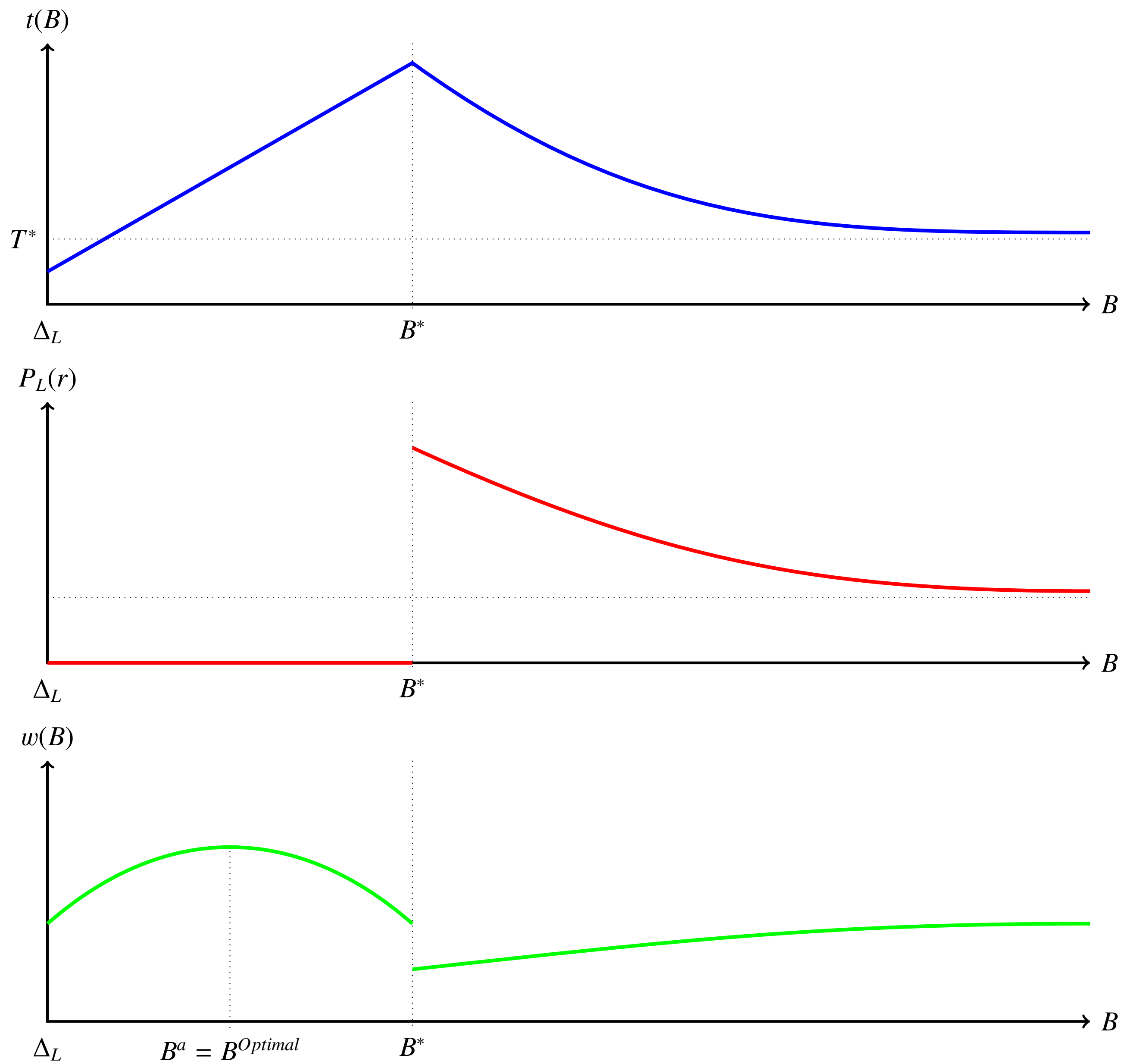

Figure 2: An illustration of the voter welfare $w(B)$ across the electoral benefit B.

5.1.1 Without electoral incentive

First, we look at the no agency case.

Lemma 1. *low-type incumbent chooses s if and only if $T^* > 2b(m_r - \theta_s)$. This condition is equivalent to the following:*

- *When $m_r > \theta_s$, then $b < T_1$ and $T_1 > 0$*
- *When $m_r < \theta_s$, then $b > T_1$ and $T_1 < 0$*

Proof. The low-type incumbent chooses s iff $-(\theta_s - b)^2 > -(m_r - b)^2 - \frac{1}{h_0}$. This gives the condition in the lemma. □

The lemma 1 shows that the relation between the status quo outcome and the reform policy's expected outcome is critical in determining the biased low type's behavior.

5.1.2 With electoral incentive

Now, since the low type is inferior to the high type in both dimensions, i.e. competency and preference alignment, the voter wants to elect the expert who is more likely to be the high-type. Thus, if the incumbent-type posterior is higher than the belief on challenger's type, then the voter reelects the incumbent, and vice versa.

Lemma 2. *Suppose $\theta_s > m_r$*

- *If the voter reelects the incumbent only when the incumbent chooses s, then low-type chooses s iff*
$$b > T_1 + \frac{B_L}{2(m_r - \theta_s)}$$
- *If the voter reelects the incumbent only when the incumbent chooses r, then low-type chooses s iff*
$$b > T_1 - \frac{B_L}{2(m_r - \theta_s)}$$

Proof. When the voter's strategy is $(\alpha(s), \alpha(r)) = (1, 0)$, then low-type incumbent chooses s iff $T^* + B_L > 2b(m_r - \theta_s)$. When the voter's strategy is $(\alpha(s), \alpha(r)) = (0, 1)$, then low-type incumbent chooses s iff $T^* - B_L > 2b(m_r - \theta_s)$. □

Lemma 2 establishes the low-type incumbent's response to the voter's pure strategies. Using Lemma 1, Lemma 2 and the argument used in the proof of Proposition 3, we can get the following equilibrium characterization for $\pi < p < p_1$.

Proposition 5. *Suppose the public consensus is s and $\theta_s > m_r$. $T_1 < 0$ due to the consensus. Also, suppose that $\pi < p < p_1$. Then, for each given b, there exists an unique equilibrium*

- *If $b < T_1 - \frac{B_L}{2(\theta_s - m_r)}$, the voter reelects the incumbent only after observing s, low-type incumbent chooses r, and the high-type incumbent under-experiments.*

- *If $T_1 - \frac{B_L}{2(\theta_s - m_r)} < b < T_1$, the voter reelects the incumbent after observing s, reelects the incumbent after observing r with probability $1 + \frac{T^* + 2(\theta_s - m_r)b}{B_L}$. Low-type incumbent chooses r with positive probability, where $P_L(r) > P_H(r)$. The high-type incumbent under-experiments, with less degree compared to the first case.*

- *If $T_1 < b < T_1 + \frac{B_L}{2(\theta_s - m_r)}$, the voter reelects the incumbent after observing s with probability $1 - \frac{T^* + 2(\theta_s - m_r)b}{B_L}$, reelects after observing r. Low-type incumbent chooses s with positive probability, where $P_L(s) > P_H(s)$. The high-type incumbent over-experiments, with less degree compared to the fourth case.*

- *If $b > T_1 + \frac{B_L}{2(\theta_s - m_r)}$, the voter reelects the incumbent only after observing r, low-type incumbent chooses s, and the high-type incumbent over-experiments.*

In the second case, $P_H(r)$ and $P_L(r)$ depend on both B_H and B_L. Likewise, in the third case, $P_H(s)$ and $P_L(s)$ depend on both B_H and B_L. On the other hand, in the first and fourth case, $P_H(r)$ and $P_H(s)$ depend only on B_H and are independent with B_L. This is because the voter's mixing probability depends on B_L via the low-type incumbent's incentive compatibility constraint. That is, if the voter only uses the pure strategy, the high-type incumbent's incentive compatibility constraint is not affected by B_L.

Also, this proposition implies that our main equilibrium characterization result (Proposition 3) is the special case of this result. Our main result assumed that $b = 0$. That is, the equilibrium is determined by in which area of low-type bias $b = 0$ belongs to. Since $T_1 < 0$, $b = 0$ cannot belong to the first or second case. If $T_1 + \frac{B_L}{2(\theta_s - m_r)}$, the threshold of bias between third and fourth case, is larger than 0, then the equilibrium found in our main characterization belongs to the third case. In the opposite case, it belongs to the fourth case. Simple algebra shows that comparing $T_1 + \frac{B_L}{2(\theta_s - m_r)}$ and 0 is equivalent to comparing B_L and T^*.

In fact, the equilibrium in the third case of Proposition 5 is equivalent to the mimicking equilibrium in Proposition 3. Likewise, the equilibrium in the fourth case of Proposition 5 is equivalent to the anti-pandering equilibrium in Proposition 3. As changing the B_L from 0 to ∞, the threshold $T_1 + \frac{B_L}{2(\theta_s - m_r)}$ moves from T_1 to ∞. In this process, the equilibrium of unbiased low-type setup changes from the anti-pandering equilibrium to the mimicking equilibrium at the moment at which the B_L passes T^*.

It is interesting that as the bias becomes smaller than T_1, the core property of the equilibrium changes from anti-pandering to pandering. That is, the voter compensates the action choice different from the the public consensus when $b > T_1$, but it starts to compensate the action choice which is congruent with the public consensus when $b < T_1$. The intuition is that as the more extreme the low-type bias becomes, the more likely low-type prefers the policy which is opposite to what the public wants. The agents' behavior in this type of pandering equilibrium is the same as in the anti-pandering equilibrium when the public consensus is r. The voter compensates choosing s, low-type chooses r, and high-type modifies her behavior towards s. However, the key mechanism is totally opposite.

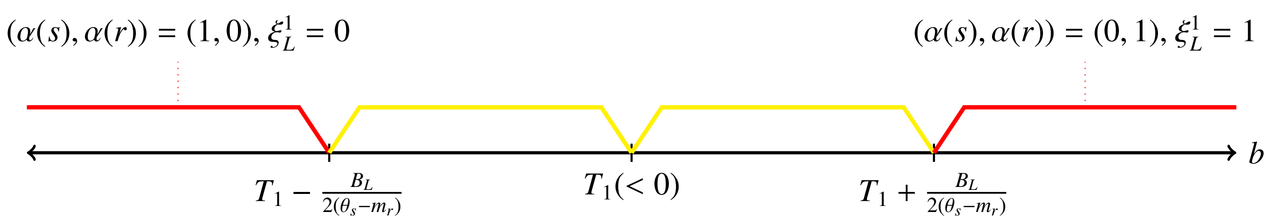

Figure 3: A graphical illustration of the equilibrium in Proposition 5. (Red region is anti-pandering equilibrium and yellow region is mimicking equilibrium.)

When $\theta_s < m_r$, then we get the analogous opposite result. Now, note that $T_1 > 0$.

Proposition 6. *For each given b, there exists an unique equilibrium.*

- *If* $b < T_1 - \frac{B_L}{2(m_r - \theta_s)}$, *the voter reelects the incumbent only after observing r, low-type incumbent chooses s, and high-type incumbent over-experiments.*

- *If* $T_1 - \frac{B_L}{2(m_r - \theta_s)} < b < T_1$, *the voter reelects the incumbent after observing s with probability* $1 - \frac{T^* + 2(\theta_s - m_r)b}{B_L}$, *reelects the incumbent after observing r. Low-type incumbent chooses s with positive probability, where* $P_L(s) > P_H(s)$. *High-type incumbent over-experiments, with less degree compared to the first case.*

- *If* $T_1 < b < T_1 + \frac{B_L}{2(m_r - \theta_s)}$, *the voter reelects the incumbent after observing s, reelects after observing r with probability* $1 + \frac{T^* + 2(\theta_s - m_r)b}{B_L}$. *Low-type incumbent chooses r with positive probability, where* $P_L(r) > P_H(r)$. *High-type incumbent under-experiments, with less degree compared to the fourth case.*

- *If* $b > T_1 + \frac{B_L}{2(m_r - \theta_s)}$, *the voter reelects the incumbent only after observing s, low-type incumbent chooses r, and high-type incumbent under-experiments.*

For the case of r being the public consensus, the result is symmetric: the resulting equilibrium when the public consensus is the reform policy and $\theta_s > m_r$ is the same with when the public consensus is the status quo and $\theta_s < m_r$, and vice versa.

5.2 When high-type incumbent has bias

Now, we suppose that $b_L = 0$, $b_H \in R - \{0\}$,i.e. only high-type expert has a bias.

5.2.1 Without electoral incentive

We first document the no agency case. Define

$$\Lambda(b) = b\frac{h_0 + h_1}{h_1} - \frac{h_0}{h_1}m_r, \qquad \Gamma(b, B) = \frac{h_0 + h_1}{h_1}\sqrt{(\theta_s - b)^2 + B - \frac{1}{h_0 + h_1}}. \tag{3}$$

$\Lambda(b)$ is the center of the *reform band* and $\Gamma(b, B)$) is the *reform bandwidth* as before. Then, we get the following result.

Lemma 3. *The low-type incumbent has the preference perfectly aligned with the voter. Thus, when the public consensus is s, the low-type incumbent chooses s. The high-type chooses the reform policy if and only if*

$$\Lambda(b_H) - \Gamma(b_H, 0) \le \sigma_H \le \Lambda(b_H) + \Gamma(b_H, 0).$$

Lemma 3 shows the behavior of the biased high-type when there is no electoral incentive.

5.2.2 With electoral incentive

It is not clear whether the voter prefers high type or low type, since high-type has more information but conflict of interest with the voter, while low-type has no information but has the preference aligned with the voter. That is, high-type is competent and biased, whereas low-type is incompetent and benevolent. Thus, to figure out which incumbent the voter will choose for the second period policy choice, we need to calculate voter's expected second period utility from choosing each type incumbent and compare them. Suppose that the public consensus is s. Denote the voter's expected second period utility from high-type (low-type) expert choosing the second period policy as $u^2_{pub}(H)$ ($u^2_{pub}(L)$). Then, $u^2_{pub}(L) = -\theta_s^2$ if the public consensus is s and $u^2_{pub}(L) = -m_r^2 - \frac{1}{h_0}$ if the public consensus is r. Also, we get

$$\begin{aligned} u^2_{pub}(H) = &\int_{[l(b_H),h(b_H)]} \left[-\left(\frac{h_0 m_r + h_1 \sigma_{H2}}{h_0 + h_1} \right)^2 - \frac{1}{h_0 + h_1} \right] f(\sigma_{H2}) d\sigma_{H2} \\ &+ \int_{[l(b_H),h(b_H)]^c} -\theta_s^2 f(\sigma_{H2}) d\sigma_{H2}, \end{aligned}$$

where $h(b_H) = \Lambda(b_H) + \Gamma(b_H, 0)$, $l(b_H) = \Lambda(b_H) - \Gamma(b_H, 0)$, and f is the probability density function of the Gaussian distribution with mean m_r and variance $\frac{1}{h_0} + \frac{1}{h_1}$. Now, we get the following result.

Lemma 4. *There exists $b^* > 0, b^{**} < 0$ such that*

- *If $b^{**} < b_H < b^*$, the voter prefers high-type to low-type in the second period.*
- *If $b_H > b^*$ or $b_H < b^{**}$, the voter prefers low-type to high-type in the second period.*

The above lemma implies that if $b^{**} < b_H < b^*$, then our main equilibrium characterization result holds in the similar manner. The voter's second period preference over expert types remains the same as before, so higher incumbent-type belief leads to reelection. The only difference comes from the high-type incumbent's incentive compatibility constraint. For instance, in the anti-pandering equilibrium, the voter reelects the incumbent only after observing r and the low-type chooses s (low-type's incentive compatibility requires $B_L < T^*$ as before). However, high-type now chooses r if and only if

$$\Lambda(b_H) - \Gamma(b_H, B_H) \leq \sigma_H \leq \Lambda(b_H) + \Gamma(b_H, B_H).$$

That is, the high-type bias changes the behavior of high-type incumbent, which again affects the voter's belief updating. Therefore, even though the threshold of B_L in our main equilibrium characterization does not change, the threshold of π changes accordingly. However, still, the structure of each equilibrium remains the same.

Now, we focus on a more interesting case, $b_H > b^*$ or $b_H < b^{**}$. Since the voter now prefers L-type to H-type in the second period, lower incumbent-type belief will lead to reelection. This creates the new equilibrium characterization.

Proposition 7. *There exists B^{**} and $P^{**}(B) \in (p_1, p]$ where $P^{**}(B) < p$ for all $B < B^{**}$ and $P^{**}(B) = p$ for all $B \geq B^{**}$ such that the following equilibria exist:*

- *(Pandering) If $\pi > p^{**}(B)$, a pandering equilibrium exists. In the equilibrium, the low type chooses the status quo, and the high type's reform bandwidth is $\Gamma(-B_H)$ (under-experimentation compared to the no election case). Reform bandwidth disappear if $B \geq B^{**}$. The voter reelects the incumbent only after observing s ($\alpha(s) = 1$, $\alpha(r) = 0$).*

- *(Weak pandering) If $\pi \in (p_1, p^{**}(B))$, there exists an equilibrium in which the low type chooses the status quo, and the high type's reform bandwidth is lower than Γ_0 but higher than $\Gamma(-B_H)$. The voter mixes after observing the status quo ($\alpha(s) \in (0, 1)$) and always replaces the incumbent after observing the reform action ($\alpha(r) = 0$).*

- *(No distortion) If $\pi \leq p_1$, there exists an equilibrium in which the incumbent's behavior is the same as one in the no agency case (Proposition 1) and the voter does not reelect the incumbent in any case.*

The pandering, weak-pandering, and no-distortion equilibria do not depend on B.
Also, there exists $\tilde{P}(B) \in [p_1, p]$ such that the following equilibria exist:

- *(Anti-pandering) If $B > B^*$ and $\pi > \tilde{P}(B)$, then there exist anti-pandering equilibria.*

Since the voter prefers low-type to high-type, it compensates s more than r. Then, low type does not face the trade-off between flow utility from policy choice and electoral incentive. Thus, low type always chooses $a = s$ and never uses mixed strategies. The voter also has no incentive to randomize after observing $a = r$. This is because after observing $a = r$, the incumbent-type belief jumps to 1. On the other hand, after observing $a = s$, belief drops. If this posterior is lower than π, then the public's best response after observing $a = s$ is to reelect. This results in the pandering equilibrium. If the posterior equals to π, then we get the weak pandering case. Finally, if the posterior is higher than π, then we get the no-distortion equilibrium.

In the pandering equilibrium documented in Proposition 7, the high-type panders to conceal her bias from the voter, even though her expertise does not support the public consensus. This is opposite to the anti-pandering equilibrium of Proposition 3. In the anti-pandering equilibrium, the fact that low-type incumbent has no incentive constrains her ability to distort, which makes her lose the reelection. In contrast, in the pandering equilibrium, the very same constraint makes her win the reelection.

However, the anti-pandering equilibrium can arise even though the high-type bias is extreme. This is possible if the office-holding benefit is high enough. Since the high-type private signal can be extreme, the high type cannot always choose the reform policy. If the voter relies on this fact and compensates the reform action to select the high type, anti-pandering equilibrium arises. In this equilibrium, the high type's inability to fully mimic the low type makes her identity exposed to the voter. In contrast, in the anti-pandering equilibrium of Proposition 3, the low type's inability to mimic the high type gives the high type an opportunity to reveal her type.

5.3 When both types have bias

Our model is very general in that it provides the framework to analyze the setting of competency difference with heterogeneous bias and heterogeneous electoral incentive. If the both types of incumbents have bias, we first fix b_L. This determines $u^2_{pub}(L)$. If $m_r > \theta_s$, then $u^2_{pub}(L) = -m_r^2 - \frac{1}{h_0}$ if $b_L > T_1$ and $u^2_{pub}(L) = -\theta_s^2$ if $b_L < T_1$. If $m_r < \theta_s$, then $u^2_{pub}(L) = -m_r^2 - \frac{1}{h_0}$ if $b_L < T_1$ and $u^2_{pub}(L) = -\theta_s^2$ if $b_L > T_1$. Using this, as in section 6.2, it is easy to calculate $u^2_{pub}(b_H|b_L) = u^2_{pub}(H) - u^2_{pub}(L)$, where $u^2_{pub}(H)$ is the function of b_H and $u^2_{pub}(L)$ is the function of b_L, which is constant. Now, we can derive the threshold of b_H, i.e. b^* and b^{**} and apply the argument in the section 6.2. Then, using this, we can decide the agent's strategy in the first period in the equilibrium.

6 Discussion

6.1 When Both Types Have Expertise

Now, suppose that both types of incumbents have expertise, i.e. the high-type receives signal σ_{H1}, σ_{H2} for each period and low-type receives signal σ_{L1}, σ_{L2}. For simplicity, assume that each type's signal is drawn from the same distribution, i.e. Gaussian with mean θ_r and precision h_1. Also, suppose that $B_H = B_L = B$. Since there is no difference in competency between high and low type incumbent, this is a quite reasonable assumption.

6.1.1 Without electoral incentive

We first analyze the no agency case.

Lemma 5. *When there is no electoral incentive, the i-type chooses the reform policy if and only if*

$$\Lambda(b_i) - \Gamma(b_i, 0) \le \sigma_i \le \Lambda(b_i) + \Gamma(b_i, 0).$$

That is, now both types form a reform band in their decision making due to the imperfect expertise. Based on Lemma 5, we get the following observations.

Proposition 8. *i-type incumbent's strategy is following, where i=high, low.*

- *If* $|b_i - \theta_s| \leq \sqrt{\frac{1}{h_0+h_1}}$*, then i-type incumbent always chooses s.*
- *If* $|b_i - \theta_s| > \sqrt{\frac{1}{h_0+h_1}}$*, then i-type incumbent's strategy contains the reform bandwidth. As* $|b_i - \theta_s|$ *increases, the size of reform bandwidth also increases.*

Proposition 8 states that if the incumbent's bias is close enough to the status quo outcome, she likes the status quo and chooses it. If her bias is far enough from the status quo outcome, then she starts to experiment for some values of signal in the reform band. Especially, the more she hates the status quo, the more she tries to experiment, i.e. the reform bandwidth increases.

From now on, to simplify the discussion, suppose that $b_H = 0$ and $b_L = b \neq 0$. Denote the reform band of low-type as $R_L = \{\sigma_L : \xi_L(\sigma_L) = 1\}$ and that of high-type as $R_H = \{\sigma_H : \xi_H(\sigma_H) = 1\}$. Then we get the following corollary.

Corollary 1. *If* $|\theta_s - b| \leq \sqrt{\frac{1}{h_0+h_1}}$*, then low-type incumbent always chooses the status quo. If* $|\theta_s - b| > \sqrt{\frac{1}{h_0+h_1}}$*, then low-type incumbent's strategy include the reform band. Especially,*

- *If* $\theta_s > b > 0$ *or* $\theta_s < b < 0$*, then* $R_L \subset R_H$*.*
- *If* $\theta_s > 0 > b$ *or* $\theta_s < 0 < b$*, then* $R_H \subset R_L$*.*
- *If* $0 < \theta_s < b$*, then both the upper bound and lower bound of* R_H *is lower than those of* R_L*.*
- *If* $0 > \theta_s > b$*, then both the upper bound and lower bound of* R_H *is higher than those of* R_L*.*

When both types receive a private signal, the probability for each type incumbent to choose each policy is hard to calculate since addressing the truncated normal distribution analytically is quite tricky. However, we can at least establish the maximal sufficient condition by focusing on the 'reform band inclusion' relations: the situation in which the reform band of one type is included in the reform band of the other type. Thanks to Corollary 1, we can get the parameter conditions where the 'reform band inclusion' relations hold. By using this and applying the similar technique in the equilibrium, we can find some interesting equilibria. (Proposition 9)

6.1.2 With electoral incentive

Here, we propose the sufficiency conditions for the existence of equilibrium. In other set of parameters that do not satisfy the sufficiency conditions, the calculation of the public's belief is tremendously complex and result in various equilibrium according to the parameter values.

Proposition 9 (The sufficiency condition of equilibrium)**.** *If i) $B < \frac{1}{h_0+h_1}$, $|\theta_s - b| \leq \sqrt{\frac{1}{h_0+h_1} - B}$ (only high-type over-experiments) or ii) $B < \frac{1}{h_0+h_1}$, $|\theta_s - b| > \sqrt{\frac{1}{h_0+h_1} - B}$, $|\theta_s| > |b|$, $\theta_s b > 0$ (both types over-experiment), then the equilibrium in which $(\alpha(s), \alpha(r)) = (0, 1)$ and $P_H(r) > P_L(r)$ exists. If iii) $|\theta_s| < \sqrt{\frac{1}{h_0+h_1} + B}$ (at least high-type under-experiments) or iv) $|\theta_s| < \sqrt{\frac{1}{h_0+h_1}}$, $\theta_s b < 0$ (both types under-experiment), the equilibrium in which $(\alpha(s), \alpha(r)) = (1, 0)$ and $P_H(r) < P_L(r)$ exists.*

The sufficiency condition for the existence of equilibrium where high-type reforms more than low-type means that the electoral incentive should not be too large. On top of that, i) low-type should be satisfied with the status quo or ii) have dissatisfaction but not as strong as the public. The sufficiency condition for the existence of equilibrium where low-type reforms more than the high-type means that iii) the status quo is good enough for the unbiased agents or iv) is bad for the unbiased agents but much worse for the biased agent.

Now, suppose that $b = 0$. Then, there is no difference between the high-type and low-type. Therefore, the public's equilibrium strategy is to always reelect (when $p \geq \pi$) or always impeach (when $p < \pi$). Then the Proposition 9 implies that introducing a very small b in the direction of θ_s can lead to the impeachment of the incumbent who chose status quo policy. Similarly, introducing a very small b in the opposite direction of θ_s can lead to the impeachment of the incumbent who chose the reform policy.

6.2 Cheap Talk Case

Now, we consider the cheap talk model. The expert does not choose a policy herself. She takes the role of a policy adviser, rather than a policymaker. The timeline is the following: the expert gets a private signal, then the expert recommends the policy $c \in \{s, r\}$ to the voter. After receiving

the recommendation from the expert, the voter chooses the policy $a \in \{s, r\}$. Then, the outcome is realized and the voter decides whether to change the advisor or not.
Denote the voter's expected utility from choosing $a \in \{s, r\}$ after observing the recommendation $c \in \{s, r\}$ as $EU_{pub}[a|c]$.

Lemma 6. *If there is no electoral incentive, the only non-babbling equilibrium is the no-distortion equilibrium. In this equilibrium, the voter follows expert's recommendation. Thus, this equilibrium is informative.*

Now, we introduce the electoral incentive and characterize the equilibrium. First, we confine the public's strategy to pure strategy.

Proposition 10. *There are 3 types of pure strategy equilibria.*

- *(No distortion) The voter does not change the advisor regardless of the recommended policy. The experts behave in the same manner as in the no electoral incentive case. The voter is obedient to the expert's recommendation.*
- *(Babbling) The voter does not change the advisor only after observing r. Both types of experts recommend r, the voter ignores the recommendation and chooses s.*
- *(Anti-pandering) The voter does not change the advisor only after observing r. Low-type expert recommends s, high-type expert recommends over-experimentation, the voter follows the recommendation. This equilibrium requires the additional 'obedient constraint' to be satisfied, which takes the form of the upper bound for expert's electoral incentive.*

By the same logic, we can show that the mixed strategy equilibria found in our main characterization result holds in the same manner, with only difference that cheap talk requires the additional obedient constraint in the form of upper bound for B_H (which is equivalent to the upper bound for B). Also, there is no other kind of mixed strategy equilibrium. That is, other than the babbling equilibrium, the distortion in equilibrium is less likely to happen compared to the office-holder setting.

Appendix: Omitted Proofs

Proof of Proposition 3. Denote the high type's net electoral incentive for given B as $t(B)$. In the equilibrium, $P_H(a)$ depends on the high-type's net electoral incentive $t(B)$, so we use the notation $P_H(a|t(B))$ here. Define

$$p'(a|t(B), P_L(a)) = \frac{pP_H(a|t(B))}{pP_H(a|t(B)) + (1-p)P_L(a)},$$

which is the voter's incumbent-type posterior after observing action a, given $t(B)$ and $P_L(a)$. By a slight abuse of notation, we use $p'(a|t(B))$ if $P_L(a) = 1$. Fix π and define p_1 as the value p solving $\pi = p'(s|0)$. Similarly, define p_2 as the value of p solving $\pi = p'(s|B^* + \Delta_H)$, where $T^* = -\theta_s^2 + m_r^2 + \frac{1}{h_0} > 0$ (Assumption 1) and $B^* = T^* + \pi(u_H - u_L) > 0$. Concretely, denote $\Pi(a, b) = \frac{\pi a}{\pi a + (1-\pi)b}$. Then, $p_1 = \Pi(1, P_H(s|0))$ and $p_2 = \Pi(1, P_H(s|B^* + \Delta_H))$. Recall that the voter's strategy is given by $\alpha : \{s, r\} \to [0, 1]$, where $\alpha(a)$ is the probability of reelecting the incumbent upon observing action a.

First, we consider the pure strategy equilibrium, i.e. both the voter and low-type incumbent use pure strategies. If $(\alpha(s), \alpha(r)) = (1, 1)$ or $(\alpha(s), \alpha(r)) = (0, 0)$, there is no change in incumbent's incentive compatibility constraint for any type τ. Therefore, both types behave as in the no agency. Since the voter's incumbent-type belief jumps to 1 after seeing $a = r$, the voter's best response requires $\alpha(r) = 1$. Thus, $(\alpha(s), \alpha(r)) = (0, 0)$ cannot hold in the equilibrium. For $(\alpha(s), \alpha(r)) = (1, 1)$ to hold in the equilibrium, the voter's best response requires $p \geq p_1$.

The remaining cases are $(\alpha(s), \alpha(r)) = (1, 0)$ and $(\alpha(s), \alpha(r)) = (0, 1)$. If $(\alpha(s), \alpha(r)) = (1, 0)$, low type should choose $a = r$. If not, then the voter's incumbent-type belief after observing action $a = r$ jumps to 1. Thus, $\alpha(r) = 1$ is voter's best response, which is contradiction. The low type's incentive compatibility constraint is $B_L \leq -T^* < 0$. Since $B_L \geq 0$, this is contradiction.

If $(\alpha(s), \alpha(r)) = (0, 1)$, low type should choose $a = s$ to satisfy the voter's best-response condition. The low type's incentive compatibility constraint is $B_L \leq T^*$. This is equivalent to $B \leq B^*$. If not, low type deviates to $a = r$. The high-type reform bandwidth is $\Gamma(B_H)$. The remaining step is to check the voter's incentive compatibility. The voter's incumbent-type belief after observing $a = s$ should be lower than π. That is, $p < \Pi(1, P_H(s|B + \Delta_H))$ should hold for each given $B \in [0, B^*]$.

Then, we turn to the mixed strategy equilibria. First, suppose that $0 < \alpha(s) < 1$ and $0 < \alpha(r) < 1$. Then, the voter's incentive compatibility produces the following two indifference conditions: $p'(s|t(B), P_L(s)) = \pi$ and $p'(r|t(B), P_L(r)) = \pi$. Together with $P_H(r)+P_H(s) = 1$ and $P_L(r)+P_L(s) = 1$, we get $p = \pi$. Then, by plugging this to the voter's indifference conditions, we get $P_H(r) = P_L(r)$ and $P_H(s) = P_L(s)$.

Now, assume that $P_H(r) \neq P_L(r)$ (thereby $P_H(s) \neq P_L(s)$). Then, the voter's incumbent-type belief should rise after observing one policy and fall after observing the other policy. If $\pi < p$, $\alpha(a) = 1$ for at least one $a \in \{s, r\}$. Suppose $\alpha(r) = 1$. Then, $0 < \alpha(s) < 1$, so the voter's indifference condition for $a = s$ should hold. Let's divide the cases according to $P_L(s)$. If $P_L(s) = 1$, then low-type's incentive compatibility constraint for $P_L(s) = 1$ is

$$EU_L(s) + \alpha(s)B_L > EU_L(r) + B_L.$$

This is equivalent to

$$\alpha(s) > 1 - \frac{T^*}{B_L}.$$

For this equilibrium to exist, it is necessary to satisfy $1 - \frac{T^*}{B_L} < 1$. This is satisfied since $T^* > 0$ and $B_L > 0$. Now, for each $B_L < T^*$, $\alpha(s)$ can be any number in $(0, 1)$. Then, as $\alpha(s)$ changes from 0 to 1, the high-type net electoral incentive changes from $B + \Delta_H$ to 0. For each fixed $B < B^*$, each $p \in [p_1, \Pi(1, P_H(s|B + \Delta_H))]$ results in the equilibrium by satisfying the voter's indifference condition $p'(s|B+\Delta_H) = \pi$. Similarly, for each fixed $B > B^*$, $\alpha(s)$ can be any number in $\left(1 - \frac{T^*}{B_L}, 1\right)$. Each $p \in [p_1, \Pi(1, P_H(s|t(B)))]$ results in the equilibrium, where $t(B) = T^*\left(1 + \frac{u_H - u_L}{B - \pi(u_H - u_L)}\right)$. This gives us the weak separation equilibria, which fills the black region of Figure 1.

Now, suppose $P_L(s) < 1$. Then, low-type's indifference condition gives

$$\alpha(s) = 1 - \frac{T^*}{B_L}.$$

$\alpha(s) > 0$ gives the condition $B > B^*$. Also, this uniquely determines $P_H(s)$. Fix $B > B^*$ and $t(B) = T^*\left(1 + \frac{u_H - u_L}{B - \pi(u_H - u_L)}\right)$. For each $p < \Pi(1, P_H(s|t(B)))$, there exists $P_L(s) \in (P_H(s|t(B)), 1)$ such that $\Pi(P_L(s), P_H(s|t(B))) = p$. This gives us the mimicking equilibrium of $p > \pi$. This is represented by the yellow region ($p > \pi$) in Figure 1. Note that the equilibrium with $\alpha(s) = 1$ does not exist since $T^* < 0$ should hold for such equilibrium to exist.

Finally, we suppose that $p < \pi$. Then, by similar argument as before, $\alpha(a) = 0$ for at least one $a \in \{s, r\}$. Suppose $\alpha(s) = 0$. Then, $P_L(r) < P_H(r)$. If $P_L(r) = 0$, then $\alpha(r) = 1$, which was already considered in the pure strategy case. If $0 < P_L(r)$, then $\alpha(r) = \frac{T^*}{B_L}$ by the low-type's incentive compatibility constraint. $\alpha(r) > 0$ is equivalent to the condition that the public consensus is s ($T^* > 0$). Now, for any $p < \pi$, there exist $P_L(r) < P_H(r)$ supporting the mimicking equilibrium. This is represented by the yellow region in Figure 1 ($p < \pi$). Equilibrium with $\alpha(r) = 0$ cannot exist because its existence requires $T^* < 0$.

By defining

$$p^*(B) = \begin{cases} \Pi(1, P_H(s|B + \Delta_H)) & \text{if } B \leq B^* \\ \Pi(1, P_H(s|t(B))) & \text{if } B > B^*, \end{cases}$$

where $t(B) = T^* \left(1 + \frac{u_H - u_L}{B - \pi(u_H - u_L)}\right)$, we get the proposition 3.

Proof of Proposition 4. The (high type's) reform bandwidth is proportional to $t(B)$ and

$$t(B) = \begin{cases} B + (1 - \pi)(u_H - u_L) & \text{if } B \leq B^* \\ T^* \left(1 + \frac{u_H - u_L}{B - \pi(u_H - u_L)}\right) & \text{if } B > B^*. \end{cases} \tag{4}$$

The probability that low type chooses reform policy in the equilibrium for given B is

$$P_L(r) = \begin{cases} 0 & \text{if } B \leq B^* \\ 1 - \frac{(1-\pi)p}{\pi(1-p)} P_H(s) & \text{if } B > B^*. \end{cases} \tag{5}$$

Plotting this across B gives the Figure 2.

Note that $t(B)$ and $P_L(r)$ is definitions used in the first period. The second period strategy of both types is the same as in the no-election benchmark, which is fixed. Denote the voter's expected first period utility from high-type (low-type) expert choosing the first period policy as

$u^1_{pub}(H)$ ($u^1_{pub}(L)$). The voter welfare from the anti-pandering equilibrium ($B < B^*$) is

$$\begin{aligned}
w(B) =& p u^1_{pub}(H) + (1-p)u^1_{pub}(L) \\
&+ [pP_H(s) + 1 - p][\pi u_H + (1-\pi)u_L] + pP_H(r)u_H \\
=& p u^1_{pub}(H) + p(1-\pi)(u_H - u_L)P_H(r) + Constant.
\end{aligned}$$

Note that in the anti-pandering equilibrium, $t(B) = B_H = B + (1-\pi)(u_H - u_L)$. Then, the first derivative with respect to B is

$$\frac{\partial w(B)}{\partial B} = [f(l(B_H))l'(B_H) - f(h(B_H))h'(B_H)](pB_H - (1-\pi)(u_H - u_L)).$$

Since $l'(B_H) < 0$ and $h'(B_H) > 0$, $f(l(B_H))l'(B_H) - f(h(B_H))h'(B_H) < 0$. Therefore, $\frac{\partial w(B)}{\partial B} > 0$ is equivalent to $B < \frac{(1-p)(1-\pi)}{p}(u_H - u_L) \equiv B^a$. This gives the inversed-U shape of $w(B)$. If $B^a > B^*$, then $W(B)$ monotonically increases in this region.

Similarly, in the mimicking equilibrium ($B > B^*$), the voter welfare is

$$\begin{aligned}
w(B) =& p u^1_{pub}(H) + (1-p)u^1_{pub}(L) \\
&+ [pP_H(s) + (1-p)P_L(s)][\pi u_H + (1-\pi)u_L] \\
&+ pP_H(r)u_H + (1-p)P_L(r)u_L \\
=& p u^1_{pub}(H) - \frac{(1-\pi)p}{\pi}T^* P_H(r) + Constant,
\end{aligned}$$

where the second equality comes from the voter's indifference condition

$$P_L(s) = \frac{(1-\pi)pP_H(s)}{\pi(1-p)}.$$

In the mimicking equilibrium, $t(B) = \frac{B_H}{B_L}T^* = T^*\left(1 + \frac{u_H - u_L}{B - \pi(u_H - u_L)}\right)$. Then, $t(B)$ is a strictly decreasing function in B. ($t'(B) < 0$) Then, the first derivative is

$$\frac{\partial w(B)}{\partial B} = -(G(h) - G(l))pT^*\left[\frac{1}{\pi} + \frac{u_H - u_L}{B - \pi(u_H - u_L)}\right],$$

where

$$G(h) - G(l) = f(h(t(B)))h'(t(B))t'(B) - f(l(t(B)))l'(t(B))t'(B) < 0. \tag{6}$$

Thus, $\frac{\partial w(B)}{\partial B} > 0$. This gives the graph of $w(B)$ as in Figure 2. The discontinuity of $w(B)$at $B = B^*$ comes from the discontinuity of $P_L(r)$ at $B = B^*$. This is because $w(B)$ is completely pinned down by $(t(B), P_L(r))$ as we show below. Now, let's find the optimal B.

<u>Claim:</u> The (voter) welfare-maximizing office holding benefit $B^{optimal}$ is given by

$$B^{optimal} = \begin{cases} B^a & \text{if } T^* > \frac{1-p-\pi}{p}(u_H - u_L) \\ B^* & \text{if } T^* \leq \frac{1-p-\pi}{p}(u_H - u_L). \end{cases}$$

This is equivalent to saying that $B^{optimal} = min\{B^a, B^*\}$.

Proof. The voter welfare in anti-pandering equilibrium is written as

$$\begin{aligned} w(B) =& pu^1_{pub}(H) + p(1-\pi)(u_H - u_L)P_H(r) \\ &+ (1-p)u^1_{pub}(L) + (1-p)(1-\pi)(u_H - u_L)P_L(r) + Constant. \end{aligned}$$

and the voter welfare in mimicking equilibrium is written as

$$\begin{aligned} w(B) =& pu^1_{pub}(H) + p(1-\pi)(u_H - u_L)P_H(r) \\ &+ (1-p)u^1_{pub}(L) - (1-p)\pi(u_H - u_L)P_L(r) + Constant. \end{aligned}$$

The first rows of $w(B)$ in each equilibrium is solely determined by the $t(B)$ and the second rows are solely determined by the $P_L(r)$. $u^1_{pub}(H)$ is decreasing function in $t(B) \geq 0$, $P_H(r)$ is increasing function in $t(B)$, and $u^1_{pub}(L)$ is decreasing function in $P_L(r)$. The candidates for $B^{optimal}$ is B^a, B^*, and $\infty (B \to \infty)$.

Note that $\lim_{B\to\infty} t(B) = T^*$ and $t(B) > T^*$ for all $B > B^*$. Thus, for given arbitrary small $\epsilon > 0$, there exists $B_\epsilon > B^*$ such that $t(B_\epsilon) = T^* + \epsilon$. By intermediate value theorem, there exists $B'_\epsilon < B^*$ such that $t(B'_\epsilon) = T^* + \epsilon$. (This implicitly assumes that the office-holding benefit B can be negative for the sake of descriptive simplicity. Confining to the non-negative B does not change the result.) Let's consider the equilibrium given $B = B_\epsilon$ and the equilibrium given $B = B'_\epsilon$. Then, $t(B'_\epsilon) = t(B_\epsilon)$, so the difference between voter welfare between the two equilibria is pinned down by $P_L(r)$.

Suppose that $\lim_{B\to\infty} P_L(r) = 0$. Then, for fixed π and for small arbitrary δ, there exists the mimicking equilibrium satisfying

$$\frac{pP_H(s)}{pP_H(s) + (1-p)(1-\epsilon)} = \pi,$$

where $P_H(s)$ is determined by $t(B_\delta)$. Then, there exist the anti-pandering equilibrium with $B = B_\delta$. This satisfies

$$\frac{pP_H(s)}{pP_H(s) + 1 - p} < \pi,$$

where the $P_H(s)$ is again determined by $t(B_\delta)$. Therefore, the $pP_H(s)$ terms in the two equilibrium belief conditions coincide. By $\epsilon \to 0$, we get the contradiction. Since $\lim_{B\to\infty} P_L(r) > 0$, $P_L(r) > 0$ holds when $B = B_\epsilon$. Any positive $P_L(r)$ negatively affects the $w(B)$ through the fourth term of $w(B)$ in the mimicking equilibrium. However, $P_L(r) = 0$ when $B = B'_\epsilon$, so the fourth term of $w(B)$ in the anti-pandering equilibrium becomes zero. Since the $u^1_{pub}(L)$ is decreasing in $P_L(r)$, we get $w(B'_\epsilon) > w(B_\epsilon)$.

From the shape of $w(B)$ in the anti-pandering region, we know that the value of B maximizing voter welfare among the anti-pandering equilibria is $min\{B^a, b^*\}$. Since the B'_ϵ forms the anti-pandering equilibrium, we get $w(B'_\epsilon) \leq w(min\{B^a, b^*\})$. Thus, $w(B_\epsilon) < w(min\{B^a, b^*\})$. This holds for arbitrary small $\epsilon > 0$, so $\lim_{B\to\infty} w(B) < w(min\{B^a, b^*\})$. □

Note that when h_1 increases, $u_H - u_L$ increases but T^* does not change.

Proof of Lemma 4. Suppose that the public consensus is s. Denote $u^2_{pub}(b_H) = u^2_{pub}(H) - u^2_{pub}(L)$. Then,

$$\begin{aligned} u^2_{pub}(b_H) &= \int_{[l(b_H),h(b_H)]} \left[-\left(\frac{h_0 m_r + h_1 \sigma_{H2}}{h_0 + h_1}\right)^2 - \frac{1}{h_0 + h_1} \right] f(\sigma_{H2}) d\sigma_{H2} \\ &+ \int_{[l(b_H),h(b_H)]^c} -\theta_s^2 f(\sigma_{H2}) d\sigma_{H2} + \theta_s^2 \\ &= \int_{l(b_H)}^{h(b_H)} \left[\theta_s^2 - \frac{1}{h_0 + h_1} - \left(\frac{h_0 m_r + h_1 \sigma_{H2}}{h_0 + h_1}\right)^2 \right] f(\sigma_{H2}) d\sigma_{H2}, \end{aligned}$$

by differentiating each side, we get

$$\begin{aligned}\frac{\partial u^2_{pub}(b_H)}{\partial b_H} =& \left[\theta_s^2 - \frac{1}{h_0+h_1} - \left(\frac{h_0 m_r + h_1 h(b_H)}{h_0+h_1}\right)^2\right] f(h(b_H))h'(b_H) \\ & - \left[\theta_s^2 - \frac{1}{h_0+h_1} - \left(\frac{h_0 m_r + h_1 l(b_H)}{h_0+h_1}\right)^2\right] f(l(b_H))l'(b_H) \\ =& -2b_H(\frac{h_0}{h_1}+1)\left[f(h(b_H))\frac{\left(\theta_s - b_H - \sqrt{(\theta_s^2 - b_H)^2 - \frac{1}{h_0+h_1}}\right)^2}{\sqrt{(\theta_s^2 - b_H)^2 - \frac{1}{h_0+h_1}}}\right. \\ & \left. + f(l(b_H))\frac{\left(\theta_s - b_H + \sqrt{(\theta_s^2 - b_H)^2 - \frac{1}{h_0+h_1}}\right)^2}{\sqrt{(\theta_s^2 - b_H)^2 - \frac{1}{h_0+h_1}}}\right]\end{aligned}$$

Thus, $\frac{\partial u^2_{pub}(b_H)}{\partial b_H} > 0$ if $b_H < 0$ and $\frac{\partial u^2_{pub}(b_H)}{\partial b_H} < 0$ if $b_H > 0$. Also, $u^2_{pub}(0) > 0$ and $\lim_{|b_H|\to\infty} u^2_{pub}(b_H) < 0$. Therefore, by intermediate value theorem, there exists $b^* > 0$ and $b^{**} < 0$ such that $u^2_{pub}(b^*) = 0$ and $u^2_{pub}(b^{**}) = 0$ and the function's first derivative shows that such (b^*, b^{**}) pair is unique. Also, $u^2_{pub}(b_H) > 0$ if $b^{**} < b_H < b^*$ and $u^2_{pub}(b_H) < 0$ if $b_H > b^*$ or $b_H < b^{**}$.

Proof of Proposition 8. Define $z_u(b) = b + \sqrt{(\theta_s - b)^2 - \frac{1}{h_0+h_1}}$. For this function to be well-defined, $(\theta_s - b)^2 \geq \frac{1}{h_0+h_1}$ is required. This is equivalent to $|b - \theta_s| \geq \sqrt{\frac{1}{h_0+h_1}}$. Then, $z_u'(b) = 1 + \frac{(b-\theta_s)}{\sqrt{(b-\theta_s)^2 - \frac{1}{h_0+h_1}}}$. Then,

$$z_u'(b) \geq 0 \iff b \geq \theta_s.$$

Thus, as $|b - \theta_s|$ increases, the upper bound of the reform bandwidth rises. Similarly, define $z_l(b) = b - \sqrt{(\theta_s - b)^2 - \frac{1}{h_0+h_1}}$. The well-definedness condition is the same as before. Now, $z_l'(b) = 1 - \frac{(b-\theta_s)}{\sqrt{(b-\theta_s)^2 - \frac{1}{h_0+h_1}}}$. Then,

$$z_l'(b) \geq 0 \iff b \leq \theta_s.$$

As $|b - \theta_s|$ increases, the lower bound of the reform bandwidth falls. In conclusion, for any b', b'' such that b'' is more far from θ_s than b', the reform band given by b' is included in reform band given by b''.

Proof of Proposition 10. Given the public's strategy $(\alpha(s), \alpha(r)) = (1, 1)$, the expert of any type does not have any incentive to distort her recommendation. Thus, she truthfully recommends her signal. Then, by the same reason as in the no electoral incentive case, the public's best response is following the expert's recommendation. This type of equilibrium is supported only when challenger-type belief π is lower than expert-type posterior after observing s under no electoral incentive.

Given the public's strategy $(\alpha(s), \alpha(r)) = (0, 1)$, the public's best response requires that either the L-type expert recommends s or no expert recommends s. If no expert chooses s, s becomes the off-the-equilibrium path, so expert always recommends r regardless of her type and private signal. Then, since the recommendation is totally uninformative about the state of the world, the public chooses s following his ex-ante expectation. Also, the public's expert-type belief remains the same at p, so he does not change the advisor unless $\pi > p$.

Now, if the L-type expert recommends s, then the expert recommends over-experimentation. Now, importantly, the L-type expert's incentive compatibility requires that the public follows the expert's recommendation. Suppose that the public chooses s after receiving recommendation r. Then, the L-type expert has a profitable deviation by recommending r, since the trade-off between flow utility from policy choice and electoral incentive is now resolved due to the public's disobedience. Likewise, if the public chooses r after observing s, the L-type expert cannot maximize her flow utility in the first period, so the only choice is to recommend r and get electoral benefit. Therefore, for the separation equilibrium requires the obedience constraint.

Obedience constraint is $EU_{pub}[r|r] > EU_{pub}[s|r]$ and $EU_{pub}[s|s] > EU_{pub}[r|s]$.

$$
\begin{aligned}
EU_{pub}[r|r] &= \int_{l(B_H)}^{h(B_H)} \left[-\left(\frac{h_0 m_r + h_1 \sigma_{H1}}{h_0 + h_1} \right)^2 - \frac{1}{h_0 + h_1} \right] f(\sigma_{H1}) d\sigma_{H1} \\
EU_{pub}[s|r] &= -\theta_s^2
\end{aligned}
$$

where $h(B_H) = -\frac{h_0}{h_1} m_r + \sqrt{\left(\frac{h_0}{h_1} + 1\right)^2 (\theta_s^2 + B_H) - \frac{1}{h_1}\left(\frac{h_0}{h_1} + 1\right)}$ and

$l(B_H) = -\frac{h_0}{h_1}m_r - \sqrt{\left(\frac{h_0}{h_1}+1\right)^2(\theta_s^2+B_H) - \frac{1}{h_1}\left(\frac{h_0}{h_1}+1\right)}$. Then, we get

$$\begin{aligned}
\frac{\partial EU_{pub}[r|r]}{\partial B_H} =& \left[-\left(\frac{h_0 m_r + h_1 h(B_H)}{h_0+h_1}\right)^2 - \frac{1}{h_0+h_1}\right] f(h(B_H))h'(B_H) \\
&- \left[-\left(\frac{h_0 m_r + h_1 l(B_H)}{h_0+h_1}\right)^2 - \frac{1}{h_0+h_1}\right] f(l(B_H))l'(B_H) \\
=& -(\theta_s^2 + B_H)(f(h(B_H))h'(B_H) - f(l(B_H))l'(B_H)) \\
=& -(\theta_s^2 + B_H)(f(h(B_H)) + f(l(B_H)))h'(B_H) \\
<& 0,
\end{aligned}$$

where the third equality comes from $l'(B_H) = -h'(B_H)$ and the last inequality is due to $h'(B_H) > 0$ for any $B_H \geq 0$. Also, we know that when $B_H = 0$, $EU_{pub}[r|r] > EU_{pub}[s|r]$. Finally,

$$\begin{aligned}
\lim_{|B_H|\to\infty} EU_{pub}[r|r] =& \int_{-\infty}^{\infty} \left[-\left(\frac{h_0 m_r + h_1\sigma_{H1}}{h_0+h_1}\right)^2 - \frac{1}{h_0+h_1}\right] f(\sigma_{H1})d\sigma_{H1} \\
=& -m_r^2 - \frac{1}{h_0} \\
<& -\theta_s^2 \\
=& EU_{pub}[s|r].
\end{aligned}$$

Combining above results, there exists a unique $\hat{B}$ such that the public follows the recommendation r if and only if $B_H < \hat{B}$.

Now, we check the obedience for recommendation s.

$$\begin{aligned}
EU_{pub}[s|s] =& -\theta_s^2 \\
EU_{pub}[r|s] =& p\int_{[l(B_H),h(B_H)]^c} \left[-\left(\frac{h_0 m_r + h_1\sigma_{H1}}{h_0+h_1}\right)^2 - \frac{1}{h_0+h_1}\right] f(\sigma_{H1})d\sigma_{H1} \\
&+ (1-p)\left(-m_r^2 - \frac{1}{h_0}\right) \\
<& p\left(-m_r^2 - \frac{1}{h_0}\right) + (1-p)\left(-m_r^2 - \frac{1}{h_0}\right) \\
=& -m_r^2 - \frac{1}{h_0}.
\end{aligned}$$

Thus, $EU_{pub}[s|s] = -\theta_s^2 > -m_r^2 - \frac{1}{h_0} > EU_{pub}[r|s]$. Therefore, the public follows the recommendation s regardless of the value of B_H. In conclusion, the obedience constraint to support the separation equilibrium is $B_H < \hat{B}$.

Now, suppose $(\alpha(s), \alpha(r)) = (1, 0)$. Then, the public's best-response requires that L-type recommends with at least satisfying $P_L(r) > P_H(r)$. However, L-type's incentive compatibility requires that L-type always recommends s, which is contradiction. $(\alpha(s), \alpha(r)) = (0, 0)$ is also ruled out by the public's best-response condition, since the public's expert-type belief jumps to 1 after receiving recommendation r. The discontinuous jump in belief is because the expert has no incentive to distort her recommendation due to the ruthless impeachment rule.

Concrete representation of B_H and B_L. Denote τ-type incumbent's second period flow utility from choosing policy a as $u_\tau^2(a)$.

$$
\begin{aligned}
u_H^2(H) =& u_H^2(r)I\{u_H^2(r) > u_H^2(s)\} + u_H^2(s)I\{u_H^2(r) < u_H^2(s)\} \\
u_H^2(L) =& u_H^2(r)I\{u_L^2(r) > u_L^2(s)\} + u_H^2(s)I\{u_L^2(r) < u_L^2(s)\} \\
u_H^2(r) =& \int_{[l(b_H), h(b_H)]} \left[-\left(\frac{h_0 m_r + h_1 \sigma_{H2}}{h_0 + h_1} - b_H \right)^2 - \frac{1}{h_0 + h_1} \right] f(\sigma_{H2}) d\sigma_{H2} \\
u_H^2(s) =& \int_{[l(b_H), h(b_H)]^c} -(\theta_s^2 - b_H)^2 f(\sigma_{H2}) d\sigma_{H2} \\
u_L^2(r) =& -m_r^2 - \frac{1}{h_0} \\
u_L^2(s) =& -\theta_s^2 \\
h(b_H) =& \left(b_H + \sqrt{(\theta_s - b_H)^2 - \frac{1}{h_0 + h_1}} \right) \left(\frac{h_0}{h_1} + 1 \right) - \frac{h_0}{h_1} m_r \\
l(b_H) =& \left(b_H - \sqrt{(\theta_s - b_H)^2 - \frac{1}{h_0 + h_1}} \right) \left(\frac{h_0}{h_1} + 1 \right) - \frac{h_0}{h_1} m_r
\end{aligned}
$$

where f is the probability density function of the Gaussian distribution with mean m_r and variance $\frac{1}{h_0} + \frac{1}{h_1}$. The above specifications reveal that $u_H^2(H) > u_H^2(L)$, so $B_H > B$. More importantly, B_H does not depend on the first-period policy choice, so we can consider B_H to be a constant.

One thing to note is that it is unclear whether $u_L^2(L) > u_L^2(H)$ or not. For example, in our baseline setting where $b_H = b_L = 0$, $u_L^2(L) < u_L^2(H)$ holds and $B < B_L$. Then, $B_L < B_H$ holds, thereby making the degree of over-experimentation more severe. However, the introduction of bias can result in $B > B_L$, which makes the relation between B_H and B_L unclear and even the relation can be reversed.

References

Ashworth, S. (2012). Electoral Accountability: Recent Theoretical and Empirical Work. *Annual Review of Political Science 15*, 183–201.

Bergemann, D. and U. Hege (1998). Venture capital financing, moral hazard, and learning. *Journal of Banking & Finance 22*(6-8), 703–735.

Bowen, R., J. M. Chan, O. Dube, and N. Lambert (2016). Reform fatigue. *Working Paper*.

Canes-Wrone, B., M. C. Herron, and K. W. Shotts (2001). Leadership and Pandering: A Theory of Executive Policymaking. *American Journal of Political Science 45*(3), 532–550.

Hörner, J. and L. Samuelson (2013, December). Incentives for experimenting agents. *The RAND Journal of Economics 44*(4), 632–663.

Hwang, I. (2021). Policy experimentation with repeated elections. *Working Paper*.

Manso, G. (2011). Motivating Innovation. *The Journal of Finance 66*(5), 1823–1860.

Maskin, E. and J. Tirole (2004, August). The Politician and the Judge: Accountability in Government. *American Economic Review 94*(4), 1034–1054.

Prat, A. (2005). The Wrong Kind of Transparency. *The American Economic Review 95*(3), 862–877.