Electoral Gambles: Why Politicians Choose Risky Policies

Maxime Cugnon de Sévricourt

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Abstract

We extend a standard two-period electoral accountability model with two types of politicians by allowing incumbents to choose not only the mean but also the variance of policy outcomes. Without electoral incentives, both types prefer the lowest variance. We show that when the value of holding office is high enough, however, the low type may strategically increase variance to raise the chance of re-election, at the expense of voter welfare. This goes against the usual responsiveness result that higher office benefit provides incentives for low-type incumbents to behave in the best interest of the voters. This has implications both in terms of institutional design and in terms of empirical predictions.

1 Introduction

Policy outcomes are inherently uncertain. The consequences of a reform are often hard to forecast because they depend on complex social and economic interactions. A decrease in interest rate can stimulate investment and growth, or may backfire and overheat the economy and fuel inflation. A foreign intervention may deter aggression or unintentionally trigger escalation (Hood, 2023). Well-intentioned education or health reforms can sometimes have adverse consequences (Gugglberger, 2018).

In addition, politicians often face multiple ways to pursue a goal that differ not only in expected payoff but also in the dispersion of outcomes. A government can choose a safer reform with predictable effects or a bolder program whose consequences are harder to forecast because the policy is novel, implementation is complex, or external reactions are uncertain. Voters typically observe realized outcomes, not the underlying policy's risk profile, and must infer what future performance would look like from noisy signals.

Representative democracy, on the other hand, rely on elections to incentivize politicians and screen the competent ones. If politicians differ in how aligned they are with voter interests, voting can screen for better types and can also shape incentives. A standard result in political economy is *responsiveness*: stronger re-election concerns push incumbents to choose actions closer to what voters prefer (Duggan and Martinelli, 2017). That result is derived in models where the incumbent chooses a single action that shifts the mean of an observable outcome.

This paper asks whether responsiveness survives once the riskiness of policy is itself a choice. When politicians can adjust both the mean level and the riskiness of outcomes, re-election incentives may influence not only how hard they try but also how much risk they take. The key question is whether forward-looking electoral discipline induces prudence or, on the contrary, whether it induces incumbent politicians to "gamble". To this end, we extend a model of electoral accountability in the lineage of Barro (1973) and Ferejohn (1986). In this type of model, an incumbent politician chooses an effort level, which determines the mean of a policy outcome that the voters care about. The voters do not observe the effort level, only the realized policy outcome. They decide to re-elect the incumbent if the policy outcome provides them with evidence they should re-elect her.

Moving beyond the standard one-dimensional model, we introduce a second dimension to the choice of a politician. More precisely, we assume that the incumbent can choose not only the mean, but also the riskiness of the policy outcome, which we model as the variance of said outcome. In practice, the policy outcome can be thought of as economic output, employment, or the provision of a public good that voters care positively about, and over which politicians exert some control. Choosing the variance of the policy outcome can then be interpreted as selecting a more or less unconventional policy. We assume that, in the absence of re-election concerns, the politicians themselves strictly prefer to adopt less risky strategies. We show that electoral incentives can sometimes induce the low-type politician to choose a riskier policy than they would otherwise prefer, leaving the voters strictly worse off.

The idea of this paper is relatively straightforward. Consider an incumbent politician facing the following problem: she chooses an effort level $x \geq 0$ and a risk level $\sigma \geq \underline{\sigma} > 0$, but the voters only observe a noisy signal y drawn from a normal distribution with mean x and variance σ^2. Voters prefer a high level of y, and are risk-averse. Therefore, all else equal, they prefer a low variance. Assume moreover that they follow a simple retrospective rule: they decide to re-elect the incumbent if and only if y is above some exogenous threshold τ. Furthermore, assume that the politician cares about the welfare of the voters, but also cares about being re-elected. Moreover, she faces a concave cost of effort, and dislikes risk. Because of the threshold nature of the rule, conditional on choosing an effort level greater than τ, the optimal choice of variance is $\sigma = \underline{\sigma}$ as she dislikes risks, and this maximizes the probability that y is above the threshold. Conditional on choosing $x < \tau$ however, any increase in σ would put more weight in the tails of the distribution, and so would increase her probability of re-election. She therefore faces a trade-off: a higher σ means more risk, which she inherently dislikes, but it also increases her probability of re-election.

The main contribution of the paper is to show that this intuition, developed in a decision-theoretic model, carries over once we endogenize the response of the voters. We consider a two-period model of electoral accountability between an incumbent politician, a challenger and the voters. We assume that there are two types of incumbents. In the second period, if elected, a high-type politician always chooses a policy that the voters strictly prefer, giving incentives for the voters to screen off the type of the incumbent. Because voters cannot commit to re-electing a politician upon observing a specific outcome, sequential rationality does not pin down the behavior of the voters in a model of electoral accountability without adverse selection. To generate retrospective voting, we need a reason for the voters to decide not to re-elect the Incumbent, hence the types.

The difficulties inherent to this setup are well-known (see Duggan and Martinelli, 2017 for more details on how different authors address them). The first problem is that the objective function need not be concave for all values of the parameters. This has two implications: a pure-strategy equilibrium is not guaranteed to exist for all parameter values, and even when it does exist, it may not be unique. The second difficulty arises when trying to prove existence of mixed strategy equilibria. Because the set of mixed strategies ordered by type is not convex, usual fixed point theorems including Glicksberg's or Kakutani's are of no help. Duggan and Martinelli (2020) come up with a clever idea: by imposing assumptions that guarantee that the incumbent's maximization problem admits at most two solutions, they can show that the best-response correspondences are contractible-valued and can therefore prove existence of a mixed-strategy equilibrium using the Eilenberg-Montomery fixed point theorem.

However, their assumptions are not easily transposed to the case where the politician has two dimensions of choice. Consequently, we focus on pure strategy equilibria. Under our assumptions, we show that existence of a pure strategy equilibrium is guaranteed as long as the office holding benefit is not too high. Furthermore, we show that the pure strategy equilibria are only of two types: either both types of politicians play a low variance in the first period, or only the low type plays a high variance. This is consistent with our intuition from the decision-theoretic model above, but the result requires substantially more assumptions once we introduce game theoretic considerations. One particular assumption, Assumption 4, requires that the high type is more risk-averse than the low type, even at a higher effort level.

Because of the way the mean and the variance of a distribution interacts, it is particularly hard to give comparative statics for this model. While we know that when the office holding benefit is close to 0, the only pure strategy equilibrium features both types choosing a low effort and low variance, there is no guarantee in general that the choice of variance by the low type is nondecreasing as office holding benefits increase. Under an additional assumption, we show that within the class of pure-strategy equilibria, the more office-motivated politicians are, the more likely they are to take on additional risk.

This paper is structured as follows: Section 2 places our contribution in the existing literature on political accountability. Section 3 introduces the model and the main results. In Section 4, we discuss comparative statics of our model, and its implications both empirically and in terms of institutional design. Finally, we conclude in Section 5.

2 Related Literature

This paper contributes to the extensive literature on electoral accountability, which traces back to the seminal works of Barro (1973) and Ferejohn (1986). Both develop infinite-horizon models of re-election in what later became known as the rent-seeking environment. In this setting, a politician controls the provision of a public good that voters value equally but may underprovide it to increase her own private utility. While Barro (1973) assumes a perfect monitoring environment, Ferejohn (1986) focuses on the moral hazard problem that arises when the action of the politician is not perfectly observable by the voters. In the same lineage, Banks and Sundaram (1993, 1998) study a moral hazard model where agents with identical preferences are short-lived but the principal lives forever. Reed (1994) introduces adverse selection by adding different types of politicians in a two-period political accountability model. He studies the implications of a model combining both moral hazard and adverse selection. However, this early literature focuses on retrospective voting rules, rather than assuming the voter's strategy satisfy sequential rationality.

Our model is closer in spirit to more recent approaches that replace retrospective voting rules with fully specified equilibrium frameworks. For instance, Berganza (2000) studies the stationary Perfect Bayesian Equilibria of an infinite-horizon electoral accountability model with only two types. However, to keep the model tractable, he assumes that the incumbent politician's effort is a binary variable that is calls diligence. Fearon (1999) studies another variation to keep the analysis feasible: rather than assuming that the policy outcome is random, he assumes the randomness enters at the level of the voter's utility. Ashworth (2005) studies a three-period model, based on the career concern model of Holmström (1999), with both moral hazard and symmetric learning about candidate ability, meaning that candidates do not know their own types. By contrast, our model includes two continuous choice variables: the effort level, a continuous analogue to diligence in Berganza (2000), and the riskiness of the policy. Moreover, randomness arises at the level of policy outcomes, and politicians know their own types, giving rise to adverse selection.

Applications of electoral accountability models often involve information asymmetries between voters and politicians. One prominent strand is the literature on *pandering*, which studies situations where incumbents possess private information about the state of the world. When voters cannot observe this information, incumbents may choose policies that align with voters' prior beliefs rather than with their private signals, even when doing so is inefficient. Key contributions include Canes-Wrone et al. (2001), Maskin and Tirole (2004), and Acemoglu et al. (2013), as well as more recent work by Prat (2005), Fox and Shotts (2009), Fox and Van Weelden (2012), and Morelli and Van Weelden (2013). Additionally, Chapter 3 of Besley (2007) presents a simplified version of this framework in which the incumbent observes a binary state of the world at the beginning of her term. Congruent incumbents prefer actions that match the state (and hence voter preferences), whereas dissonant incumbents prefer not to do so.

A closely related literature studies *policy experimentation*. Majumdar and Mukand (2004) analyze a setting where a newly elected government chooses between maintaining the status quo and implementing a new, uncertain policy. In their framework, the incumbent can learn from the policy outcome and potentially reverse course. They show that reputational concerns may lead low-ability politicians to forgo experimentation when it would be optimal, or to persist in bad policies when reversal would be desirable. Empirically, Bernecker et al. (2021) find support for this theory using data on US governors experimentation from 1978 to 2007.

Our model differs from both the pandering and policy experimentation literatures in that politicians are not better informed than voters. The inefficiency arises purely from a moral-hazard problem: since voters cannot observe the incumbent's actions, low-type politicians have an incentive to take on excessive risk. Moreover, because voters cannot commit to a re-election rule *ex ante*, they are further constrained in their ability to discipline such behavior.

The political-cycle literature is also tightly connected to electoral accountability. While the early work of Nordhaus (1975), Lindbeck (1976) and Hibbs (1977) focused on myopic voters, models with rational voters have since been developed (Alesina, 1988; Rogoff and Sibert, 1988; Persson and Tabellini, 1990; Rogoff, 1990). These models focus on the idea that electoral incentives can lead politicians to affect economic variables prior to elections. Several reviews of the literature are available: Persson and Tabellini (2000), Alesina et al. (1997), Drazen (2001) and Dubois (2016).

Most closely related to our work are the models studied by Duggan and Martinelli (2017) and Duggan and Martinelli (2020). The former paper synthesizes, contextualizes, and reviews much of the electoral accountability literature within a unified framework. The latter focuses on a two-period setting and, under additional assumptions, proves existence and characterizes the mixed-strategy equilibria of a general model with multiple politician types as the office-holding benefit tends to infinity. Our model departs from theirs by introducing riskiness of the policy as an endogenous choice variable for the politician. While we restrict attention to pure-strategy equilibria, our results suggest a reversal of the standard responsiveness result. In particular, Duggan and Martinelli (2020) show that as politicians become increasingly motivated by re-election, above-average types choose arbitrarily high actions and their re-election probability converges to one. By contrast, we show that—under specific assumptions and within the class of pure-strategy equilibria—increasing the office-holding benefit can induce low-type politicians to take on greater risk, thereby raising their probability of re-election.

The empirical evidence broadly supports the predictions of the theoretical literature on electoral accountability. In the U.S. context, governors spend more and raise more taxes when they are not subject to re-election (Besley and Case, 1995, 2003; Alt et al., 2011). In Brazil, Ferraz and Finan (2011) find that mayors who cannot be re-elected tend to be more corrupt than those who can. Structural models have also been estimated to quantify the effects of re-election incentives on politicians' behavior, as in Sieg and Yoon (2017). Aruoba et al. (2019) show that elections both discipline incumbents and improve selection by increasing the probability that high-type politicians are elected. For comprehensive reviews of the empirical literature, see Ashworth (2012) and Pande (2011).

Our paper is also related to the principal–agent literature. We have already discussed Holmström (1999) and Banks and Sundaram (1998). More recently, Chade and Swinkels (2024) studies the implications of adding a risk dimension to the standard principal–agent framework. As in our setting, the agent chooses not only her level of effort but also between a low-variance and a high-variance project. The main difference is that their analysis centers on the optimal contract designed by the principal, whereas we study an electoral setting in which voters cannot commit to a re-election rule. In addition, variance is a binary choice in their model but a continuous one in ours.

To the best of our knowledge, this paper is the first to analyze an electoral accountability model in which politicians choose both the mean and the variance of the policy outcome.

3 Model

In this section, we adapt a standard model of electoral accountability, similar to Duggan and Martinelli, 2017, by introducing a new dimension of choice for the incumbent politician: the riskiness of the policy she selects.

3.1 Set-Up

We consider a game with 3 players, the Incumbent, the Challenger and the Representative Voter[1] over the course of two time periods $t \in \{1, 2\}$. Before the game starts, Nature chooses the Incumbent's and Challenger's types. With probability $p \in (0, 1)$, the Incumbent is of type θ_H. Otherwise, she is of type $\theta_L < \theta_H$. The Challenger's type is independently drawn from the same distribution. Types are private information and unobserved by the other players.

At time $t = 1$, the Incumbent chooses a policy with two components: an effort level $x_1 \in \mathbb{R}_+$ and a level of risk $\sigma_1 \in [\underline{\sigma}, +\infty)$ where $\underline{\sigma} > 0$. A policy outcome $Y_1 \sim \mathcal{N}(x_1, \sigma_1^2)$ is realized.[2] The Voter observes the outcome Y_1, but not the policy chosen by the Incumbent. At the end of the period, the Representative Voter decides whether to re-elect the Incumbent or to elect the Challenger. At time $t = 2$, the winner of the election again selects a policy (x_2, σ_2). Another policy outcome is realized $Y_2 \sim \mathcal{N}(x_2, \sigma_2^2)$. The game ends and payoffs are realized.

The Voter has preferences over the policy outcomes: her per-period utility is given by $u : \mathbb{R} \to \mathbb{R}$. Her overall utility is given the sum of the per-period payoffs $u(Y_1) + u(Y_2)$.

The Incumbent's and Challenger's payoffs depend on the policy they choose while in office, on whether they got elected at the end of period 1, and on their types. More precisely, we assume that the payoffs of an Incumbent of type θ_I are given by:

$$w(x_1, \sigma_1|\theta_I) + \Pr(\text{Voter re-elects Incumbent}|x_1, \sigma_1)\,(\beta + w(x_2, \sigma_2|\theta_I))$$

where $w : \mathbb{R}_+ \times \mathbb{R}_{++} \to \mathbb{R}$ represents the Incumbent's *intrinsic preferences* over policies, and $\beta \geq 0$ captures the perceived benefits of holding office, sometimes referred to as "the spoils of office" or "ego rents".

Similarly, the payoffs of a Challenger of type θ_C are given by:

$$\Pr(\text{Voter elects the Challenger}|x_1, \sigma_1)\,(\beta + w(x_2, \sigma_2|\theta_C))$$

Implicit in these preferences is the assumption that both the Challenger and the Incumbent are indifferent about the policy that gets implemented when out of office. In addition, we make the following assumptions on the politicians' preferences.

Assumption 1. *w is twice continuously differentiable in (x, σ).*

Assumption 1 is purely technical and enables the use of the first-order and second-order conditions to study the best-response of the politicians.

Assumption 2. *For each σ and each θ, w is strictly concave in x, that is $w_{xx} < 0$. In addition, $w_x(0, \underline{\sigma}; \theta_L) > 0$ and $\lim_{x\to\infty} w_x(x, \underline{\sigma}; \theta_L) = -\infty$.*

[1]We adopt the fiction of a Representative Voter purely as a matter of convenience. We would consider any number of voters instead. We only need the voters to behave as if they are pivotal, and thus cast their votes for their preferred candidate.

[2]The normality assumption is not strictly necessary. Our analysis extends to any family of symmetric distributions that (i) satisfies the monotone likelihood ratio property for a given risk level, and (ii) for which the likelihood ratio between any two distributions in the family crosses one at most twice. For instance, our results apply to all common families of symmetric exponential distributions.

Assumption 2 ensures that for a given variance, each type of politician has a unique effort level that maximizes their intrinsic preferences. We can thus denote this effort level by $\hat{x}(\sigma, \theta)$. Formally, $\hat{x}(\sigma, \theta) \equiv \arg\max_{x \in \mathbb{R}_+} w(x, \sigma; \theta)$. The second part of the assumption is an Inada-type condition. It ensures that the effort level that maximizes the low type's intrinsic utility at the minimum variance $\underline{\sigma}$ is interior, that is $\hat{x}(\underline{\sigma}, \theta) > 0$.

Assumption 3. *For each $x \in \mathbb{R}_+$ and each $\theta \in \Theta$, $w(x, \sigma; \theta)$ is strictly decreasing in σ.*

Assumption 3 implies that the politicians are risk-averse: all else equal, they always prefer a less risky policy over a risky one. Combined with Assumption 2, this implies that the policy that maximizes type θ's intrinsic preferences is $(\hat{x}(\underline{\sigma}, \theta), \underline{\sigma})$. Therefore, we can define $\hat{x}(\theta) \equiv \hat{x}(\underline{\sigma}, \theta)$ as $\hat{x}(\theta) = \arg\max_{\sigma > \underline{\sigma}} w(\hat{x}(\sigma, \theta), \sigma, \theta)$.

This assumption is justified insofar as our goal is to study how electoral incentives can push politicians to adopt riskier policies than they would otherwise prefer. If politicians intrinsically favored high-risk policies, observing risk-taking would be unsurprising. The assumption thus allows us to demonstrate that excessive risk-taking can emerge as an inefficiency inherent to electoral competition.

Assumption 4. *w is (weakly) supermodular in $(x, -\sigma, \theta)$. In addition, for all σ, w is **strictly** supermodular in (x, θ). In other words, $w_{x,-\sigma} \geq 0$, $w_{-\sigma,\theta} \geq 0$ and $w_{x,\theta} > 0$.*

Assumption 4 consists of two parts. First, because w is strictly supermodular in (x, θ), a high-type politician prefers a higher effort level compared to the low type. That is, for each σ, $\hat{x}(\theta_H, \sigma) > \hat{x}(\theta_L, \sigma)$, and in particular $\hat{x}(\theta_H) > \hat{x}(\theta_L)$. This part of the assumption is common in the literature (Duggan and Martinelli, 2017) and is indeed crucial. It is only because the Voter correctly anticipates that a high-type Incumbent would choose a higher effort level in the second period that they have incentives to screen the type of the Incumbent and only re-elect her if they are sufficiently convinced she is of a high type. In particular, we need the supermodularity in (x, θ) to be strict. Otherwise, if we had $\hat{x}(\theta_H) = \hat{x}(\theta_L)$, then the Voter would always be indifferent between electing a high-type or a low-type politician. As a result, politicians would always choose their intrinsically preferred policy in the first period.

Since our model introduces a new dimension of choice, the risk dimension, we need to specify how the types of politicians interact with their preferences over this new dimension of choice. We assume that the high type is more risk-averse than the low type in a strong sense: for a given effort level, the high type dislikes a marginal increase in the variance more than the low type. In addition, for a given type of Incumbent, she dislikes a marginal increase in the riskiness more the higher her effort level is. While strong, this assumption is needed to rule out counterintuitive equilibria. Without it, there could exist equilibria in which the high type chooses both a higher effort level and a higher variance compared to the weak type. Because we think of high-type Incumbent as more aligned with voters' preferences, this type of equilibrium strikes us as implausible. Such an equilibrium, where the high-type Incumbent plays a high risk level, would require that the voters re-elect the Incumbent when they see extreme outcomes, that is when they see very high values as well as very low values of the outcome, which seems counterintuitive.

While Assumption 4 rules out, as shown in Section 3.3, equilibria in which the high type chooses a high risk level, its symmetric counterpart would not guarantee the converse, that only the high type selects high risk. If instead w were supermodular in (x, σ, θ), the low type could still choose a high level of risk. This is because the low type faces a trade-off between the intrinsic disutility of risk and the higher probability of re-election, and for sufficiently large β, the latter effect may dominate. Overall, imposing Assumption 4 helps restrict the set of possible equilibria and rules out counterintuitive configurations.

Assumption 5. *We normalize the maximum of w to 0, that is $w(\hat{x}(\theta), \underline{\sigma}, \theta) = 0$.*

The normalization in Assumption 5 has two main implications. On the one hand, both types always weakly prefer to be re-elected. Indeed, if we had that $w(\hat{x}(\theta), \underline{\sigma}, \theta) < 0$ for some type θ, then, for some β low enough, a politician of type θ would prefer not to be re-elected. Since both types of politicians care about re-election, they will exert a higher effort than their ideal level. The second implication is that both types of politicians care about re-election as strongly as each other. It simplifies the equilibrium characterization, and will matter when we derive first-order conditions.

Assumption 6. *u is strictly increasing and strictly concave.*

The voters' preferences are straightforward: they prefer a higher level of policy outcome and a lower level of risk, all else equal. The assumption that voters have common preferences over a public good is referred to in the political accountability literature as the rent-seeking environment (see, for instance, Duggan and Martinelli (2017)). Examples of policy outcomes we have in mind are GDP, employment, or the inverse of crime rates and hospitalizations. Note that we could weaken Assumption 6: we only need that, in the second period, absent re-election incentives, the high-type Incumbent selects a policy that the Voter prefers to what the low-type Incumbent would select. This is true as long as $\mathbb{E}(u(Y)|\hat{x}(\theta_H), \underline{\sigma}) > \mathbb{E}(u(Y)|\hat{x}(\theta_L), \underline{\sigma})$. We choose to maintain Assumption 6 for its plausibility if we think of y as a public good, and for its simplicity when it comes to welfare analysis.

3.2 Equilibrium Definition

We now turn to the equilibrium definition. First, we need to define strategies. In period 1, the Incumbent can condition her choice of policy only on her own type. A period 1 pure strategy for the Incumbent, s_1, is therefore a mapping from types to the space of feasible policies:

$$s_1 : \Theta \to \mathbb{R}_+ \times [\underline{\sigma}, +\infty).$$

For type $\theta_j \in \{\theta_L, \theta_H\}$ we write:

$$s_1(\theta_j) = (x_j, \sigma_j),$$

with x_j denoting the effort level and σ_j the risk level of the policy the Incumbent selects.

In period 2, the Incumbent may also condition her policy choice on the realization of the period 1 outcome:

$$s_2 : \Theta \times Y \to \mathbb{R}_+ \times [\underline{\sigma}, +\infty).$$

At the beginning of period 2, the elected Challenger is in a similar position to the Incumbent. Thus, a pure strategy for the Challenger is a mapping:

$$s_C : \Theta \times Y \to \mathbb{R}_+ \times [\underline{\sigma}, +\infty).$$

For the Voter, a pure strategy is a mapping from the set of policy outcomes to the re-election decision:

$$\rho : \mathbb{R} \to \{0, 1\},$$

where $\rho(y) = 0$ means the Challenger is elected if y occurs whereas $\rho(y) = 1$ means the Incumbent is re-elected. A belief system for the Representative Voter is a mapping from realized policy outcomes to a probability distribution over types:

$$\mu : \mathbb{R} \to \Delta(\Theta).$$

Definition 1. A *pure strategy Perfect Bayesian Equilibrium* (PBE) consists of a pure strategy for each player and a belief system for the voters, $(s_1, s_2, s_C, \rho, \mu)$, such that:

- s_1, s_2, s_C, ρ are sequentially rational given the strategies of the other players and beliefs μ.
- μ is consistent with s_1, i.e. it is derived via Bayes's rule.[3]

A *pooling equilibrium* is a pure strategy PBE in which both types of Incumbent choose the same strategy in the first period: $s_1(\theta_H) = s_1(\theta_L)$. A *separating equilibrium* is a pure strategy PBE in which both types of Incumbent choose distinct strategies in the first: $s_1(\theta_H) \neq s_1(\theta_L)$.

Sequential rationality for the Incumbent and Challenger imposes that in the final period of the game the elected politician will choose her intrinsically most preferred policy: in period 2, a politician of type θ implements $(\hat{x}(\theta), \underline{\sigma})$, and thus, receives a re-election payoff of $w(\hat{x}(\theta), \underline{\sigma}) + \beta = \beta$ by Assumption 5. By Assumption 6, the Voter prefers higher effort x and therefore prefers to elect a high-type politician. This, in turn, gives the Incumbent an incentive to exert more effort in the first period than she would otherwise prefer.

Since each strategy chosen by the Incumbent induces a distribution with full support on $\mathbb{R}$, Bayes's rule uniquely determines the Voter's beliefs for every outcome. Hence we will omit explicit reference to beliefs in what follows. Combined with sequential rationality, this implies that in any PBE, for every $y \in \mathbb{R}$:

$$f(y \mid x_H, \sigma_H) > f(y \mid x_L, \sigma_L) \quad \Rightarrow \quad \rho(y) = 1,$$

$$f(y \mid x_H, \sigma_H) < f(y \mid x_L, \sigma_L) \quad \Rightarrow \quad \rho(y) = 0,$$

where $f(\cdot \mid x, \sigma)$ is the pdf of the normal distribution with mean x and variance σ^2. In words, sequential rationality and consistency jointly determine the Voter's action whenever the two types assign different likelihoods to an outcome: if an outcome y is more likely if the Incumbent is of high type rather than low type, then the Voter will choose to re-elect the Incumbent.

However, whenever $f(y \mid x_H, \sigma_H) = f(y \mid x_L, \sigma_L)$, the Voter is indifferent. For instance, in a pooling equilibrium, i.e. when $(x_H, \sigma_H) = (x_L, \sigma_L)$, for every outcome $y \in \mathbb{R}$, the voter is indifferent between re-electing the Incumbent or electing the Challenger. One possible

[3] In addition, we assume measurability of strategies and beliefs whenever necessary, without further mention.

strategy for the Voter would be to re-elect the Incumbent if and only if y is, say, a rational number. We will see in the next section that pooling equilibria are ruled out by Assumption 4.

Since f is the pdf of the normal distribution, distinct strategies $(x_H, \sigma_H) \neq (x_L, \sigma_L)$ imply that the equation:

$$f(y \mid x_H, \sigma_H) = f(y \mid x_L, \sigma_L)$$

has either one or two solutions. We refer to such solutions as *cutoff points*, since they are the policy outcomes at which the Voter is indifferent between re-electing the Incumbent or choosing the Challenger.

If both types choose the same variance ($\sigma_H = \sigma_L$), then the monotone likelihood ratio property guarantees a unique cutoff point. By symmetry of the normal distribution, this cutoff point is then given by:

$$y^* = \tfrac{1}{2}(x_H + x_L).$$

If $x_L < x_H$, then the re-election region is $[y^*, +\infty)$, as shown in Figure 1(a). Otherwise, the re-election region is $[-\infty, y^*)$ (see Figure 1(b)).

If instead the two types choose different variances ($\sigma_H \neq \sigma_L$), then there are two cutoff points, which divide the support of outcomes into regions where the Voter strictly prefers one candidate over the other. If the high type chooses a lower variance, then the re-election region is an interval that includes x_H, as exemplified in Figure 2(b). Otherwise, if the low type chooses a lower variance, then the re-election region is the union of two intervals that covers all of $\mathbb{R}$ except for an interval that contains x_L (see Figure 2(a)).

Let

$$Y^*(s_L, s_H) \equiv \{y \in \mathbb{R} : \rho(y) = 1\} = \left\{ y \in \mathbb{R} : \frac{f(y; x_H, \sigma_H)}{f(y; x_L, \sigma_L)} \geq 1 \right\}$$

be the re-election region, i. e. the set of policy outcomes such that the Voter decides to re-elect the Incumbent upon observing said outcome. The previous observations imply that Y^* is either an interval $[a, b]$ where $a, b \in \bar{\mathbb{R}}$, or the complement of such an interval, and it is bounded in the case that $\sigma_L > \sigma_H$ and unbounded otherwise. Note that $Y^*(s_L, s_H)$ depends on the strategies of both types Incumbents. However, when considering potential deviations, the Incumbent treats the re-election region as fixed. Hence, we omit its arguments whenever doing so simplifies notation more.

Building on the preceding analysis, we can write the type-θ Incumbent's maximization problem as:

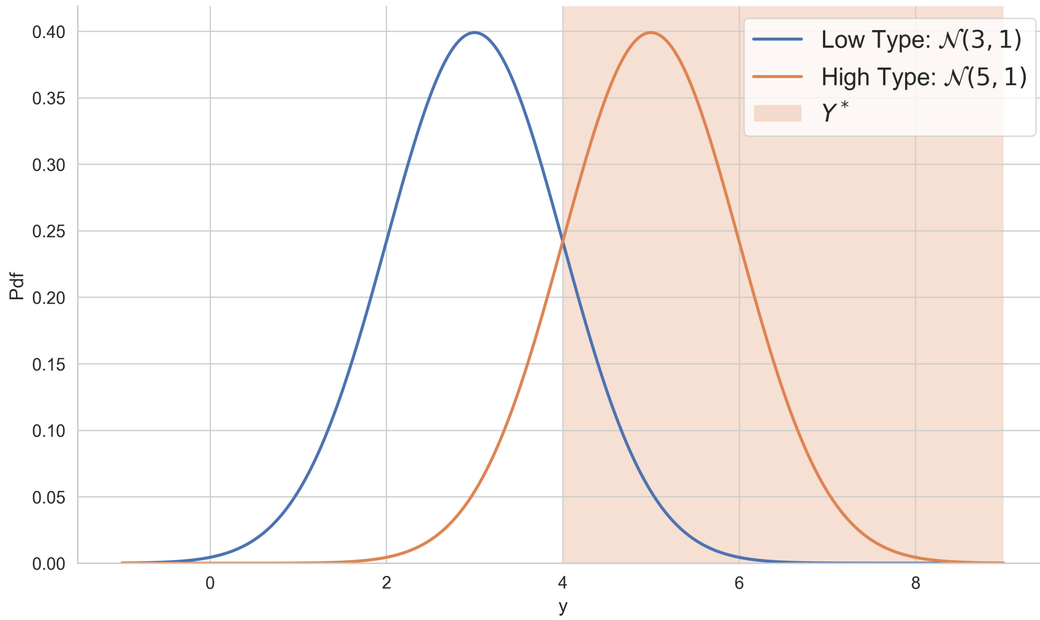
$$\max_{x \in \mathbb{R}_+,\ \sigma > \underline{\sigma}} \ w(x, \sigma; \theta) + \beta \Pr(y \in Y^* | x, \sigma). \tag{1}$$

For convenience, let $\pi_{Y^*}(x, \sigma) = \Pr(y \in Y^* \mid x, \sigma)$ and $U_\theta(x, \sigma) = w(x, \sigma; \theta) + \beta\, \pi_{Y^*}(x, \sigma)$. Note that π_{Y^*} is an equilibrium object, as it depends on Y^* and thus on both types' strategies. Once more, for ease of notation, and because each type treats Y^* as fixed when considering deviations, we omit Y^* as an argument of π_{Y^*} when doing so causes no confusion.

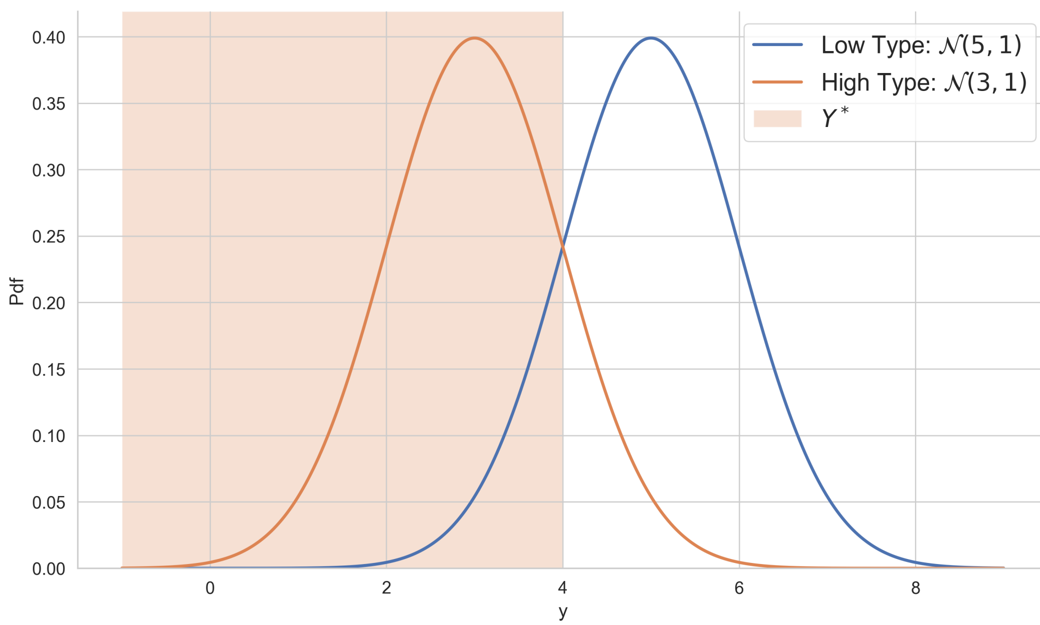
Ignoring the boundary case where $x_\theta = 0$,[4] the first-order conditions are given by:

$$w_x(x, \sigma; \theta) + \beta \pi_x(x, \sigma) = 0, \tag{2}$$
$$w_\sigma(x, \sigma; \theta) + \beta \pi_\sigma(x, \sigma) \leq 0, \tag{3}$$

[4]We will show in the next section that this case is impossible in equilibrium.

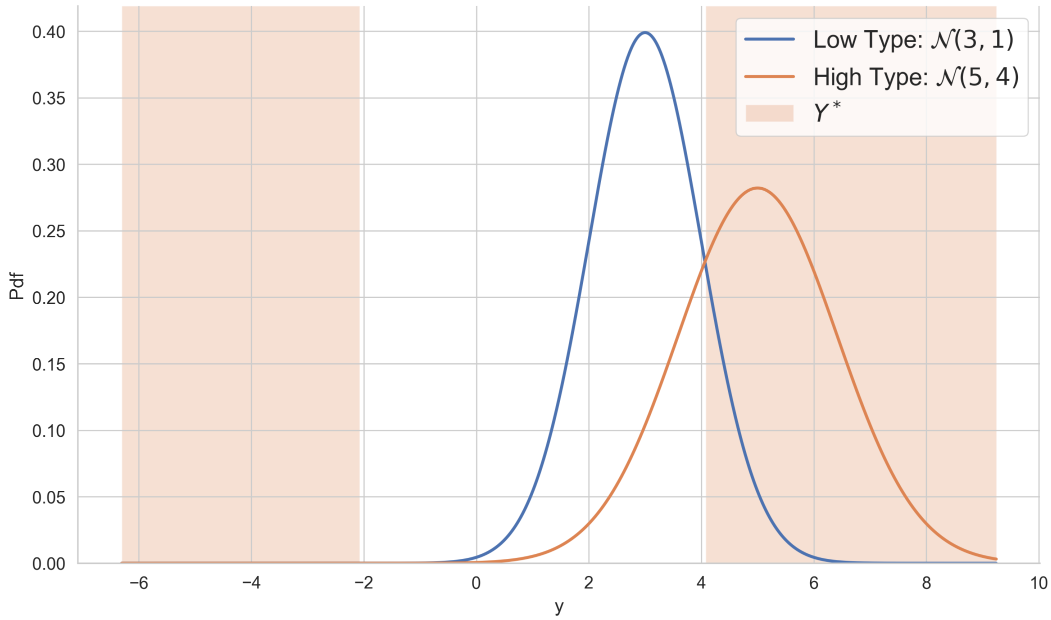


((a)) Shape of Re-election Region when $x_L < x_H$.

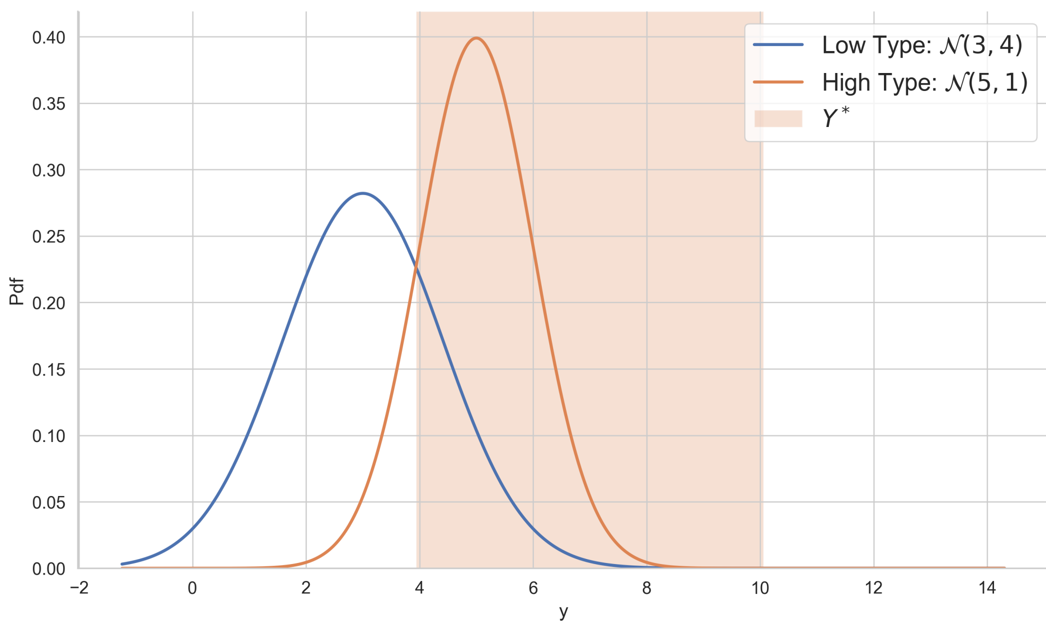


((b)) Shape of Re-election Region when $x_L > x_H$.

Figure 1: Possible Shapes of Re-election Region when $\sigma_H = \sigma_L$.



((a)) Shape of Re-election Region when $\sigma_H > \sigma_L$



((b)) Shape of Re-election Region when $\sigma_L > \sigma_H$

Figure 2: Possible Shapes of Re-election Region when $\sigma_L \neq \sigma_H$.

where (3) holds with equality if $\sigma > \underline{\sigma}$.

Let the Hessian at (x, σ) be

$$H(x,\sigma) = \begin{pmatrix} U_{\theta,xx} & U_{\theta,x\sigma} \\ U_{\theta,x\sigma} & U_{\theta,\sigma\sigma} \end{pmatrix} = \begin{pmatrix} w_{xx} + \beta\,\pi_{xx} & w_{x\sigma} + \beta\,\pi_{x\sigma} \\ w_{x\sigma} + \beta\,\pi_{x\sigma} & w_{\sigma\sigma} + \beta\,\pi_{\sigma\sigma} \end{pmatrix}.$$

For an interior solution, a strict local maximum requires $H(x, \sigma)$ negative definite, which for a 2×2 matrix is equivalent to:

$$U_{\theta,xx}(x,\sigma) = w_{xx}(x,\sigma;\theta) + \beta\,\pi_{xx}(x,\sigma) < 0, \tag{4}$$

$$\det H(x,\sigma) = \Big(w_{xx} + \beta\,\pi_{xx}\Big)\Big(w_{\sigma\sigma} + \beta\,\pi_{\sigma\sigma}\Big) - \Big(w_{x\sigma} + \beta\,\pi_{x\sigma}\Big)^2 > 0. \tag{5}$$

For a corner solution at $\sigma = \underline{\sigma}$, only (4) needs to hold.

3.3 Analysis

In this section, we study the existence and structure of pure-strategy equilibria of the model. For ease of exposition, the analysis unfolds sequentially: each proposition builds on top of the previous one, and together they lead to the paper's main theorem. For ease of exposition, we collect all the the proofs of the results in this section in Appendix A.

First, we note that, in any pure-strategy equilibrium, a marginal increase in the effort level of the Incumbent must have the same effect on the probability of re-election, regardless of type. Formally, we must have:

$$\pi_x(x_H, \sigma_H) = \pi_x(x_L, \sigma_L) \tag{6}$$

This fact can be seen graphically. Consider for instance an equilibrium of the type displayed in Figure 2(a). Here, $Y^* = [a, b]$, where a and b are the bounds of the re-election region. Thus, keeping Y^* fixed, increasing x_H shifts the pdf of the distribution to the right. The marginal change in the probability of re-election is thus equal to difference between the mass that enters the interval at the lower abound a, and the probability mass that exists the interval at the higher bound b. In other words,

$$\pi_x(x_H, \sigma_H, \theta_H) = f(a, x_H, \sigma_H) - f(b, x_H, \sigma_H).$$

Furthermore, a and b are cutoff points at which the Voter is indifferent between re-election the Incumbent or electing the Challenger, meaning that $f(a, x_H, \sigma_H) = f(a, x_L, \sigma_L)$ and $f(a, x_H, \sigma_H) = f(b, x_L, \sigma_L)$ and thus eq. (6) is true.

From the first-order condition with respect to x (eq. (2)), the marginal benefit from a higher probability of re-election of increasing x must equal the marginal disutility of effort for each type. Hence, in equilibrium, the marginal disutility from effort must be the same across types:

$$w_x(x_H, \sigma_H, \theta_H) = w_x(x_L, \sigma_L, \theta_L). \tag{7}$$

The first implication of eq. (7) is that there can be no pooling in equilibrium. Indeed, if the high-type and low-type Incumbents pooled, both types would have the same marginal disutility from effort levels. In turn, this would contradict the strict supermodularity of w in (x, θ) (Assumption 4). This observation leads to Proposition 1.

Proposition 1. *Under Assumptions 1-6, there can be no pooling in equilibrium.*

Let us now consider separating equilibria. The second implication of eq. (7) is that the high-type Incumbent always chooses a strictly higher effort level than the low-type Incumbent. To see this, assume the high-type plays a lower effect level compared to the low-type. There are two possible cases. First, the high type could be playing a variance equal or smaller than the low type's, that is $\sigma_H \leq \sigma_L$. But then, assuming that this optimal for the high-type Incumbent, this implies that the low-type Incumbent has a profitable deviation: by switching to the high type's strategy, she could reduce her effort, reduce the variance, and increase the probability she is re-elected.[5] Formally, because w is supermodular in $(x, -\sigma, \theta)$, we must have that $w_x(x_H, \sigma_H, \theta_H) > w_x(x_L, \sigma_L, \theta_L)$, a contradiction with eq. (7).

If, on the other hand, the high-type plays $\sigma_H > \sigma_L$, then the high-type is playing a policy that has a lower effort level, a higher variance and a higher probability of re-election than the low-type's. Assuming this is optimal for the high type Incumbent, the low type has a profitable deviation. Indeed, the low type dislikes effort more and, at a given effort level, she is less risk-averse than the high type. Finally, she would also increase her probability of re-election. Therefore, she prefers to deviate to the high type's policy and so this cannot be an equilibrium. These results are captured by Proposition 2:

Proposition 2. *Under Assumptions 1-6, in a pure strategy equilibrium, the high-type Incumbent always chooses an effort level x_H strictly higher than low-type's effort level x_L.*

Let us now turn to the question of whether the high-type politician can play a greater variance than the lowest variance, $\underline{\sigma}$. The answer turns out to be negative: the high-type politician will always choose $\sigma_H = \underline{\sigma}$ in equilibrium. While this is natural implication of the supermodularity assumption (Assumption 4), it is not completely straightforward. We know from Proposition 2 that the high-type politicians chooses a higher effort level, which means that we only have two kinds of equilibria to check: either the low-type Incumbent plays a variance greater or equal to the high type's, or it plays a strictly lower one.

The first case, $\sigma_L \geq \sigma_H > \underline{\sigma}$ is the easier one. In this case, the re-election region is an interval that contains x_H (as in Figure 2(b)), potentially unbounded (as in Figure 1(a)). But then, keeping Y^* fixed, any reduction in σ_H further increases the high type's probability of re-election. This follows from the fact that, for any interval I, if the mean of a normal distribution μ is in I, then the distribution that puts the most mass on I is the one with the lowest variance. Because politician are assumed to be risk-averse (Assumption 3), the high-type would therefore reduce the variance and so, if $\sigma_L > \sigma_H$, we must have $\sigma_H = \underline{\sigma}$.

The remaining case is more subtle: could we have an equilibrium in which the high type plays a high variance while the low type plays a low variance? This is not obviously ruled out by our assumptions because in that case, the re-election region is the complement of an interval I and might not contain x_H. In particular, if $x_H \in I$, then reducing σ_H would hurt the high type's probability of re-election. Let us assume that we are in such a situation: that

[5] The last point follows because, in any separating equilibrium, the high type has a strictly higher probability of re-election. This is easy to see: the probability of re-election of the high-type corresponds to the integral of the pdf of her policy on Y^*, which is precisely defined as the interval on which it is higher than the pdf of the low-type's policy.

reducing σ_H would decrease the high-type's re-election probability.[6]

It turns out that in any situation in which the high type benefits from playing $\sigma_H > \sigma_L$, the low type would also benefit from switching from σ_L to σ_H. Moreover, the gain in probability of being re-elected would always be weakly greater for the low-type than for the high-type. This fact only relies on general properties of the normal distribution, namely that it is symmetric and that the pdfs of two normal distributions cross at most twice.

Figure 3 illustrates this case. On the graph, we can clearly see that playing a high variance leads to a higher probability of re-election for both types, at their current effort levels. This can be seen graphically by the fact that the red area is bigger than the green area, indicating that the pdf with the low variance places more weight on the rejection interval I. But then, because the x_L is closer to the midpoint of I, the low type would benefit even more from switching to a high variance. This is seen graphically by the fact that the red area is bigger for the low type while the green area is smaller. This result is formalized in Lemma 1 and proved in Appendix A.1. It only relies on general properties of the normal distribution, namely that it is symmetric and that the pdfs of two normal distributions cross at most twice.

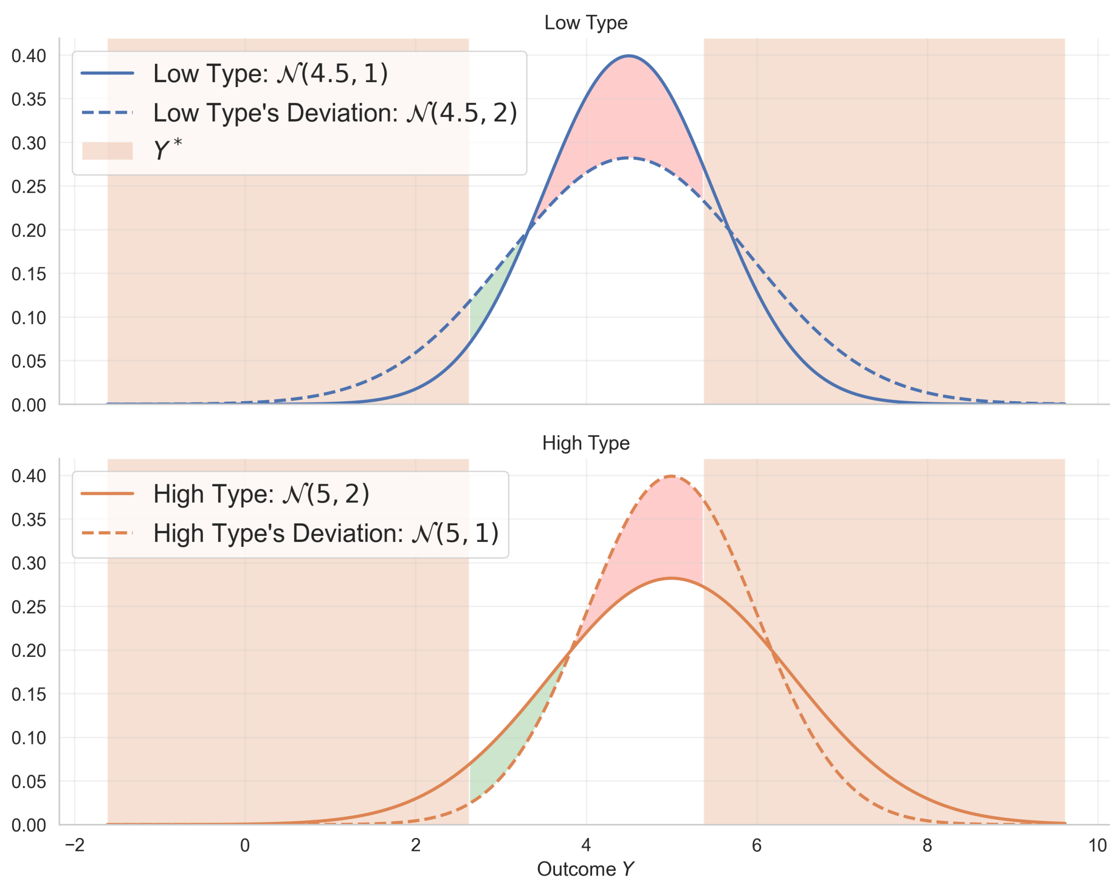


Figure 3: The high type plays a higher variance.

As a result, Assumption 4 implies that the low type, being less risk-averse than the

[6]Otherwise, if reducing σ_H increased the high-type's probability of re-election, then she would have no reason to play $\sigma_H > \underline{\sigma}$!

high-type but standing to gain more from playing a high risk level, would have a profitable deviation and so we cannot have an equilibrium where the high type plays a higher risk level than the low type.

This case illustrates the difficulties encountered when going from the decision theoretic model to the game theoretic one. In the model discussed in the introduction, because we treated the threshold as exogenous, we were guaranteed that a higher variance was beneficial if and only if the effort level was below the threshold. Having endogenized the re-election region, we now have to deal with re-election regions which can be bounded intervals, or the union of two unbounded intervals. The effect of variance on the probability of re-election depends not only on the shape of the interval, but also on how far the mean of the distribution is from said interval. This is why Assumption 4 is needed in the proof of Proposition 3:

Proposition 3. *Under Assumptions 1-6, in a pure strategy separating equilibrium, the high-type Incumbent always chooses the minimal variance $\underline{\sigma}$.*

We collect the previous results in Theorem 1.

Theorem 1. *Under Assumptions 1–6, the pure-strategy equilibria of the game take one of two forms: either both types choose the minimum variance $\underline{\sigma}$, or the low type chooses a strictly higher variance $\sigma_L > \underline{\sigma}$ while the high type chooses $\underline{\sigma}$. In both cases, the high type exerts strictly greater effort than the low type, $x_H > x_L$.*

To the best of our knowledge, Theorem 1 identifies a new source of inefficiency arising from electoral incentives, distinct from previously documented ones such as pandering (Canes-Wrone et al., 2001), or policy experimentation (Majumdar and Mukand, 2004). It shows that electoral pressures can induce incumbents to take on greater risk than they otherwise would, in an attempt to raise their re-election probability. Importantly, this form of risk-taking does not stem from learning or experimentation: the risk is intrinsic to the chosen policy or project, not a byproduct of information acquisition. This inefficiency arises even when all agents are risk-averse, in the sense that, absent electoral motives, they would all prefer the minimum feasible level of risk.

Finally, we turn to existence. It is well-known in the one-dimension version of the model that if β is too high, a pure strategy equilibrium may fail to exist (see for instance, Duggan and Martinelli, 2020). The two-dimension of choice version of the model is no exception. The problem arises from the fact that for high enough spoils of office parameter β, the objective function of the politician fails to be concave, leading to several potential solutions to the Incumbent's problem. This failure of concavity is unavoidable if one wishes to retain a distribution with full support on $\mathbb{R}$ in order to rule out off-the-path equilibria: no distribution with full support on $\mathbb{R}$ can make the probability of re-election concave in x.

Duggan and Martinelli (2017) circumvent this difficulty by introducing an additional assumption that ensures the Incumbent's maximization problem admits at most two solutions, even in mixed-strategy equilibria. A key element of their analysis is that the equilibrium satisfies a property called *monotonicity*, which holds even when strategies are mixed: voters re-elect if and only if y exceeds some endogenously determined threshold. Under these conditions, they define a space in which best responses are contractible-valued, allowing the application of the Eilenberg–Montgomery Fixed Point Theorem to establish the existence of a mixed-strategy equilibrium. By contrast, our model does not exhibit monotonicity, even within the class of pure-strategy equilibria, and to the best of our knowledge, there are no assumptions that would restrict the number of maximizers in the Incumbent's problem once an additional choice dimension is introduced.

We therefore focus on existence of pure-strategy equilibria. Given that w is strictly concave, we know that when $\beta = 0$, the Incumbent's problem admits a unique solution. By continuity, we can conclude that there will be an equilibrium in a neighborhood of β. Furthermore, because the Incumbent is strictly risk-averse, in the sense that their marginal utility from σ is strictly negative, we know that if β is small enough, they will choose $\sigma = \underline{\sigma}$. The combination of both these observations lead to the Proposition 4:

Proposition 4. *Under Assumptions 1–6, there exists $\bar{\beta}$ such that for all $\beta \in [0, \bar{\beta})$, a pure-strategy equilibrium exists. Moreover, there exists $\beta^\dagger \leq \bar{\beta}$ such that for all $\beta \in [0, \beta^\dagger)$, the unique pure-strategy equilibrium is the one in which both types choose the minimum variance $\underline{\sigma}$.*

Under certain functional forms and parameter configurations, all pure-strategy equilibria involve both types selecting the lowest feasible risk level, $\sigma_H = \sigma_L = \underline{\sigma}$, which justifies the weak inequality $\beta^\dagger \leq \bar{\beta}$.

4 Comparative Statics

In this section, we study the comparative statics of the model. In Section 4.1, we study how the equilibrium changes as the office-holding benefit increases, and in Section 4.2, we consider the impact of the term limits in our model.

4.1 Office-holding benefit β

In the model developed in Section 3.3, the effort and risk levels interact both through the politician's intrinsic preferences and through their joint effect on the re-election probability π. This interdependence makes comparative statics in the full model analytically intractable. To simplify the analysis, we impose the following assumption:

Assumption 7 (Quadratic Loss in x)**.** *$w(x, \sigma, \theta) = -(x - \theta)^2 - c(\sigma, \theta) + \kappa_\theta$, where $c : [0, +\infty) \times \Theta \to \mathbb{R}$ is increasing and convex in σ and $\kappa_\theta \in \mathbb{R}$.*

This assumption simplifies the analysis in two key ways. First, it implies additive separability between x and σ, so that the marginal utility from one choice variable does not depend on the level of the other. Second, the quadratic specification yields a simple expression for eq. (7):

$$x_H - x_L = \theta_H - \theta_L, \tag{8}$$

which implies that the distance between x_L and x_H is independent of β. As a result, the incentives to choose σ depend only on this distance, not directly on x_H or x_L.

Intuitively, this distance determines the low type's incentive to increase variance. If x_L and x_H are very close to each other, a higher variance reduces the low type's re-election probability: when $x_L \approx x_H$, any $\sigma_L > \sigma_H$ implies that the re-election region Y^* is an interval with midpoint x_H. Therefore, any $\sigma_L > \underline{\sigma}$ spreads probability mass away from the common mean, and thus cannot be optimal. On the other hand, if x_L and x_H are very far apart, the incentives to raise variance is also weak, as the thin tails of the normal distribution imply that a higher σ_L increases the re-election probability only marginally, and thus risk aversion prevents the low-type from choosing $\sigma_L > \underline{\sigma}$.

Hence, risk-taking arises only when x_L and x_H are at an intermediate distance—neither too close nor too far. More generally, this discussion highlights that the distance $x_H - x_L$ is a key determinant of the low type's choice of variance. By fixing this distance in every pure-strategy equilibrium, Assumption 7 simplifies the model's comparative statics. In particular, it implies that the variance that the low-type chooses must be nondecreasing in the office-holding benefit β, along continuous selection of equilibria.

Proposition 5. *Suppose Assumptions 1–7 hold, and that a pure-strategy equilibrium exists for all $\beta \in (0, \bar{\beta})$ for some $\bar{\beta} > 0$. Then, along any continuous selection of equilibria, $\sigma_L(\beta)$ is weakly increasing in β. Moreover, whenever $\sigma_L(\beta) > \underline{\sigma}$, it is strictly increasing at that value of β.*

As an illustration of how the equilibrium changes with the parameter β, we simulate the model using the following utility function for a politician of type θ:

$$w(x, \sigma, \theta) = -\tfrac{1}{2}(x - \theta)^2 - \tfrac{1}{2}\gamma\sigma^2 + C, \tag{9}$$

where $\gamma = 0.75$. The constant C is chosen so that $u(\hat{x}(\theta), \underline{\sigma}, \theta) = 0$, so as to satisfy Assumption 5. The minimum risk level is fixed at $\underline{\sigma} = 1.0$, and we set $\theta_L = 1.0$ and $\theta_H = 3.0$. We simulate the model over a range of β values.

For each β, we solve for the Perfect Bayesian Equilibrium using a modified fixed-point algorithm. We begin by assuming that each type plays its ideal policy. At each iteration, we compute the Voter's best response and derive the corresponding re-election region. Holding this region fixed, we compute each Incumbent type's best response and update policies by averaging the previous and new choices. This process continues until convergence or until 1000 iterations are reached, whichever occurs first. Conditional on convergence, we verify that the first- and second-order conditions hold for both types. Convergence was consistently achieved for low β, but sometimes failed for higher values, suggesting that a pure-strategy equilibrium did not exist in those cases. We only report the results for which convergence was achieved and all optimality conditions were satisfied.

The equilibrium choices of effort and risk for each type, along with their respective re-election probabilities, are shown in Figure 4. First, because the utility function satisfies Assumption 7, the distance between x_H and x_L remains constant for all values of β. Second, as β increases, both types exert more effort—a phenomenon that is common in models of electoral accountability. A novel effect emerges, however: for low values of β, both types select the minimum variance, $\sigma_H = \sigma_L = \underline{\sigma}$. Once β exceeds a certain threshold, σ_L begins to rise, which increases the re-election probability of the low type while reducing that of the high type.

This comparative statics exercise has stark implications for voter welfare. In the baseline model where politicians cannot choose variance, increasing the office-holding benefit β

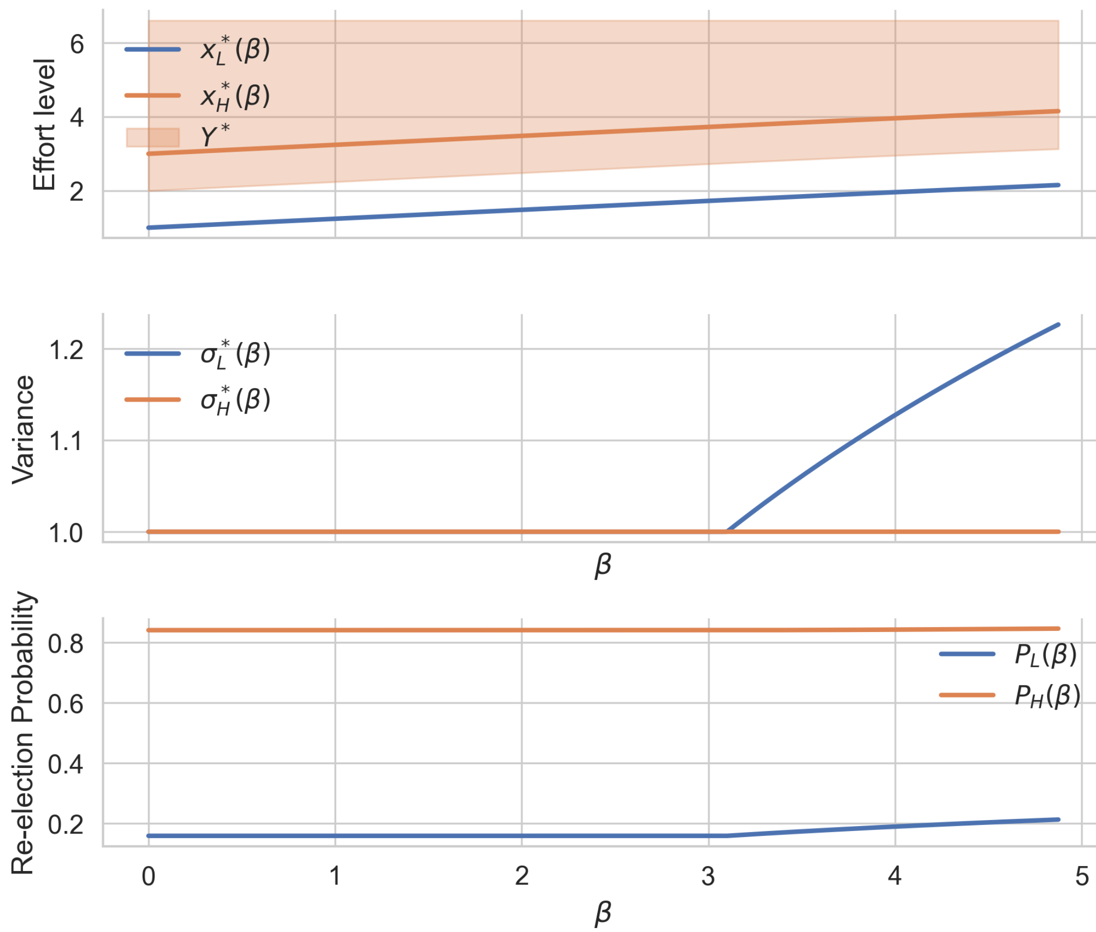


Figure 4: Comparative Statics in β

unambiguously benefits the Voter under the rent-seeking assumption (Assumption 6). Here, this is no longer true. There exists a range of parameters for which a higher β increases the mean effort level but also raises the risk associated with the policy chosen by the low-type politician. If the Voter is sufficiently risk averse, this could reduce overall welfare.

This welfare effect operates through both the moral-hazard and selection channels. An increase in σ_L directly harms the Voter due to their risk aversion, and indirectly through selection, since it lowers the probability that the second-term politician is of the high type. Because the distance between x_L and x_H remains fixed across all values of β, the increase in variance necessarily produces two effects: (i) the re-election probability of the high-type Incumbent decreases, and (ii) that of the low-type Incumbent increases—both of which reduce voter welfare. The last panel of Figure 4 illustrates this mechanism.

4.2 Term Limits

Another question that our model can address concerns the role of term limits. By term limits, we mean that Incumbents cannot run for re-election, so the Challenger is always elected after the first period. In this model, the effect of term limits depends on the value of β.

If β is low enough that both types choose the minimum variance $\underline{\sigma}$, term limits reduce voter welfare. In this regime, β serves only to discipline politicians by increasing their effort in the first term, which benefits the Voter. Moreover, under Assumption 7, this has no effect on re-election probabilities, so higher β is unambiguously welfare-improving, and term limits unambiguously hurt the voters.

When β is high enough that $\sigma_L > \underline{\sigma}$, the welfare impact of term limits becomes ambiguous. On the one hand, term limits remove the incentives for low-type politicians to choose excessive risk, which helps the voters in two ways: it helps they screen low-type from high-type Incumbents, and reduces the variance of the policy outcome. On the other hand, term limits also eliminate incentives for both types to exert higher effort in the first period. Hence, the overall welfare effect depends on the Voter's degree of risk aversion: the more risk-averse the Voter, the more likely they are to benefit from term limits.

These results have implications for institutional design. While the existing literature has emphasized the *responsiveness result*—that higher office-holding benefits always improve voter welfare—introducing a choice over policy risk makes this conclusion ambiguous. An increase in β may harm voters if it induces the low-type Incumbent to select riskier policies. This negative effect is stronger when Incumbents are more likely to be a low type *ex ante*, or when voters are more risk-averse.

The model also yields several empirical predictions. First, holding other factors constant, policy outcomes should exhibit greater variance when Incumbents are not term-limited than when they are. Second, variance should be higher when the benefits of holding office are greater, whether through higher salaries or greater prestige. Finally, under a two-term limit as in our model, Incumbents who achieve better outcomes in their second term should exhibit lower variance in their first term, all else equal. This follows because, in the model, a high second-term outcome signals a high-type Incumbent, and high types never choose risky policies in their first term.

These results invite a fresh reading of existing evidence. For instance, Healy and Malhotra (2009) find that governments tend to underinvest in disaster preparedness. Several explanations have been proposed, ranging from voter myopia to more rational accounts. Our model offers yet another rational explanation: a low-ability incumbent may underinvest in preparedness to increase the variance of outcomes, rather than to smooth voter welfare across possible states of the world. This highlights how electoral incentives can distort policy choices even when politicians act strategically. More broadly, it underscores the importance of considering variance, not just mean outcomes, when evaluating political accountability.

5 Conclusion

We analyze a model of electoral accountability when incumbents choose both the mean and the variance of a policy outcome observed with noise. Under our assumptions, we show that no pooling equilibrium exists, and that in any pure strategy equilibrium, the high type chooses a strictly higher effort level than the low type and sets the variance of the policy outcome at the minimum. Hence the pure-strategy outcomes reduce to two cases: either both types choose the lowest variance, or the low type chooses a higher variance. In the second case, electoral incentives can push the low-type incumbent to take on more risk, despite her intrinsic dislike for risk, because doing so raises her probability of re-election. This lowers the welfare of the voters.

On existence, we prove that when the office benefit is small, a pure-strategy equilibrium exists with both types choosing a low variance. For larger β, the objective in (x, σ) can lose concavity and produce multiple local optima, so pure-strategy equilibria may fail to exist, as in one-dimensional electoral accountability models.

Under an additional separability assumption, we are able to show that the riskiness of the policy chosen by the low-type Incumbent is increasing in the office-holding benefit. This result is in opposition with the traditional responsiveness result which suggests that higher office-holding benefits increases incentives for Incumbents to behave in the interest of the voters, although the welfare effects are ambiguous and depend crucially on the Voter's risk aversion.

Overall, the model isolates a clear mechanism: screening incentives can make low-type incumbents choose higher variance even when all actors are risk-averse. Whether this persists at high office rents—where mixing is unavoidable—remains an open question. Future work is needed to fully characterize the equilibria at higher levels of office benefit and to determine whether the low type's choice of risky policies disappear in the limit.

A Proofs of Lemmas and Propositions

A.1 Proof of Lemma 1

Lemma 1. *Assume a separating equilibrium in which the high-type Incumbent and the low-type Incumbent play (x_H, σ_H) and (x_H, σ_L) respectively, with $x_H \geq x_L$ and $\sigma_H > \sigma_L$. Denote by $\pi(x, \sigma) = \int_{Y^*} f(y; x, \sigma)\, \mathrm{d}y$, the Incumbent's probability of winning the election if she selects (x, σ), taking the re-election region Y^* as fixed.*

If $\pi(x_H, \sigma_H) - \pi(x_H, \sigma_L) > 0$, then $\pi(x_L, \sigma_H) - \pi(x_L, \sigma_L) \geq \pi(x_H, \sigma_H) - \pi(x_H, \sigma_L)$.

Proof. Let the rejection region be $R = \mathbb{R} \setminus Y^* = (a, b)$, and note that $x_L \in R$. Let $m = (a + b)/2$ be its midpoint.

Define
$$g(y \mid x) \equiv f(y; x, \sigma_L) - f(y; x, \sigma_H).$$
By symmetry and strict unimodality of the normal density, $g(\cdot \mid x)$ is symmetric around x, attains its maximum at $y = x$, and has exactly two roots at $y = x \pm \ell$ for some $\ell > 0$.

Thus,
$$\pi(x, \sigma_H) - \pi(x, \sigma_L) \; = \; -\int_a^b g(y \mid x)\, dy.$$
Hence the assumption $\pi(x_H, \sigma_H) - \pi(x_H, \sigma_L) > 0$ is equivalent to
$$\int_a^b g(y \mid x_H)\, dy > 0.$$

As x increases from $a - \ell$ to m, a larger portion of the interval $[x - \ell, x + \ell]$ falls inside $[a, b]$. Since $g(\cdot \mid x)$ is nonnegative, symmetric, and unimodal with mode $y = x$, the integral $\int_a^b g(y \mid x)\, dy$ increases in this range. By symmetry, as x increases from m to $b+\ell$, the overlap shrinks, so the integral decreases. Thus the function
$$h(x) \equiv \int_a^b g(y \mid x)\, dy$$
is single-peaked, increasing on $[a - \ell, m]$ and decreasing on $[m, b + \ell]$.

We claim $m < x_L$. Suppose instead that $m \geq x_L$. By symmetry and unimodality of the normal distribution, this would imply $f(a; x_L, \sigma_L) \geq f(b; x_L, \sigma_L)$. But then, by the definition of the cutoffs a, b, we would also have $f(a; x_H, \sigma_H) \geq f(b; x_H, \sigma_H)$, forcing $m \geq x_H > x_L$. This contradicts the fact that $x_L \in R$. Therefore $m < x_L$.

Furthermore, $x_H < b + \ell$, then the entire interval $[a, b]$ lies to the left of $x_H - \ell$. On that region $g(y \mid x_H) < 0$, and thus
$$\int_a^b g(y \mid x_H)\, dy < 0,$$
contradicting the assumption that $\int_a^b g(y \mid x_H)\, dy > 0$. Therefore, $x_H < b + \ell$.

Since $h(x)$ increases on $[a-\ell, m]$ and decreases on $[m, b+\ell]$, and since $m < x_L \leq x_H < b+\ell$, we must have
$$h(x_L) \; \geq \; h(x_H).$$
That is,
$$\pi(x_L, \sigma_H) - \pi(x_L, \sigma_L) \; \geq \; \pi(x_H, \sigma_H) - \pi(x_H, \sigma_L),$$
which completes the proof. □

A.2 Proof of Proposition 1

Proof of Proposition 1. For the sake of contradiction, assume that both types of Incumbent are playing the same strategy, that is $(x_L, \sigma_L) = (x_H, \sigma_H) \equiv (x^*, \sigma^*)$. This implies that the Voter does not gain any information when observing the outcome of the first-period policy, and thus is indifferent between re-electing the Incumbent or electing the Challenger.

Therefore, the re-election region Y^* can be any measurable subset of $\mathbb{R}$. Combining the first-order condition with respect to x for both the low and the high-type Incumbent, we get:

$$w_x(x^*, \sigma^*; \theta_H) = w_x(x^*, \sigma^*; \theta_L) \tag{10}$$

which is a contradiction with the strict supermodularity assumption (assumption 4). $\square$

A.3 Proof of Proposition 2

Proof of Proposition 2. In a separating equilibrium, the re-election region Y^* is either an interval $[a, b]$ with $a, b \in \bar{\mathbb{R}}$ and $a < b$, or the complement of such an interval. Without loss, assume Y^* is an interval[7].

Assume that the low-type Incumbent plays (x_L, σ_L) and the high-type Incumbent plays (x_H, σ_H). By definition of the cutoffs a and b, we have that:

$$f(a; x_H, \sigma_H) = f(a; x_L, \sigma_L) \text{ and } f(b; x_H, \sigma_H) = f(b; x_L, \sigma_L)$$

Combining the first-order conditions with respect to x for both the low and the high type Incumbent, we obtain (10).

For the sake of contradiction, assume that $x_H \leq x_L$. From our assumptions, we have that:

$$w_x(x_H, \sigma_L; \theta_H) \geq w_x(x_L, \sigma_L; \theta_H) > w_x(x_L, \sigma_L; \theta_L)$$

where the first inequality follows from Assumption 2 and the second one from Assumption 4. If $\sigma_H \leq \sigma_L$, then Assumption 4 further implies that $w_x(x_H, \sigma_H; \theta_H) \geq w_x(x_H, \sigma_L; \theta_H)$, which would contradict (10). Thus we must have $\sigma_H > \sigma_L$.

No types should prefer to deviate to the other type's policy, so we have:

$$w(x_H, \sigma_H, \theta_H) + \beta\pi(x_H, \sigma_H) \geq w(x_L, \sigma_L, \theta_H) + \beta\pi(x_L, \sigma_L)$$

and

$$w(x_L, \sigma_L, \theta_L) + \beta\pi(x_L, \sigma_L) \geq w(x_H, \sigma_H, \theta_L) + \beta\pi(x_H, \sigma_H)$$

Upon re-arranging, and combining both inequalities, we get:

$$w(x_H, \sigma_H, \theta_H) - w(x_L, \sigma_L, \theta_H) \geq w(x_H, \sigma_H, \theta_L) - w(x_L, \sigma_L, \theta_L) \tag{11}$$

Define $D(\theta) = w(x_H, \sigma_H, \theta) - w(x_L, \sigma_L, \theta)$. Differentiating, we obtain:

$$\begin{aligned}
&D'(\theta) = w_\theta(x_H, \sigma_H, \theta) - w_\theta(x_L, \sigma_L, \theta) \\
&D'(\theta) = [w_\theta(x_H, \sigma_H, \theta) - w_\theta(x_L, \sigma_H, \theta)] + [w_\theta(x_L, \sigma_H, \theta) - w_\theta(x_L, \sigma_L, \theta)] .
\end{aligned}$$

Assumption 4 implies that w_θ is increasing in x and weakly decreasing in σ. Since $x_H < x_L$, the first bracketed term is strictly negative and since $\sigma_H > \sigma_L$, the second bracketed term is weakly so. Therefore $D'(\theta) < 0$, which contradicts (11). Therefore $x_H \geq x_L$.

$\square$

[7]If instead Y^* is the complement of an interval, we can replace the cdf with the survivor function and the argument goes through *verbatim*.

A.4 Proof of Proposition 3

Proof of Proposition 3. Assume, towards a contradiction, that in a separating equilibrium the high-type Incumbent chooses (x_H, σ_H) and the low-type Incumbent chooses (x_L, σ_L) with $\sigma_H > \underline{\sigma}$. By Proposition 2, $x_H > x_L$.

Furthermore, assume that the low-type Incumbent chooses a variance $\sigma_L \geq \sigma_H$. The re-election region Y^* is therefore an interval $[a, b]$ where $a, b \in \bar{\mathbb{R}}$ with $a < b$ with $x_H \in Y^*$. Also, $Y^* \neq \mathbb{R}$. But then, the high-type Incumbent could increase both her probability of re-election and her intrinsic utility by setting $\sigma_H = \underline{\sigma}$ (by Assumption 3), a contradiction.

Assume instead that the low-type Incumbent chooses a variance $\sigma_L < \sigma_H$. Denote by $\pi(x, \sigma) = \int_{Y^*} f(y; x, \sigma)\, \mathrm{d}x$. By Lemma 1, $\pi(x_L, \sigma_H^2) - \pi(x_L, \sigma_L^2) > \pi(x_H, \sigma_H^2) - \pi(x_H, \sigma_L^2)$. But then, using Assumption 4, we know that for all σ,$w_\sigma(x_L, \sigma, \theta_L) \geq w_\sigma(x_H, \sigma, \theta_H)$ and so $\int_{\sigma_L}^{\sigma_H} w_\sigma(x_L, \sigma, \theta_L)\, \mathrm{d}\sigma \geq \int_{\sigma_L}^{\sigma_H} w_\sigma(x_H, \sigma, \theta_H)\, \mathrm{d}\sigma$. In other words, $w(x_L, \sigma_H, \theta_L) - w(x_L, \sigma_L, \theta_L) \geq w(x_L, \sigma_H, \theta_L) - w(x_H, \sigma_L, \theta_H)$. But then, if the high-type Incumbent has no profitable deviation, we have:

$$w(x_H, \sigma_H, \theta_H) + \beta\pi(x_H, \sigma_H) \geq w(x_H, \sigma_L, \theta_H) + \beta\pi(x_H, \sigma_L)$$

which implies

$$w(x_L, \sigma_H, \theta_H) + \beta\pi(x_L, \sigma_H) > w(x_L, \sigma_L, \theta_H) + \beta\pi(x_L, \sigma_L)$$

and so the low-type Incumbent has a profitable deviation. □

A.5 Proof of Proposition 4

Proof of Proposition 4. When $\beta = 0$, then the Incumbent's maximization problem (1) reduces to selecting the policy that maximizes the Incumbent's intrinsic preferences, and therefore both types choose: $(\hat{x}(\theta), \underline{\sigma})$.

If β is close enough to 0, treat (x_H, x_L, y) as endogenous and β as a parameter. Define $F : \mathbb{R}^3 \times \mathbb{R} \to \mathbb{R}^3$:

$$\begin{aligned}
F_1\left(x_H, x_L, y; \beta\right) &:= w_x\left(x_H, \underline{\sigma}; \theta_H\right) + \beta\partial_{x_H}\pi_H\left(x_H, \underline{\sigma} \mid y\right), \\
F_2\left(x_H, x_L, y; \beta\right) &:= w_x\left(x_L, \underline{\sigma}; \theta_L\right) + \beta\partial_{x_L}\pi_L\left(x_L, \underline{\sigma} \mid y\right), \\
F_3\left(x_H, x_L, y; \beta\right) &:= y - \frac{x_H + x_L}{2}.
\end{aligned} \tag{12}$$

A pure-strategy equilibrium with $\sigma_H = \sigma_L = \underline{\sigma}$ satisfies $F\left(x_H, x_L, y; \beta\right) = 0$.

At $\beta = 0$, we have a unique solution as described above. Letting $X := (x_H, x_L, y)$ and

$$X^0 := \left(\hat{x}\left(\theta_H\right), \hat{x}\left(\theta_L\right), \frac{\hat{x}\left(\theta_H\right) + \hat{x}\left(\theta_L\right)}{2}\right),$$

we have $F\left(X^0; 0\right) = 0$.

We compute the Jacobian $D_X F\left(X^0; 0\right)$ (partial derivatives w.r.t. (x_H, x_L, y)).

$$D_X F\left(X^0; 0\right) = \begin{pmatrix} w_{xx}\left(\hat{x}\left(\theta_H\right), \underline{\sigma}; \theta_H\right) & 0 & 0 \\ 0 & w_{xx}\left(\hat{x}\left(\theta_L\right), \sigma; \theta_L\right) & 0 \\ -\frac{1}{2} & -\frac{1}{2} & 1 \end{pmatrix}.$$

By strict concavity (assumption 2), $w_{xx}\left(\hat{x}\left(\theta_H\right), \underline{\sigma}; \theta_H\right) < 0$ and $w_{xx}\left(\hat{x}\left(\theta_L\right), \underline{\sigma}; \theta_L\right) < 0$, so

$$\det D_X F\left(X^0; 0\right) = w_{xx}\left(\hat{x}\left(\theta_H\right), \underline{\sigma}; \theta_H\right) \cdot w_{xx}\left(\hat{x}\left(\theta_L\right), \underline{\sigma}; \theta_L\right) \cdot 1 \neq 0.$$

By the multivariate Implicit Function Theorem, there exist $\tilde{\beta} > 0$ and a unique C^1 map $\beta \mapsto X(\beta) = (x_H(\beta), x_L(\beta), y(\beta))$ on $[0, \tilde{\beta})$ such that $F(X(\beta); \beta) = 0$ and $X(0) = X^0$. With a slight abuse of notation, we can take $\tilde{\beta}$ to be the supremum of all such $\tilde{\beta}$. By continuity, $F(X(\tilde{\beta}), \tilde{\beta}) = 0$.

To show that these correspond to equilibrium, we still need to show that it is optimal for both types to choose $\underline{\sigma}$. For the high-type Incumbent, this follows from the observation that when the re-election threshold is below her effort level, the Incumbent always prefers to play the minimal variance. For the low-type Incumbent, this follows from Assumption 3: at $\beta = 0$, $w_\sigma\left(\hat{x}\left(\theta_L\right), \underline{\sigma}; \theta_L\right) < 0$ and so by continuity, there exists $\bar{\beta}$ such that, for all $\beta \in [0, \bar{\beta}]$:

$$\left.\frac{\partial U_L}{\partial \sigma^+}\right|_{\beta} \leq 0$$

Again with a slight abuse of notation, we let $\bar{\beta}$ be the supremum of all such $\bar{\beta}$s. By continuity, $\left.\frac{\partial U_L}{\partial \sigma^+}\right|_{\beta=\bar{\beta}} \leq 0$. □

A.6 Proof of Proposition 5

Proof of Proposition 5. Assume that, for all $\beta \in (0, \tilde{\beta})$, $(x_L(\beta), \sigma_L(\beta), x_H(\beta), \sigma_H(\beta))$ represent a continuous selection of equilibria.

If $\sigma_L(\beta) = \underline{\sigma}$, then the low-type incumbent cannot choose a lower variance, so the claim is trivially true.

Fix $\beta \in (0, \tilde{\beta})$ such that $\sigma_L(\beta) > \underline{\sigma}$. Under Assumption 7, the low-type incumbent's first-order condition with respect to σ is:

$$c'(\sigma_L(\beta)) = \beta\, \pi_\sigma(x_L(\beta), \sigma_L(\beta)).$$

Because c is increasing and convex, c' is strictly increasing and positive. It follows that $\pi_\sigma(x_L(\beta), \sigma_L(\beta)) > 0$.

Suppose, for contradiction, that $\sigma_L(\beta)$ is weakly decreasing at β. Then there exists a sequence $\beta_n \uparrow \beta$ such that $\sigma_L(\beta_n) \leq \sigma_L(\beta)$ for all n. By continuity of the selection and of π_σ,

$$\pi_\sigma(x_L(\beta_n), \sigma_L(\beta_n)) \to \pi_\sigma(x_L(\beta), \sigma_L(\beta)) =: m > 0.$$

Using the first-order condition at β_n and β,

$$c'(\sigma_L(\beta_n)) = \beta_n\, \pi_\sigma(x_L(\beta_n), \sigma_L(\beta_n)), \qquad c'(\sigma_L(\beta)) = \beta\, \pi_\sigma(x_L(\beta), \sigma_L(\beta)).$$

Taking limits as $n \to \infty$ yields

$$\lim_{n\to\infty} c'(\sigma_L(\beta_n)) = \beta\, m = c'(\sigma_L(\beta)).$$

Since c' is strictly increasing, the only way to satisfy this equality with $\sigma_L(\beta_n) \leq \sigma_L(\beta)$ is if $\sigma_L(\beta_n) \to \sigma_L(\beta)$ from below. However, for n large, the right-hand sides satisfy

$$\beta\, \pi_\sigma(x_L(\beta), \sigma_L(\beta)) - \beta_n\, \pi_\sigma(x_L(\beta_n), \sigma_L(\beta_n)) \approx (\beta - \beta_n)\, m > 0,$$

so equality in the first-order condition requires an increase in $c'(\sigma_L(\beta_n))$, which, by monotonicity of c', necessitates an increase in σ_L. This contradicts $\sigma_L(\beta_n) \leq \sigma_L(\beta)$.

Therefore, $\sigma_L(\beta)$ cannot be weakly decreasing at β. Hence, $\sigma_L(\beta)$ is non-decreasing in β along any continuous selection of equilibria. Moreover, when $\sigma_L(\beta) > \underline{\sigma}$, the strict increase in the right-hand side of the first-order condition with respect to β, together with the strict monotonicity of c', implies that σ_L is strictly increasing at β. □

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