Policymaking in Times of Crisis

Peter Bils   Federica Izzo

January 27, 2023

Abstract

How does a crisis influence an executive's willingness to implement policy reforms? While existing work focuses on how crises impact voters' demand for reform, we instead investigate how they alter politicians' incentives to supply policy experimentation, even if the crisis does not shift voters' policy preferences. To study this question, we develop a model of elections and policy experimentation. In our setting, voters face uncertainty about the optimal policy reform and politicians' ability to manage a crisis. A crisis represents an exogenous test of the incumbent's competence, therefore his performance on the crisis impacts his electoral prospects. Consequently, the crisis influences his incentives to enact risky policy reforms. We find that, in contrast to the conventional wisdom, a crisis induces bolder policy reforms only when the incumbent is likely to be competent. If the incumbent is relatively unlikely to be competent, then the crisis instead results in less reform.

When written in Chinese, the word "crisis" is composed of two characters – one represents danger and one represents opportunity.

– John F. Kennedy

Political leaders are often defined in terms of their performance under a crisis (Ansell, Boin and t'Hart, 2014). During times of crisis, voters look to officeholders to demonstrate leadership, and failure to do so may have disastrous consequences for their electoral prospects. Thus, as emphasized by President Kennedy, for an executive a crisis represents both a risk and an opportunity. At the same time, officeholders must decide which broader policy programs to pursue even on dimensions unrelated to an ongoing crisis. Indeed, executive politicians face significant pressure from the public to deliver successful policy outcomes (Cohen, 1999). While a bold reform may lead to a significant policy success, it also entails significant uncertainty and risk for the officeholder (Majumdar and Mukand, 2004; Dewan and Hortala-Vallve, 2019). In this paper, we ask: How does a crisis influence an elected leader's willingness to enact risky policy reforms?

Previous works argue that crises may influence policy reforms because they alter voters' demands (e.g., Drazen and Easterly, 2001; Drazen, 2000; Stewart, McCarty and Bryson, 2020; Guiso et al., 2019). Our paper complements these accounts by providing a theory of the *supply-side* effect of crises on policymaking, which can arise absent a demand-side shock to voters' policy preferences. We show that even when the crisis dimension is entirely *orthogonal* to the policy dimension, it may still influence the incumbent's willingness to supply policy reforms.

We argue that an executive, when deciding how much to reform policy, considers whether the risks inherent to a bold reform are beneficial or harmful for winning reelection. Voters, however, care about outcomes on both the crisis and policy dimension. Thus, an officeholder's performance on the crisis and performance on policy are, to a certain extent, substitutes. In turn, this implies that the incumbent's incentives to implement risky reforms depend on whether a crisis is ongoing and, if so, the risk that he may be unable to manage it. This holds true even for policy dimensions largely unrelated to the crisis. For example, President Obama and his advisors discussed how the ongoing financial crisis should affect their approach to healthcare, given the electoral risks inherent to both the crisis and the choice to engage in bold policy reforms.[1]

We show that this electoral interaction leads to a conditional effect of crises on reform. When the incumbent's initial electoral prospects are sufficiently good crises induce bolder policy reforms. In contrast, incumbents who are far behind implement more moderate reforms during a crisis than during normal times. Finally, when the election is very competitive crises may induce more or less reform, depending on the other features of the environment. This result is due to two effects. First, the crisis makes the policy dimension relatively less salient, which motivates the incumbent to

[1] See: `www.newyorker.com/magazine/2020/11/02/barack-obama-new-book-excerpt-promised-land-obamacare`.

choose a policy close to his ideologically preferred point. Second, the crisis gives electorally trailing incumbents an opportunity to prove themselves and improve their electoral prospects. Moreover, leading incumbents may fail to solve the crisis and lose their advantage. Consequently, under a crisis leading and trailing incumbents choose policies more similar to each other. Taken together, these two channels generate our conditional effect of crises on reform.

Although we see our theory as a complement to, rather than substitute for, demand-driven accounts, our theory provides new predictions and insights into the impact of crises on policymaking. Furthermore, our results may enrich our understanding of patterns we see in aggregate data. While conventional wisdom in the literature maintains that crises should always increase policy experimentation (Tommasi and Velasco, 1996), the empirical evidence on this matter is mixed (see the discussion in Prato and Wolton (2018); Mahmalat and Curran (2018)). Some scholars confirm a positive association between crises and reform (Lora and Olivera, 2004; Alesina, Ardagna and Trebbi, 2006; Pitlik and Wirth, 2003), while others find crises may have an opposite effect (Campos, Hsiao and Nugent, 2010; Pop-Eleches, 2008; Castanheira, Nicodème and Profeta, 2012; Galasso, 2014; Mian, Sufi and Trebbi, 2014). By identifying conditions under which the supply-side effect of crises on reform may go in one or the other direction, our theory may provide a framework to reevaluate these mixed results.

In this paper, we formally explore these dynamics by analyzing a two-period model of electoral accountability. In each period, the incumbent chooses how much to reform policy on an ideological dimension. This can represent, for example, the standard left-right economic dimension or healthcare. At the moment the incumbent chooses which policy program to pursue, the country is either in a period of business as usual or is hit by a crisis. The crisis may represent a financial recession, a natural disaster, or pandemic. In the baseline model, the crisis is exogenous and orthogonal to the policy dimension. Thus, whether the crisis is solved or not depends only on the incumbent's underlying competence and not on the policy reform. The voter observes the incumbents' policy choice and the resulting outcome, as well as the resolution of the crisis if there is one, and decides whether to keep the incumbent or replace him with an ideologically opposed challenger.

The voter in our model faces uncertainty over the optimal policy reform and the competence of the incumbent. This uncertainty has two implications in our setting. First, a crisis represents a test for the officeholder. The incumbent's performance managing the crisis allows the voter to learn about his underlying competence. Second, different policy choices on the ideological dimension entail different levels of electoral risk for the officeholder. After observing past policy outcomes the voter updates her beliefs and this shifts her preferences over policies (as described in Fiorina (1981)). Crucially, we show that more extreme policy reforms generate more informative outcomes for the voter. Suppose the incumbent implements a bold liberal reform moving policy far to the left of the status quo. If this policy produces a good outcome for the voter, then it is likely that the reform was in the optimal direction. Conversely, policies close to the status quo are much less informative because outcomes are noisy.

Thus, when choosing how much to reform policy the officeholder considers both his own ideological preferences and whether facilitating voting learning is electorally beneficial. We find the crisis fundamentally alters such strategic calculations because the incumbent anticipates that success or failure will reveal information about his competence to the voter. Importantly, this is true even when the crisis is exogenous and entirely unrelated to the policy dimension.

Consider an incumbent who is initially electorally leading. If the country is in a period of business as usual, then the voter only learns about policy outcomes and not about the incumbent's competence. Consequently, the incumbent is incentivized to choose a policy close to the status quo because he wins reelection absent new information. Now suppose the country is in a crisis. If the incumbent solves the crisis this further consolidates his electoral lead and affords him more risk to pursue a policy program closer to his ideological preferences. If instead he fails to solve the crisis, then a bold reform creates the chance to score a big success on the policy dimension and rebuild his electoral capital. Thus, a leading incumbent's equilibrium policy entails more radical reforms under a crisis than during normal times, even if he is uncertain about his ability to solve the crisis.

The opposite logic holds for incumbents who are far behind ex-ante. During normal times, these incumbents are incentivized to pursue risky reforms because winning reelection requires the incumbent to generate favorable policy-relevant information. In a crisis, however, these incentives to gamble are weakened. A failure on the crisis dimension makes policy information less electorally relevant, while a success makes generating policy information an unnecessary risk. Thus, these incumbents implement less reform in a crisis.

This conditional effect of crises on reform is due to a *quantitative* change in behavior for incumbents who are very ahead or behind, and a *qualitative* impact on incumbents facing more competitive elections.

If the incumbent is sufficiently likely to be competent, then he chooses a policy closer to the status quo than his ideal point in both normal and crisis times. However, as discussed above, the crisis weakens the incumbent's incentives to control information, which leads to more reform. Similarly, if the incumbent is sufficiently far behind electorally ex-ante then he always chooses a policy further from the status quo than his ideal point, but the crisis leads to less reform. Thus, the crisis has a clear quantitative effect on the incumbent's equilibrium policy choice when the election is ex-ante not very competitive.

Instead, when the election is more competitive, the crisis can also change the nature of his incentives to control information and, thus, have a qualitative effect on policymaking. Even a barely leading incumbent tends to avoid policy gambles during normal times. However, the prospect of a failed crisis response creates incentives to secure an advantage on the policy dimension. In other words, a crisis can induce marginally leading incumbents to behave as if they were electorally trailing. Therefore, in equilibrium, these incumbents pursue risky policies and implement bolder reforms than their ideological preference would dictate. Similarly, under some conditions a crisis may induce an incumbent who is only barely trailing to behave as if he was electorally leading, and distort policy away from his ideal point and towards the status quo.

Finally, we consider three extensions to the baseline model. First, we relax our assumption that the crisis is orthogonal to the policy dimension. Specifically, we show that our main result about the conditional effect of crises on reform holds even if the crisis creates a significant shock to the voter's beliefs on the policy dimension. Second, we study whether the officeholder ever wants to generate a crisis in our setting. We find that if the probability the incumbent is a competent type is larger than the probability of the policy-relevant state being favorable to him, then his best bet is to generate the crisis. Third, we allow the incumbent to have private information about his competence. With asymmetric information the incumbent's policy choice influences the voter's beliefs about the optimal reform *and* may signal information about the incumbent's ability. Despite the potential for signaling, our findings continue to hold in this richer information environment.

Related Literature

Our paper contributes to the small formal literature studying how crises impact political and policy outcomes. Most of the work in this tradition conceptualizes crises as a shock to the actors' policy tastes (Drazen and Easterly, 2001; Levy and Razin, 2021; Fernandez and Rodrik, 1991; Drazen, 1996; Prato and Wolton, 2018; Guiso et al., 2019; Williamson, 1994). Thus, these works present theories of the demand-side effect of a crisis.

In contrast, we model a crisis as a test of the officeholder's ability and provide a theory of the supply-side effect, one that applies even to crises that are orthogonal to the policy dimension. We build on Ashworth, Bueno de Mesquita and Friedenberg (2018), who also study crises as exogenous informative shocks that alter the inferences voters draw upon observing governance outcomes. However, in their model politicians take no strategic action and there is not an orthogonal policy dimension. We complement this approach by analyzing how an exogenous but informative crisis impacts policymakers' strategic choices.

In our model, voters are uncertain about which policy is best for them and learn via experience. Officeholders thus have incentives to strategically use policy to control the *amount* of voter learning, by either engaging in risky policy experiments or playing it safe. In this perspective, our work contributes to the literature on policy experimentation and multi-armed bandit problems (e.g., Strumpf, 2002; Volden, Ting and Carpenter, 2008; Strulovici, 2010; Hirsch, 2016; Dewan and Hortala-Vallve, 2019; Gieczewski and Kosterina, 2020) by considering how the additional risk imposed by the crisis alters experimentation in the shadow of electoral accountability.

As such, our model relates to the literature on policy gambles by elected politicians, dating back to Downs and Rocke (1994). As in Downs and Rocke, the officeholder in our model is incentivized to gamble when trailing and play it safe when ahead.[2] However, this is true both in normal times and in a crisis. Thus, by comparing these two cases we are able to analyze if and when a crisis strengthens incentives to gamble or choose a safer policy. Additionally, most of this literature considers a binary policy space, with one risky option and one safe option.[3] As such, these works can only analyze a decision-maker's choice to experiment or not. Instead, we consider policy experimentation with a continuous space. Doing so allows us to analyze the intensity of the policymaker's dynamic incentives to take risks and study the equilibrium amount of policy experimentation. This is important because a binary policy choice would obfuscate much of the effect of crises on policymaking. In particular, it would yield the result that crises only affect policy reforms when elections are very competitive, and miss that crises also change the incumbent's behavior when far ahead or behind.

The learning technology we use relates to the models introduced in Ashworth, Bueno de Mesquita and Friedenberg (2017) and Izzo (2022). However, neither paper considers how the risk of information revelation on a second dimension (the crisis) impacts the incumbent's incentives. In both models, as in ours, the policymaker chooses between a continuum of actions, and his choice determines how informative the resulting outcome is going to be for the voter. Ashworth, Bueno de Mesquita and Friedenberg (2017), however, consider a continuous choice of effort which is unobserved by the voter, whereas we study an ideological policy choice which is observed by the voter. As a consequence, the voter in our model updates her beliefs (and thus ideological preferences) based on the implemented policy as well as the outcome of the reform. Izzo (2022) also focuses on policymaking along an ideological dimension, however, in that model learning is stark because each policy outcome is either fully informative or completely uninformative (due to the assumption that the noise in the outcome realization is uniformly distributed). In contrast, in our setting policy outcomes are never fully informative (because our noise is drawn from a normal distribution) and this leads to less stark behavior by politicians in equilibrium.

Finally, our model contributes to a literature on elections in which candidates have an exogenous characteristic, such as valence, that is orthogonal to the policy dimension (e.g., Ansolabehere and Snyder, 2000; Groseclose, 2001; Bernhardt, Câmara and Squintani, 2011; Krasa and Polborn, 2012). In our paper, voters face uncertainty about the incumbent's exogenous characteristic, i.e., his ability to manage a crisis. We show that crises, by resolving this uncertainty, can have a significant impact

[2]We note, however, that we uncover a more nuanced effect effect of electoral advantage on policy gambling. Specifically, the incumbent in our model is most motivated to gamble when trailing but not too far behind.

[3]Strumpf (2002) considers an extension with two experimental policies. Hirsch (2016) considers a binary policy space where one option is not inherently more risky than the other, but a correct policy succeeds only if a bureaucrat exerts sufficient effort in its implementation.

on policymaking. Moreover, our paper's focus on policy experimentation is unique in this literature.

Model

Players and Actions: We consider a two-period model of electoral accountability. There is an incumbent (I), challenger (C), and representative voter (V).

At the start of the first period, the country is either in a crisis, indicated by $\zeta_1 = 1$, or normal times, $\zeta_1 = 0$, where $\zeta_1 \in \{0, 1\}$ is publicly observed. In either case, the officeholder chooses a policy on an ideological dimension given by $x_1 \in \mathbb{R}$.[4] Next, the outcome of the crisis and the voter's utility from the policy are realized. As described later, the crisis outcome is determined solely by the officeholder's ability, while the policy outcome is determined by x_1 and an unknown state of the world. Thus, the policy dimension is orthogonal to the crisis dimension. Throughout, we denote the first-period crisis outcome by $\chi \in \{N, S, F\}$. That is, if a crisis did not arise then $\chi = N$. If there is a crisis and it is successfully managed then $\chi = S$. Finally, if the incumbent fails to solve the crisis then $\chi = F$.

The voter observes the crisis outcome χ, her utility from the crisis U_1^c, the policy choice x_1, and her policy utility U_1^p, then decides whether to reelect I or to elect C.

The game then proceeds to the second period. With probability $p \in (0, 1)$ the country experiences a crisis, $\zeta_2 = 1$, and with probability $1 - p$ the country is in normal times, $\zeta_2 = 0$.[5] Next, the officeholder chooses the second-period policy $x_2 \in \mathbb{R}$. Finally, players obtain second-period payoffs and the game ends.

Information: Players are uncertain about each politician's ability to manage a crisis, given by $\theta_j \in \{0, 1\}$ for $j \in \{I, C\}$, where $\theta_j = 1$ denotes a good (or competent) type and $\theta_j = 0$ the bad type. Each θ_j is drawn at the start of the game independently of each other, with $Pr(\theta_j = 1) = \pi_j \in (0, 1)$. To abstract from signalling incentives, we assume symmetric uncertainty about each politician's ability. We later relax this assumption and allow I to have private information about θ_I.

Additionally, players face uncertainty about a policy-relevant state of the world $\omega \in \{-1, 1\}$, where ω is drawn at the beginning of the game independently of θ_I and θ_C, with $Pr(\omega = 1) = \gamma \in (0, 1)$. In particular, the realization of ω determines the location of the voter's ideal policy.

[4] We do not consider a budget constraint for the policymaker (as in Ash, Morelli and Van Weelden (2017), who study the allocation of resources across a common values and an ideological dimensions). Such considerations could be incorporated in our framework. For example, if bolder reforms need a larger budget to be implemented, then a crisis has the mechanical effect of imposing a bound on how far the policymaker can move from the status quo on the ideological dimension. As long as this bound is not too low, our qualitative results would survive in this setting.

[5] Our results are robust to allowing the likelihood of a crisis in the second period to depend on the first-period outcome. For example, an unresolved crisis may persist into the future, or a crisis successfully managed today may reduce the probability one arises tomorrow.

The distributions of θ_I, θ_C, and ω are commonly known to all players. Thus, in our setting the players face uncertainty about which candidate is more competent at managing crises *and* which one of the candidates' policy programs is better for the voter.

Payoffs: The voter cares about both the policy dimension and the crisis dimension. Overall, the voter's *total* per-period utility is:

$$U_t^v = U_t^p + U_t^c,$$

where U_t^p denotes her policy utility and U_t^c her crisis utility for period $t \in \{1, 2\}$. We now describe these two components in more detail.

Given implemented policy x_t, the voter's *policy* utility is in period t is

$$U_t^p = -(x_t - \omega)^2 + \varepsilon_t,$$

where ε_t is a shock drawn i.i.d. in each period from the standard normal distribution with CDF given by Φ and PDF ϕ. Thus, ω determines the optimal policy for the voter, but the voter's realized utility from the policy also depends on exogenous noise.

As for U_t^c, a mismanaged crisis imposes a cost K on the voter. We assume that the crisis is mismanaged if the incumbent is the bad type, $\theta_t = 0$. Otherwise, if the incumbent is the good type, $\theta_t = 1$, then the crisis is successfully managed and this mitigates the cost K.[6] Specifically, the voter's *crisis* utility in period t is given by

$$U_t^c = -(1 - \theta_t)\zeta_t K,$$

where θ_t is the ability of the officeholder in period t and $\zeta_t = 1$ denotes that a crisis occurred in period t, and $\zeta_t = 0$ denotes no crisis.

Finally, politicians are motivated by both ideology and winning office. Politician j's per-period utility is

$$U_t^j = \mathbb{I}_j \beta - (x_j - x_t)^2,$$

where $\mathbb{I}_j = 1$ if politician j is in office at time t and $\mathbb{I}_j = 0$ otherwise. For simplicity, we assume $x_I = -x_C > 0$.

We assume that office benefit is sufficiently large: $\beta > \frac{x_I^2(4\gamma-3)}{1-\gamma}$. This assumption implies that the policy choice of an incumbent who is only slightly ahead of the challenger is driven mostly

[6]We obtain similar results if a successfully managed crisis still imposes a cost on the voter strictly less than K.

by reelection concerns. This does not alter our qualitative results, but simplifies the analysis and statement of the propositions. Note that if the incumbent is not too advantaged on the policy dimension, $\gamma \leq \frac{3}{4}$, then this assumption holds even if $\beta = 0$. Thus, this can be interpreted as assuming that the election is highly competitive when the incumbent and challenger are similar ex-ante.

Players' dynamic payoffs are given by the sum of per-period utility and to reduce notation we assume no discounting.

Timing: To sum up, the game proceeds as follows:

1. Nature draws the policy-relevant state ω, I's ability, θ_I, and C's ability, θ_C.
2. The country is either in a crisis ($\zeta_1 = 1$) or not ($\zeta_1 = 0$).
3. I chooses policy $x_1 \in \mathbb{R}$.
4. The voter observes the crisis outcome χ, the policy choice x_1, and her realized utility on the policy dimension U_1^p, then updates her beliefs about ω and θ_I.
5. The voter makes her retention decision.
6. The second period begins, and a crisis emerges with probability p.
7. The second period officeholder chooses policy $x_2 \in \mathbb{R}$.
8. Utilities are realized and the game ends.

Comments on the model: Before proceeding to the analysis, we discuss some important features of our model.

First, we emphasize that in our setting crises are entirely orthogonal to the policy dimension. That is, crises have no impact on voters' policy preferences, or on their beliefs over the policy dimension. This also implies that the policy choice has no impact on the probability that the crisis is resolved. For example, environmental or redistributive policies do not determine a country's performance in an international conflict or the likelihood of successfully controlling the COVID-19 crisis. We choose to shut down these potential demand-side channels because our goal in this paper is to provide a theory of the *supply-side* effect of crises on policy reforms. However, following Proposition 2 we analyze an extension where the crisis also alters the voters' policy demands and show that this need not change our main insights.

Second, in our model the voter is uncertain about a policy-relevant state of the world ω. In the context of policy reforms, we can interpret the state of the world as determining the optimal direction of reform, with policy 0 representing the status quo. Thus, if $\omega = 1$, then the optimal reform for the voter is to the right of the status quo. Otherwise, if $\omega = -1$, then policy should be moved to the left of the status quo. Alternatively, we could model a world in which the voter knows the optimal direction of reform, but is uncertain about the exact location of the ideal policy (i.e., both possible values of ω are on the same side of the status quo). This would change our exact predictions but not the dynamic logic and mechanism at the core of our model. We focus on the case in which the voter is unsure of the optimal direction of reform in order to capture issues on which the conflict between parties over the policy dimension is ideological.

Finally, we comment on the timing of policymaking and learning in the model. The incumbent chooses policy before the crisis outcome realizes. This models the uncertainty in such circumstances about when and how the crisis will resolve. If the incumbent learns the outcome ahead of time this simplifies his problem, however, our main directional prediction about the effect of the crisis on policymaking still holds. Additionally, in our model the voter observes her utility from the policy choice prior to the election. Our inclusion of noise in the voter's can capture that policy consequences may not fully realize before the election. Alternatively, in some instances, as in the case of Obamacare mentioned in the introduction, policies may be passed but not implemented beforehand. Here, we can reinterpret our model as one in which more significant reforms result in greater scrutiny from the media and voters and this attention still generates a noisy signal for voters about the impacts of the policy.

Equilibrium Analysis

We proceed by backwards induction, starting from the second-period officeholder's policy choice.

In the last period, the officeholder always implements his ideal policy and this does not depend on whether a crisis emerges or not. Thus, if I is re-elected then $x_2^* = x_I$. Otherwise, $x_2^* = x_C$.

Therefore, the voter faces a selection problem when making her retention decision. Here, her problem is two-fold. She wants to elect the candidate who is most likely to be competent and she wants to select the candidate whose ideal policy provides her with the highest expected utility. Consequently, in equilibrium, she strictly prefers to reelect the incumbent if:

$$\mathbb{E}_\omega[U_2^p(x_I)|x_1, U_1^p] + \mathbb{E}_{\theta_I}[U_2^c|\chi] > \mathbb{E}_\omega[U_2^p(x_C)|x_1, U_1^p] + \mathbb{E}_{\theta_C}[U_2^c].$$

If the inequality is reversed then she always elects the challenger. If it holds with equality then the voter is indifferent and we assume she reelects the incumbent with probability 1/2.[7] The voter's

[7]This assumption makes the incumbent's problem continuous at $x = 0$ for all π_I. It is only consequential for a measure 0 set of parameters and does not affect our results otherwise.

retention decision is thus a function of her posterior belief about the state of the world, denoted μ_ω, and her posterior belief about the incumbent's ability, denoted μ_θ. Lemma 1 characterizes this decision.

Lemma 1. *Given posterior beliefs μ_ω and μ_θ, the voter reelects the right-wing incumbent if*

$$\mu_\omega \geq \frac{1}{2} - \frac{pK(\mu_\theta - \pi_C)}{8x_I}.$$

Otherwise, the voter elects the challenger.

Notice that the reelection threshold is decreasing in μ_θ. Thus, increasing the voter's posterior about the incumbent's competence makes her more lenient on the policy dimension. Moreover, this effect is amplified by the weighted cost of a crisis pK. The higher the risk of future crises, the more the voter cares about competence when making her retention decision.

Voter Learning

As highlighted by Lemma 1, the voter's retention decision depends on her expectations about the incumbent's ability and the optimal policy. Thus, voter learning from policy and crisis outcomes is at the core of this model. We assume players update about θ_I and ω using Bayes rule. We now discuss how these learning processes work in our setting.

Exogenous Learning on the Incumbent's Competence

In our model, a crisis is a test that is *exogenously* imposed on the incumbent. If there is no crisis, then the voter does not have an opportunity to learn about the incumbent's competence, and simply retains her prior belief, $\mu_\theta(N) = \pi_I$. On the other hand, if there is a crisis then the outcome is entirely determined by the incumbent's ability. If the crisis is successfully managed, then the voter learns that the incumbent is competent, $\mu_\theta(S) = 1$. Otherwise, if the incumbent fails to manage the crisis, then the voter learns she is not competent, $\mu_\theta(F) = 0$.[8]

Endogenous Learning on the Voter's Ideal Policy

Next, we analyze voter learning on the policy dimension. Although the voter observes the incumbent's policy choice x_1 and her utility from this policy, her inference problem is complicated because the realized utility on this dimension is also a function of the idiosyncratic shock ϵ_1. Thus,

[8]Similar results hold if the crisis outcome is a noisy signal of politician competence as long as the outcome is sufficiently informative about competence.

the voter's policy-payoff realization is a noisy signal of her optimal policy. In this setting, the amount of voter learning is a function of the implemented policy.

By Bayes' rule we have that if the incumbent chooses policy x_t and this yields utility U_t^p to the voter, then the voter's posterior belief over ω is given by:

$$\mu_\omega(x_t, U_t^p) = \frac{\gamma\phi\left(U_t^p + (x_t-1)^2\right)}{\gamma\phi\left(U_t^p + (x_t-1)^2\right) + (1-\gamma)\phi\left(U_t^p + (x_t+1)^2\right)}$$

The voter's posterior over ω highlights two crucial properties of the learning process. First, when a policy provides higher utility, the voter believes it is more likely that the reform moved policy in the optimal direction from the status quo. Because the noise distribution satisfies the Monotone Likelihood Ratio Property, μ_ω is increasing in U_1^p when $x_t > 0$, and decreasing in U_1^p otherwise.

Second, even fixing the policy outcome U_1^p, the inferences that the voter draws depend on the implemented policy. It is easy to see that $|E[U_t^p|\omega = 1] - E[U_t^p|\omega = -1]| = |4x_t|$ increases if x_t moves away from 0 in either direction. In other words, as x_t moves away from the status quo, the utility distributions conditional on the state ω move farther apart (see Figure 1). As a consequence, the voter is better able to filter out information from noise. In the Appendix, we formalize this discussion and show that outcomes are more (Blackwell) informative as $|x_t|$ increases.

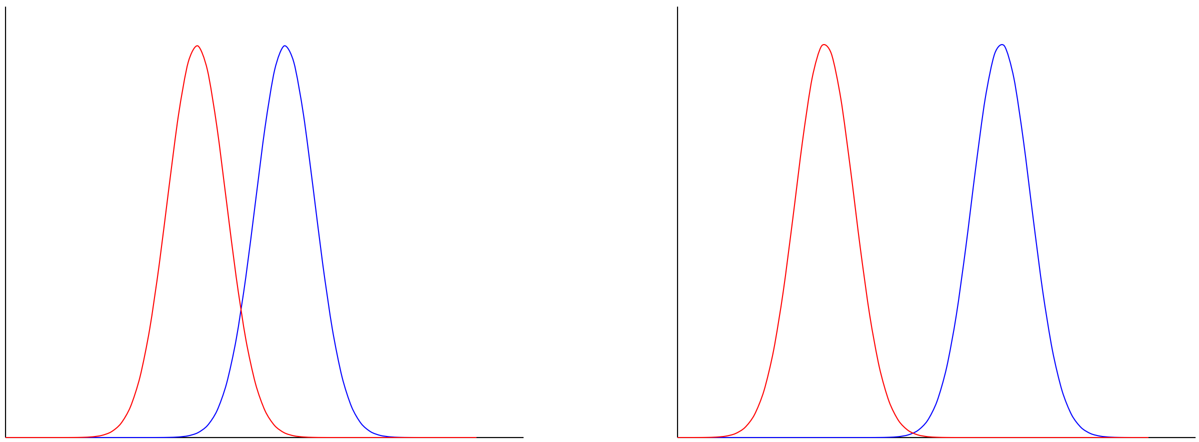
Substantively, suppose that the incumbent implements a bold liberal reform, moving the status quo far to the left. If this policy produces a good outcome for the voter, then it is likely that the reform was in the optimal direction. Conversely, because policy outcomes are noisy and thus the voter's learning is imperfect, the consequences of a policy close to the status quo are much less informative. Thus, the amount of voter learning increases under bolder policy reforms.

Equilibrium Policymaking

We now consider the incumbent's optimal policy choice. The voter's retention decision depends on her posterior belief on both the competence and the policy dimension. While opportunities for learning on the competence dimension arise exogenously (i.e., depend on whether a crisis emerges or not), the amount of learning on the policy dimension is endogenous. As the previous section highlights, policies further from the status quo induce more learning. Therefore, the incumbent's policy choice is a function of his own ideological preferences, x_I, *and* his incentives to either prevent or facilitate voter learning about policy.

Let $P_\chi(x)$ be the incumbent's probability of winning if he chooses policy x and the first-period crisis outcome is $\chi \in \{N, S, F\}$. Hence, the incumbent's expected utility for policy x in normal

Figure 1: Policy and learning



Note: Figure 1 depicts the effect of moving policy away from 0 on the signal. In each graph, the red curve represents the policy outcome distribution under $\omega = -1$, and the blue curve the distribution under $\omega = 1$. The left graph fixes a policy $x'_t > 0$, and the right one a policy $x''_t > x'_t$.

times is

$$U_n(x) = -(x - x_I)^2 - (x_I - x_C)^2\Big[1 - P_N(x)\Big] + \beta P_N(x).$$

Instead, his expected utility for policy x during times of crisis is

$$U_c(x) = -(x - x_I)^2 - (x_I - x_C)^2\Big[1 - \pi_I P_S(x) - (1 - \pi_I)P_F(x)\Big] + \beta\Big[\pi_I P_S(x) + (1 - \pi_I)P_F(x)\Big].$$

With these in hand, we can now characterize the incumbent's equilibrium policy choice.

Lemma 2. *Let x^*_c be an equilibrium policy under a crisis and x^*_n denote an equilibrium policy in normal times. In times of crisis, if x^*_c is an equilibrium policy then it solves*

$$2(x_I - x) + (\beta + 4x_I^2)\Big(\pi_I \frac{\partial P_S}{\partial x} + (1 - \pi_I)\frac{\partial P_F}{\partial x}\Big) = 0.$$

In normal times, if x^*n is an equilibrium policy then it solves

$$2(x_I - x) + (\beta + 4x_I^2)\frac{\partial P_N}{\partial x} = 0.$$

The first order condition highlights that the implemented policy influences the incumbent's probability of being reelected (via the voter learning). Given the symmetry in our setup, any pair of policies x and $-x$ induces the same posterior distribution in expectation, therefore we have that $P_\chi(x) = P_\chi(-x)$. This implies that, in equilibrium, a right-wing incumbent never implements a policy $x < 0$. Therefore, if the second term in the FOC is positive, so that more extreme reforms increase his probability of winning in this range, then the incumbent implements a policy to the right of his ideological preferences, $x^* > x_I$. Otherwise, the incumbent distorts his policy choice away from his static optimum and towards the status quo, $x^* < x_I$.

In what follows, we often use the following terminology:

Definition 1. *We say the incumbent gambles if $x^* > x_I$.*

That is, the incumbent gambles if he chooses a policy that is further from the status quo than his ideal point. We use this terminology to capture that more extreme reforms, by generating more policy-relevant information, entail more uncertainty and thus higher electoral risk for the incumbent.

In the next section, we show that I's policy choice and incentives to gamble depend on the electoral environment, in particular the prior belief π_I, but this relationship fundamentally differs in normal times and in times of crisis. Subsequently, we build on this result to characterize the effect of crises on policy reforms.

Policymaking and the Electoral Environment

The results of the previous section highlight that whether the incumbent chooses a policy more or less extreme than his ideal point depends on his electoral incentives to control information. Thus, our first step in analyzing the equilibrium policy choice is characterizing the conditions under which I's probability of winning is increasing as x moves away from 0. Let $\tilde{\pi}$ be the value of π_I at which, under normal times, the voter is ex-ante indifferent between incumbent and challenger. Specifically, $\tilde{\pi} = \pi_C + \frac{4x_I}{pK}(1 - 2\gamma)$.footnoteNote, whenever $\pi_C \in \left(\frac{4x_I}{pK}(2\gamma - 1), 1 + \frac{4x_I}{pK}(2\gamma - 1)\right)$ we have that $\tilde{\pi}$ is interior, and the voter does not always prefer one candidate over the other in normal times. Notice that when $\gamma > \frac{1}{2}$, this indifference threshold is lower than π_C. The voter's prior on the ideological dimension is favorable to the incumbent, therefore she may ex-ante prefer to reelect him even if he is worse than the challenger on the competence dimension. Vice versa for $\gamma < \frac{1}{2}$.

Lemma 3 now describes how the incumbent's probability of winning changes in the first-period policy choice x.

Lemma 3. *Suppose $x > 0$.*

1. *If a crisis arises in the first period and it is solved, $\chi = S$, then I's probability of winning is decreasing in x.*

2. *If a crisis arises in the first period and it is not solved, $\chi = F$, then I's probability of winning is increasing in x.*

3. *In normal times, the following holds:*

   - *If* $\pi_I > \max\{\pi_C, \tilde{\pi}\}$ *then I's probability of winning is decreasing in* x*;*
   - *If* $\pi_I < \min\{\pi_C, \tilde{\pi}\}$ *then I's probability of winning is increasing in* x*;*
   - *If* $\pi_I \in (\min\{\pi_C, \tilde{\pi}\}, \max\{\pi_C, \tilde{\pi}\})$*, then the probability of winning is non-monotonic in* x*. When* $\gamma < \frac{1}{2}$*, the probability is single-peaked in* x*; instead, when* $\gamma > \frac{1}{2}$ *it is decreasing then increasing in* x*.*

Symmetric results hold for $x < 0$*.*

Suppose a crisis arises in the first period. If the incumbent successfully manages it then he secures an electoral advantage. In this case, generating new policy-relevant information can only hurt his reelection chances. Thus, I's ex-ante probability of winning is decreasing in the amount of voter learning, i.e., decreasing as x moves away from 0. In contrast, if the incumbent fails to solve the crisis then he becomes significantly disadvantaged and needs to generate favorable information on the policy dimension to win reelection. Consequently, I's probability of winning is increasing in $|x|$ if he fails to solve the crisis.

Instead, assume a crisis does not materialize. For a logic analogous to the above, the probability of winning is always decreasing in $|x|$ when the incumbent is sufficiently far ahead ex-ante, $\pi_I > \max \in \{\tilde{\pi}, \pi_C\}$, and always increasing in $|x|$ when I is sufficiently far behind, $\pi_I < \min \in \{\tilde{\pi}, \pi_C\}$.

Now consider an incumbent such that $\pi_I \in (\min\{\pi_C, \tilde{\pi}\}, \max\{\pi_C, \tilde{\pi}\})$. If $\gamma > 1/2$ then $\tilde{\pi} < \pi_C$. Thus, such an incumbent is less competent than the challenger in expectation, but ex-ante remains electorally leading due to the voter's prior on the policy dimension γ. If no new information is generated then the ex-ante advantaged incumbent is always reelected. Therefore, I's probability of winning is initially decreasing as x increases away from the status quo 0. However, a false negative, i.e., a bad outcome that occurs despite policy moving in the correct direction, severely damages I's electoral prospects because he is close to the indifference threshold. The likelihood of a false negative decreases as outcomes becomes more informative, that is, when x moves further away from 0. When x is sufficiently extreme, this second effect dominates and the probability of winning increases in x. Instead, if $\gamma < \frac{1}{2}$ then $\pi_C < \tilde{\pi}$. In this case, the above logic is reversed and the incumbent's probability of winning is maximized when there is a high probability of generating a false positive, which occurs for intermediate values of $|x|$.

Having characterized how policy choices impact I's probability of winning, we now analyze the effect of I's expected competence, π_I, on the equilibrium policy.

Proposition 1.

1. *The equilibrium policy in a crisis,* x_c^**, is decreasing in* π_I*.*

2. *There exists a cut-point $\hat{\pi} < \tilde{\pi}$, such that: if $\pi_I \in (\hat{\pi}, \tilde{\pi})$ then the equilibrium policy in normal times, x_n^*, is decreasing in π_I. Otherwise, x_n^* is increasing in π_I.*

First, suppose a crisis arises in the first period. Recall that the incumbent must choose policy before uncertainty is resolved about the outcome of the crisis. Furthermore, the crisis is solved if and only if the incumbent is a competent type. Therefore, increasing π_I increases the probability I is successful and acquires an ex-post electoral advantage. In turn, this strengthens the incumbent's incentives to preserve his expected advantage by preventing learning on the policy dimension. Thus, the equilibrium crisis policy decreases towards 0 as π_I increases. Consequently, less competent politicians engage in more reform.[9]

If the country does not experience a crisis, there is no learning on the competence dimension. Therefore, the voter's retention decision is a function of her prior belief about competence π_I. In this case, increasing π_I decreases the reelection threshold, rather than increasing the probability that I obtains an advantage. As a consequence, changing π_I has two effects on the incumbent's incentives. First, increasing π_I makes the voter more willing to reelect the incumbent. Second, moving π_I towards $\tilde{\pi}$ makes the electoral environment more competitive. Importantly, these two effects imply that increasing π_I can lead to an increase or decrease in x_n^* depending on the degree of I's initial electoral advantage (or disadvantage).

If the incumbent is leading then the two effects always go in the same direction. Increasing π_I away from $\tilde{\pi}$ increases how much negative policy information the incumbent can generate while still winning reelection *and* makes policy information less relevant. Both effects weaken I's incentives to control information and push x_n^* to the right towards the incumbent's ideal point as π_I increases.

In contrast, if the incumbent is trailing then these two effects are competing. Increasing π_I towards $\tilde{\pi}$ makes the voter more lenient towards I (making information control less relevant) but also increases the salience of the policy dimension (making information control more relevant). If π_I is close to $\tilde{\pi}$ then the first effect dominates and I becomes less incentivized to control information, whereas the second effect dominates when π_I is close to 0. Thus, increasing π_I moves x_n^* rightward towards x_I when elections are competitive, $\pi_I \in (\hat{\pi}_I, \tilde{\pi})$, and pushes x_n^* towards the status quo when the incumbent is far behind, $\pi_I < \hat{\pi}_I$.

Building on this result, Corollary 1 characterizes the conditions under which the incumbent is electorally incentivized to gamble in equilibrium by implementing a policy further from the status quo than his ideal point.

Corollary 1. *Expected competence and policy gambles.*

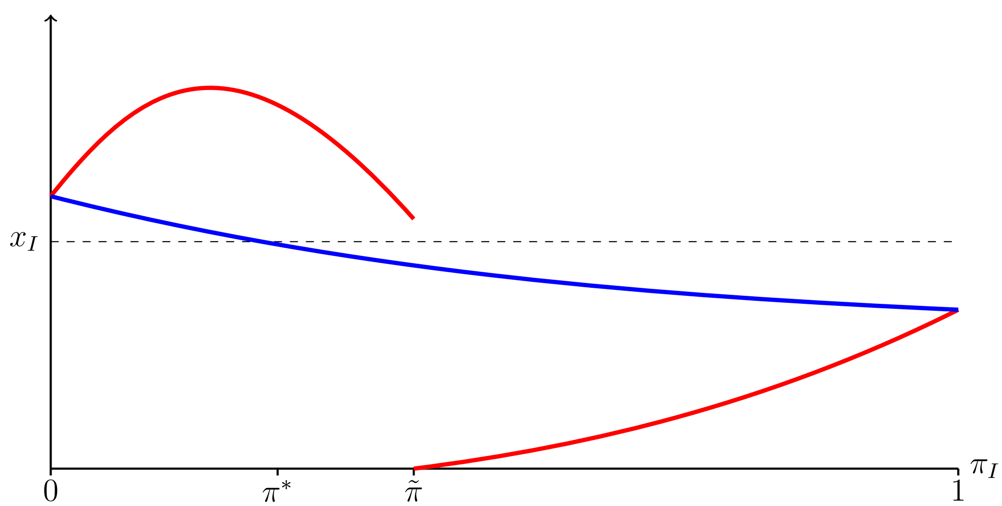
- *In normal times, there exists $\pi_n^* \leq \tilde{\pi}$ such that the incumbent gambles if and only if $\pi_I < \pi_n^*$.*

[9] Gratton et al. (2021) also find that low competence politicians overproduce on policy reforms during turbulent times, but their result is driven by a very different mechanism.

- *In a crisis, there exists $\pi_c^* \neq \pi_n^*$ such that the incumbent gambles if and only if $\pi_I < \pi_c^*$.*

Figure 2 pulls together Proposition 1 and Corollary 1 and depicts how the equilibrium policy changes as a function of π_I in normal times versus times of crisis.[10] In both normal and crisis times the incumbent engages in policy gambles only when his ex-ante electoral prospects are sufficiently bad, π_I is sufficiently low. However, the crisis changes exactly how bad the incumbent's initial prospects need to be to induce a gamble, that is, $\pi_n^* \neq \pi_c^*$.[11] Furthermore, Figure 2 illustrates that even at very high (low) values of π_I, where the incumbent always (resp. never) gambles both under crisis and during normal times, his policy choice still differs in the two scenarios. In what follows, we build on the results of this section to fully characterize these effects and thereby find conditions under which crises lead to more or less reform.

Figure 2: Crisis vs. no crisis



Note: Figure 2 compares equilibrium policy in normal times, x_n^* (depicted in red) against the equilibrium policy in times of crisis, x_c^* (depicted in blue).

The Effect of the Crisis on Reform

In this section we first present our main result characterizing when the crisis induces more or less policy reform. Second, we decompose this result into two effects and clarify the underlying mechanism.

[10]Note that in normal times the equilibrium policy is discontinuous in π_I at $\pi_I = \tilde{\pi}$ despite including noise in the voter's utility. This is because at $\pi_I = \tilde{\pi}$ and $x = 0$ the voter does not learn and is thus indifferent between I and C, whereas the voter has a strict preference at $x = 0$ for $\pi_I \neq \tilde{\pi}$.

[11]Except for a measure-zero set of parameters.

Let $\overline{\pi} = \max\{\pi_c^*, \pi_n^*\}$, as defined in Corollary 1. We now state our main proposition.

Proposition 2. *There exists $\underline{\pi} < \overline{\pi}$ such that: If $\pi_I > \overline{\pi}$ then the incumbent enacts a more extreme reform during times of crisis than during normal times, $x_c^* > x_n^*$. If $\pi_I < \underline{\pi}$ then the incumbent implements a more moderate reform during times of crisis than during normal times, $x_c^* < x_n^*$. If $\pi_I \in (\underline{\pi}, \overline{\pi})$ then the crisis can lead to more or less reform.*

Proposition 2 highlights that the directional effect of the crisis on policy reform depends on the incumbent's electoral standing. More precisely, this effect is mediated by the officeholder's expected ability. If the incumbent is sufficiently likely to be competent, then the crisis induces more policy reform. In contrast, for incumbents of sufficiently low expected ability, the model predicts they should implement more extreme reforms during normal times. When the incumbent's expected competence is intermediate the crisis can lead to more or less reform, depending on the other features of the environment. This conditional effect of the crisis on reform is due to the crisis having a *quantitative* impact on policymaking incentives when the incumbent is very likely or unlikely to be reelected, and a *qualitative* impact when elections are more competitive. It is these effects that underlie the directional predictions of Proposition 2.

To understand these two effects, consider an incumbent who is electorally leading ex-ante. During normal times, such an incumbent distorts policy away from his ideal point and towards the status quo to prevent information generation and protect his electoral advantage. When this incumbent is hit by a crisis it changes his policymaking calculus. He may score a success on the crisis dimension and further increase his electoral lead, which makes voter learning on the policy dimension less electorally relevant. Alternatively, he may fail to solve the crisis and lose his initial advantage. In this case, voter learning on policy becomes electorally valuable as failure turns a leading incumbent into a trailing one. Although both forces push a leading incumbent to choose a more extreme policy, which force dominates determines whether the crisis has a quantitative or qualitative effect on policymaking.

For a leading incumbent who is very likely to be competent, $\pi_I > \overline{\pi}$, the crisis has a quantitative effect on policy. In this case, the incumbent anticipates that he is very likely to solve the crisis and, thus, still has incentives to prevent voter learning and choose a policy closer to the status quo than his ideal. However, this incumbent knows that he can afford more risk in policymaking because a success on the crisis dimension makes his retention probability less elastic to the outcome on the ideological policy. Therefore, the crisis weakens his incentives to control information, which causes him to choose a policy closer to his ideal point and farther from the status quo.

Similarly, the crisis has a quantitative effect when the incumbent is very far behind, $\pi_I < \underline{\pi}$, although this effect goes in the opposite direction to what described above. During normal times, trailing incumbents always have incentives to take policy gambles to facilitate voter learning. When

π_I is low, the incumbent anticipates he is unlikely to solve the crisis and continues to distort policy away from the status quo in hopes of securing a policy success. As above, however, the crisis weakens the incumbent's strategic incentives, because the anticipated failure on the crisis makes policy outcomes less electorally relevant. Thus, the incumbent engages in less risky reforms than in normal times.

Finally, suppose the election is ex-ante close, $\pi_I \in [\underline{\pi}, \overline{\pi}]$. Here, the crisis can have a qualitative effect on policymaking by altering the nature of the incumbent's incentives to control information. In particular, for $\pi_I \in [\min\{\pi_c^*, \pi_n^*\}, \max\{\pi_c^*, \pi_n^*\}] \subseteq [\underline{\pi}, \overline{\pi}]$ the crisis changes whether or not the incumbent gambles. As described below, this can lead to more or less reform.

When $\pi_n^* < \pi_c^*$, the qualitative effect produces more reform because the crisis induces a marginally leading incumbent to behave as if he was electorally trailing. If the voter's indifference threshold during normal times is low (which implies $\pi_n^* < \pi_c^*$), then even an incumbent who is unlikely to be competent may be electorally leading and avoid policy gambles in a period of business as usual. However, in a crisis this marginally leading incumbent believes he is likely to fail and lose his initial advantage. In turn, this induces him to engage in policy gambles in hopes of scoring a success on the ideological dimension. A symmetric reasoning applies to marginally trailing incumbents when the voter's indifference threshold is high (producing $\pi_n^* > \pi_c^*$). Such an incumbent is ex-ante electorally behind and gambles on policy during normal times. However, he is overall likely to be competent and secure an advantage if given the chance to prove himself on the crisis dimension. Thus, when hit by a crisis, this marginally trailing incumbent finds it optimal to behave as if he was electorally leading, and avoids gambling. Here, the qualitative effect therefore implies that crises induce produces less reform.

The following result complements this discussion. It shows there exist conditions under which the qualitative effect of the crisis generates more reform ($\pi_n^* < \pi_c^*$), as well as conditions under which it generates less reform ($\pi_n^* > \pi_c^*$).

Corollary 2. *Assume $\gamma > \frac{1}{2}$ and pK is sufficiently large. If π_C is sufficiently small then $\pi_n^* < \pi_c^*$. If π_C is sufficiently large then $\tilde{\pi} > \pi_c^*$.*

When π_C is low this implies $\tilde{\pi}$ is low as well, because a weak challenger makes the voter relatively more favorable towards the incumbent. As discussed above, in this case, the qualitative effect of a crisis emerges for marginally leading incumbents. In contrast, if π_C is large, then the voter's indifference threshold is quite high. Thus, even an incumbent who is likely to be competent in absolute terms can find himself at a disadvantage during normal times. In this case, the crisis induces these marginally trailing incumbents to avoid gambling.

Finally, we note a potential ambiguity. There may exist $\pi_I \in [\underline{\pi}, \overline{\pi}]$ such that the incumbent experiences a quantitative rather than qualitatitve effect. In this case, the crisis may have a non-monotonic effect on reform. However, if x_c^* and x_n^* intersect for at most one value of $\pi_I < \tilde{\pi}$ then this type of non-monotonicity cannot arise. In particular, there is a unique cutoff in π_I above which the crisis always leads to more reform, and below which it leads to less reform. An example is depicted in Figure 2, where the crisis and no-crisis policies never intersect at interior values. Moreover, numerical simulations support the claim that the policies can only intersect at most once. However, due to the nuanced competing effects of π_I on the equilibrium policies it is difficult to obtain a general analytical characterization of this region.

In sum, our results highlight the importance of the political environment for understanding how crises impact reform, and thereby qualifies the conventional intuition on the topic. Earlier theories, focusing on demand-side effect, imply that crises should increase policy experimentation (e.g., Tommasi and Velasco, 1996). However, findings in the empirical literature are mixed. Some scholars do find that crises and reform are positively related (Lora and Olivera, 2004; Alesina, Ardagna and Trebbi, 2006; Pitlik and Wirth, 2003), while others find crises may lead to less reform (Campos, Hsiao and Nugent, 2010; Pop-Eleches, 2008; Castanheira, Nicodème and Profeta, 2012; Galasso, 2014; Mian, Sufi and Trebbi, 2014).

In our setting, whether crises induce more or less reform depends on whether the incumbent is sufficiently likely to be competent, i.e., whether he is ex-ante electoral leading. Failing to account for this interaction, an empirical analysis of the effect of a crisis on reform may recover biased estimates. Furthermore, the bias can go in either direction, which implies that researchers may even recover a zero effect when averaging across different values of π_I. Considering the supply-side incentives of politicians can therefore help explain why a crisis may lead to less reform, and provide a potential framework to reinterpret the mixed results in the literature. Additionally, our model helps elucidate the exact channels through which this supply-side effect may materialize and how it may be mediated by other features of the competitive environment. These results provide additional implications that are unique to our theory and thus open several potential avenues for future research.

To conclude, notice that a direct implication of Proposition 2 is that some crises appear as unifying ones, pushing the incumbent's policies closer to the challenger's preferences (compared to the no-crisis counterfactual). Instead, other crises have a polarizing effect and push policy to the extreme. Importantly, in our framework, the difference between a unifying crisis and a polarizing one is not in the nature of a crisis itself. Rather, these are equilibrium effects that emerge, respectively, under incumbents of low and high expected ability even when they face identical crises.

Extensions

Non-orthogonal Crises

To isolate the incumbent's incentives to supply reforms we have assumed that the crisis is entirely orthogonal to the policy dimension. However, plicymakers may consider reforms on dimensions related to an ongoing crisis, even if they do not directly solve it. For example, Pitlik and Wirth (2003) studies whether economic crises lead countries to adopt market-oriented reforms. Our first extension shows that our conditional effect of crises on reform can hold even if the crisis changes voters' policy demands and, thus, the dimensions are not fully orthogonal. Consequently, the supply-side incentives underlying Proposition 2 remain even if the crisis changes voters' preferences for reform.

To capture a demand-side channel in our model we assume that the crisis alters the players' prior belief about the optimal policy ω. Specifically, under a crisis $Pr(\omega = 1|\zeta_1 = 1) = \gamma_c \neq \gamma = Pr(\omega = 1|\zeta_1 = 0)$. Here, a crisis affects the incumbent's strategic considerations because it tests his ability *and* changes how favorable voters are ex-ante towards his policy position. Although this shifts the incumbent's optimal policy choice, his policymaking incentives are similar to before and this shift does not necessarily alter our main insight, as the next proposition demonstrates.

For simplicity, and to highlight that a significant demand-side shock does not alter our insights into supply-side incentives, we consider cases in which the crisis has a large impact on the voter's policy demands.

Proposition 3. *Assume γ_c is sufficiently large or sufficiently small. If π_I is sufficiently large, then the incumbent enacts a more extreme reform during times of crisis than during normal times. Otherwise, the incumbent implements a more moderate reform during times of crisis than during normal times.*

Consider a crisis that makes the voter sufficiently convinced that her ideal policy is aligned with the incumbent, i.e., γ_c close to 1. This decreases the incumbent's incentives to control information because under such a strong prior his retention chances are very inelastic to the realized policy outcome. As a consequence, the equilibrium policy in times of crisis moves closer to the incumbent's static optimum. Graphically, this flattens the blue curve in Figure 2 towards the incumbent's ideal point. However, the policy remains decreasing in the incumbent's expected ability for the same logic described earlier. Substantively, the demand-side channel implies that the crisis further dampens the incumbent's strategic incentives to control information. This may emphasize or dampen the supply-side effect described in the previous section, but our main directional prediction remains unaltered.[12] Thus, the crisis continues to create more reform by incumbents who are electorally

[12] Further, notice that the dampening effect of this demand-side channel eliminates the potential ambiguity dis-

leading and less reform by those who are behind. A similar argument holds if the crisis instead convinces the voter she is likely to be ideologically aligned with the challenger.

Endogenous Crises

In our baseline model, crises arise exogenously so the incumbent's only tool to improve his reelection prospects is to control information on the policy dimension. However, in some cases the officeholder may also be able to take actions that endogenously create a crisis and thus provide voters with a test of his ability (as in Downs and Rocke (1994)). In this section, we study when (if ever) the incumbent is incentivized to generate an endogenous crisis.

To address this question, we consider whether I's equilibrium payoff is higher when the game begins in a crisis, $\zeta_1 = 1$, or not, $\zeta_1 = 0$. We assume office rents β are sufficiently large that the incumbent's dynamic reelection incentives dominate ideological considerations. This allows us to focus on the electoral incentives to generate a crisis and implies that the equilibrium policy is close to the one that maximizes the incumbent's probability of winning.

Proposition 4. *Suppose office benefit is sufficiently large. If $\pi_I \in [\gamma, \tilde{\pi}]$, then there exist parameter values such that I generates a crisis in equilibrium. Otherwise, if $\pi_I \notin [\gamma, \tilde{\pi}]$, then endogenous crises never emerge.*

Suppose $\pi_I > \tilde{\pi}$. In this case, the incumbent is ex-ante leading and wins reelection absent any new information. Therefore, I has no incentive to gamble, whether on the policy or the crisis dimension. In contrast, when $\pi_I < \tilde{\pi}$, the trailing incumbent needs the voter to update positively on at least one of these dimensions to win the election. If $\pi_I < \gamma$ then gambling on the policy dimension is more likely to succeed than gambling on the crisis. The incumbent therefore never chooses to generate a crisis, in order to maximize the probability that new policy-relevant information is enough to push him above the retention threshold. Instead, when $\pi_I > \gamma$ the incumbent is more likely to succeed solving a crisis than he is to convince the voter that her ideal policy is to the right. Therefore, he finds it optimal to induce a crisis to improve his retention chances. Thus, the incumbent prefers to generate a crisis only when he is not too likely or too unlikely to be able to solve it.

In concluding this section, we note that our incumbent has no private information about his ability, therefore his decision to initiate a crisis only influences his retention chances via the realized outcome. However, it is plausible that generating a crisis imposes a valence loss on the incumbent in the eyes of the voter. In the model, is equivalent to increasing the retention threshold given in Lemma 1. Importantly, this does not need to alter our main insight from this extension. To

cussed in the previous section for intermediate values of π_I. This guarantees the conditional effect of crises is monotonic, as stated in Proposition 3.

see this, suppose that the reputation gain from solving a crisis is enough to outweigh the initial valence loss from generating one. Consequently, an incumbent who faces an unfavorable electoral environment ex-ante and is unlikely to score a success on the policy dimension (γ is relatively low) is still incentivized to generate a crisis. Even if this causes an immediate valence loss, generating a crisis that provides voters with a test of his ability is the only way this trailing incumbent can try to resurrect his electoral chances.

Asymmetric Information

In this section, we allow the incumbent to have private information about his ability θ_I. Now the incumbent's policy choice may impact his reelection probability via two channels. As in the baseline model, the implemented policy influences voter learning about ω. Additionally, the information asymmetry implies that this choice may also provide the voter with a signal about the incumbent's ability θ_I. We show that our qualitative results survive in this richer information setting.

Formally, assume that at the beginning of the game the incumbent observes a private signal of his own ability, given by $s_\theta \in \{0, 1\}$. We assume the probability the incumbent's signal is correct is the same in both states, $Pr(s_\theta = 1|\theta = 1) = Pr(s_\theta = 0|\theta = 0) \in (1/2, 1]$. After observing the signal, the incumbent updates his beliefs about his own ability and the game proceeds as in the baseline model. Let ψ_{s_θ} be the incumbent's (interim) posterior that he is a good type conditional on the realization of his private signal, where $0 \leq \psi_0 < \psi_1 \leq 1$.

We denote $x_n^b(\pi_I)$ as the equilibrium policy under normal times in the baseline symmetric uncertainty model, and $x_n^a(s_\theta)$ as the equilibrium policy choice of the incumbent after observing the signal s_θ in the asymmetric information setting. Similarly, let $x_c^b(\pi_I)$ and $x_c^a(s_\theta)$ denote the equilibrium policies in times of crisis in the baseline and asymmetric information models, respectively. Finally, let $\mu_\theta(x_1)$ be the voter's interim belief about the incumbent's ability after observing his policy choice.

First, we show that the equilibrium is always separating in times of crisis.

Lemma 4. *Suppose there is a crisis. In every perfect Bayesian equilibrium, the incumbent chooses different policies following each signal, $x_c^a(0) \neq x_c^a(1)$. Furthermore, $x_c^a(0) = x_c^b(\pi_I = \psi_0)$ and $x_c^a(1) = x_c^b(\pi_I = \psi_1)$.*

If a crisis emerges in the first period, then the incumbent's type is always revealed via the crisis outcome. As a consequence, the voter's interim posterior $\mu_\theta(x_1)$ is electorally irrelevant.[13]

[13]Here, we assume that if the voter's interim posterior and the posterior conditional on crisis outcome are incompatible, the voter only updates conditioning on the crisis outcome. Specifically, if the voter forms an interim posterior that the incumbent is competent with probability 1 but observes a failed crisis, then we assume she believes that $\theta_I = 0$ with probability 1.

Therefore, the incumbent's policy choice influences his reelection chances only via experimentation and the voter learning on the policy dimension. The incumbent's strategic problem is then identical to the one he faces in the baseline model. Thus, in equilibrium, he always acts *as if* there was no information asymmetry between him and the voter and implements the dynamically optimal policy given his interim posterior ψ_{s_θ}. Specifically, $x_c^a(0) = x_c^b(\pi_I = \psi_0)$ and $x_c^a(1) = x_c^b(\pi_I = \psi_1)$. .

A corollary follows straightforwardly:

Corollary 3. *The expected policy in times of crisis is decreasing in π_I.*

As in the symmetric uncertainty baseline, during times of crisis more competent (in expectation) officeholders implement more moderate reforms, all else equal.

Next, we show that under normal times the incumbent can never do better than in the symmetric uncertainty model. First, we verify that there always exists an equilibrium where both types of the incumbent pool on $x_n^b(\pi_I)$, the optimal policy in the baseline model without asymmetric information.

Lemma 5. *There always exists a perfect Bayesian equilibrium where the incumbent adopts $x_n^b(\pi_I)$ following either signal, $x_n^a(0) = x_n^a(1) = x_n^b(\pi_I)$.*

When a crisis does not materialize, fixing the voter's interim posterior $\mu_\theta(x_1)$, the incumbent's dynamically optimal policy is not a function of his own beliefs over θ_I. Thus, the optimal policy does not depend on the incumbent's private signal. Notice this implies that the usual beliefs refinements (intuitive criterion, D1, etc.) do not have bite here. Next, suppose that, following a deviation off the equilibrium path, the voter forms believes that $s_\theta = 0$, then neither type has an incentive to deviate and the conjectured equilibrium always exists under this assumption.

Next, we show that this equilibrium yields both types their highest expected utility. As a first step, we establish an indifference-based separation result.

Lemma 6. *In any separating equilibrium, both types are indifferent between policies on the equilibrium path.*

As discussed above, fixing the voter's interim posterior, the incumbent's expected dynamic utility from any policy x is not a function of his private information. Therefore, if separation can be sustained in equilibrium, it must be the case that the incumbent is always indifferent between the policies on the equilibrium path. Furthermore, in any separating equilibrium, an incumbent who observes $s_\theta = 0$ must be locating at his dynamically optimal policy from the baseline model.

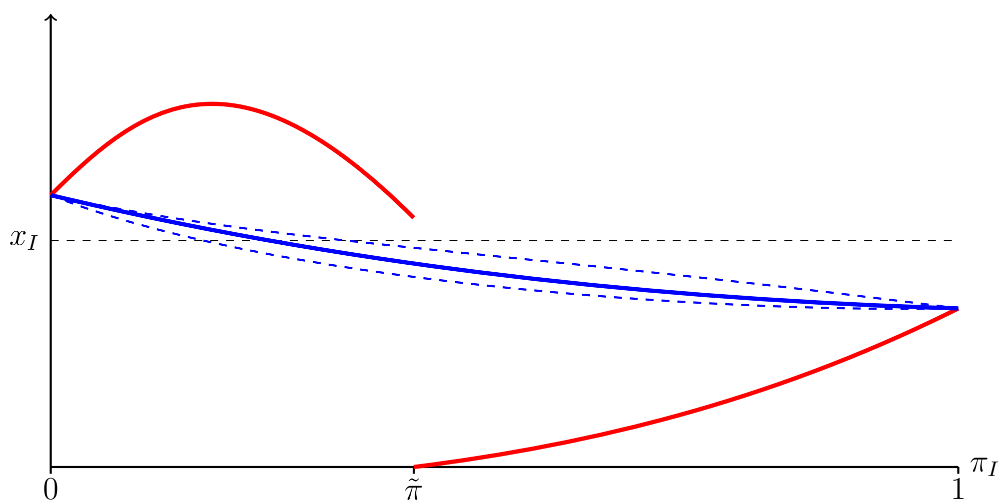
From here, our result follows from a standard envelope argument.

Proposition 5. *Suppose no crisis emerges in the first period. Among all perfect Bayesion equilibria, the equilibrium where $x_n^a(0) = x_n^a(1) = x_n^b(\pi_I)$ maximizes the expected utility of both types of the incumbent.*

Proposition 5 shows there is no equilibrium in which the incumbent can do better than the one where he ignores his private information, even if he learns he is the competent type. An important implication follows immediately. If we focus on the equilibrium that provides the incumbent with the highest expected utility, asymmetric information has no impact on the equilibrium policy during normal times. The incumbent acts as if he had no private information, and conditions his choice on the prior π_I.

This result, together with Corollary 3, implies that the qualitative predictions of our earlier results continue to hold. Figure 3 illustrates this robustness. Here, the red curve is exactly as in the baseline, as it plots the incumbent's policy from the welfare-maximizing equilibrium under normal times, $x_n^a(0) = x_n^a(1) = x_n^b(\pi_I)$. The blue dashed curves are the equilibrium policies in times of crisis, under both possible realizations of the private signal s_θ. Finally, the blue solid line is the ex-ante expected policy (where the expectation is over s_θ). As in the baseline, we can see there is a qualitative and quantitiative effect of the crisis on incumbent behavior and this leads to more reform by leading incumbents in a crisis and less reform by trailing incumbents.

Figure 3: Policymaking with asymmetric information



Note: Figure 3 compares equilibrium policy in normal times (red line) against the equilibrium policy in times of crisis following the $s_\theta = 0$ signal (upper dashed blue line), following the $s_\theta = 1$ signal (lower dashed blue line), and the expected crisis policy (solid blue line).

Conclusion

How do crises influence an executive's willingness to implement policy reforms? While existing work focuses on how crises impact voters' demand for reform, this paper investigated how they alter politicians' incentives to supply policy experimentation, even if the crisis does not shift voters' policy preferences. To study this problem, we developed a model of elections and policy experimentation, where voters face uncertainty about their optimal policy and politicians' ability to manage a crisis. Overall, we show that a crisis induces bolder policy reforms only when the incumbent is sufficiently likely to be competent. If the incumbent is relatively unlikely to be competent, then the crisis instead yields policies closer to the status quo.

We show that this effect survives even if crises influence voters' policy demands, or if the incumbent has private information about his ability. Further, we find that in our framework incumbents who are electorally trailing and unlikely to score a success on the policy dimension have strategic incentives to generate a crisis.

Moving forward, we see two ways that future research may build on the insights this model delivers. First, while the conventional demand-side theories argue that crises beget reforms, the empirical findings are mixed. Our results show that the supply-side effect of a crisis may go in either direction, as it is mediated by the incumbent's reputation. Empirical scholars may find it useful to adopt this framework, and investigate whether accounting for the incumbent's competence allows us to recover more consistent patterns in the data. Second, although we focus on the relationship between crises and reforms, from a theoretical standpoint our argument is more general. Our main intuition is that an imposed exogenous risk influences a political actor's preference for endogenous risks. This intuition may be explored, for example, in the context of electoral campaigns to study how the likelihood of a scandal erupting changes a party's strategic choices. Alternatively, we may think about a crisis as being generated by internal divisions in the party, and adopt this framework to analyze how intraparty conflict influences an officeholder's choices.

References

Alesina, Alberto, Silvia Ardagna and Francesco Trebbi. 2006. “Who adjusts and when? The political economy of reforms.” *IMF Staff Papers* 53(1):1–29.

Ansell, Chris, Arjen Boin and Paul t’Hart. 2014. *Political leadership in times of crisis*. Oxford University Press Oxford.

Ansolabehere, Stephen and James M Snyder. 2000. “Valence politics and equilibrium in spatial election models.” *Public Choice* 103(3):327–336.

Ash, Elliott, Massimo Morelli and Richard Van Weelden. 2017. “Elections and divisiveness: Theory and evidence.” *The Journal of Politics* 79(4):1268–1285.

Ashworth, Scott, Ethan Bueno de Mesquita and Amanda Friedenberg. 2017. “Accountability and information in elections.” *American Economic Journal: Microeconomics* 9(2):95–138.

Ashworth, Scott, Ethan Bueno de Mesquita and Amanda Friedenberg. 2018. “Learning about voter rationality.” *American Journal of Political Science* 62(1):37–54.

Bernhardt, Dan, Odilon Câmara and Francesco Squintani. 2011. “Competence and ideology.” *The Review of Economic Studies* 78(2):487–522.

Campos, Nauro F, Cheng Hsiao and Jeffrey B Nugent. 2010. “Crises, what crises? New evidence on the relative roles of political and economic crises in begetting reforms.” *The Journal of Development Studies* 46(10):1670–1691.

Castanheira, Micael, Gaëtan Nicodème and Paola Profeta. 2012. “On the political economics of tax reforms: survey and empirical assessment.” *International Tax and Public Finance* 19(4):598–624.

Cohen, Jeffrey E. 1999. *Presidential responsiveness and public policy-making: The publics and the policies that presidents choose*. University of Michigan Press.

Dewan, Torun and Rafael Hortala-Vallve. 2019. “Electoral competition, control and learning.” *British Journal of Political Science* 49(3):923–939.

Downs, George W and David M Rocke. 1994. “Conflict, agency, and gambling for resurrection: The principal-agent problem goes to war.” *American Journal of Political Science* pp. 362–380.

Drazen, Allan. 1996. “The political economy of delayed reform.” *The Journal of Policy Reform* 1(1):25–46.

Drazen, Allan. 2000. *Political Economy in Macroeconomics*. Princeton University Press.

Drazen, Allan and William Easterly. 2001. "Do crises induce reform? Simple empirical tests of conventional wisdom." *Economics & Politics* 13(2):129–157.

Fernandez, Raquel and Dani Rodrik. 1991. "Resistance to reform: Status quo bias in the presence of individual-specific uncertainty." *The American economic review* pp. 1146–1155.

Fiorina, Morris P. 1981. *Retrospective voting in American national elections.* Yale University Press.

Galasso, Vincenzo. 2014. "The role of political partisanship during economic crises." *Public Choice* 158(1-2):143–165.

Gieczewski, Germán and Svetlana Kosterina. 2020. "Endogenous Experimentation in Organizations." *Princeton University Typescript* .

Gratton, Gabriele, Luigi Guiso, Claudio Michelacci and Massimo Morelli. 2021. "From Weber to Kafka: Political instability and the overproduction of laws." *American Economic Review* 111(9):2964–3003.

Groseclose, Tim. 2001. "A model of candidate location when one candidate has a valence advantage." *American Journal of Political Science* pp. 862–886.

Guiso, Luigi, Helios Herrera, Massimo Morelli and Tommaso Sonno. 2019. "Global crises and populism: the role of Eurozone institutions." *Economic Policy* 34(97):95–139.

Hirsch, Alexander V. 2016. "Experimentation and persuasion in political organizations." *American Political Science Review* 110(1):68–84.

Izzo, Federica. 2022. "Ideology for the Future." *American Political Science Review* First View:1–16.
URL: *https://doi.org/10.1017/S0003055422000843*

Krasa, Stefan and Mattias K Polborn. 2012. "Political competition between differentiated candidates." *Games and Economic Behavior* 76(1):249–271.

Levy, Gilat and Ronny Razin. 2021. "Short-term political memory and the inevitability of polarisation." *London School of Economics working paper* .
URL: *https://drive.google.com/file/d/1a1rRJfGw9bEukdgVHdTmINCi2MF6EQMX/view*

Lora, Eduardo and Mauricio Olivera. 2004. "What makes reforms likely: Political economy determinants of reforms in Latin America." *Journal of Applied Economics* 7(1):99–135.

Mahmalat, Mounir and Declan Curran. 2018. "Do Crises Induce Reform? A Critical Review of Conception, Methodology and Empirical Evidence of the 'Crisis Hypothesis'." *Journal of Economic Surveys* 32(3):613–648.

Majumdar, Sumon and Sharun W Mukand. 2004. "Policy gambles." *American Economic Review* 94(4):1207–1222.

Mian, Atif, Amir Sufi and Francesco Trebbi. 2014. "Resolving debt overhang: Political constraints in the aftermath of financial crises." *American Economic Journal: Macroeconomics* 6(2):1–28.

Pitlik, Hans and Steffen Wirth. 2003. "Do crises promote the extent of economic liberalization?: an empirical test." *European Journal of Political Economy* 19(3):565–581.

Pop-Eleches, Grigore. 2008. *From Economic Crisis to Reform*. Princeton University Press.

Prato, Carlo and Stephane Wolton. 2018. "Rational ignorance, populism, and reform." *European Journal of Political Economy* 55:119–135.

Stewart, Alexander J, Nolan McCarty and Joanna J Bryson. 2020. "Polarization under rising inequality and economic decline." *Science advances* 6(50):eabd4201.

Strulovici, Bruno. 2010. "Learning while voting: Determinants of collective experimentation." *Econometrica* 78(3):933–971.

Strumpf, Koleman S. 2002. "Does government decentralization increase policy innovation?" *Journal of Public Economic Theory* 4(2):207–241.

Tommasi, Mariano and Andres Velasco. 1996. "Where are we in the political economy of reform?" *The Journal of Policy Reform* 1(2):187–238.

Volden, Craig, Michael M Ting and Daniel P Carpenter. 2008. "A formal model of learning and policy diffusion." *American Political Science Review* 102(3):319–332.

Williamson, John. 1994. "In search of a manual for technopols." *The political economy of policy reform* pp. 11–28.

A Proofs for Baseline Model

Lemma (A1). *If $|x| > |x'|$ then policy experiment x is Blackwell more informative than x'.*

Proof. The noise term is distributed normally and thus satisfies the MLRP property. Furthermore, fixing an x_t on either side of zero, the policy choice and the state of the world are strict complements. This can be verified by noting that, for any $z > y > 0$, we have

$$-(z-1)^2 + (z+1)^2 > -(y-1)^2 + (y+1)^2,$$

with the symmetric result holding for $z < y < 0$. Thus, Theorem 3.1 of Ashworth, Bueno de Mesquita and Friedenberg (2017) applies, and shows that outcomes are more Blackwell informative as x moves away from 0 in either direction. □

Lemma 1. *Given posterior beliefs μ_ω and μ_θ, the voter reelects the right-wing incumbent if*

$$\mu_\omega \geq \frac{1}{2} - \frac{pK(\mu_\theta - \pi_C)}{8x_I}.$$

Otherwise, the voter elects the challenger.

Proof. The voter's expected utility from re-electing the incumbent is greater than her utility from electing the challenger if

$$\begin{aligned}&-\mu_\omega(x_I-1)^2 - (1-\mu_\omega)(x_I+1)^2 - (1-\mu_\theta(\chi))p_2K \\ &\qquad \geq -\mu_\omega(x_C-1)^2 - (1-\mu_\omega)(x_C+1)^2 - (1-\pi_C)p_2K.\end{aligned}$$

Substituting $x_C = x_I$ the above reduces to

$$\mu_\omega \geq \frac{1}{2} - \frac{p_2K(\mu_\theta(\chi) - \pi_C)}{8x_I}$$

□

Definition 2. *Let $\overline{\gamma}_\chi = \frac{1}{2} - \frac{pK(\mu_\theta(\chi)-\pi_C)}{8x_I}$., for crisis outcome $\chi \in \{N, S, F\}$.*

Lemma (A2). *If the crisis outcome is $\chi \in \{N, S, F\}$, then the probability of reelection for the incumbent is*

$$P_\chi(x_1) = \gamma\Big(1 - \Phi(\frac{\lambda_\chi}{4|x_1|} - 2|x_1|)\Big) + (1-\gamma)\Big(1 - \Phi(\frac{\lambda_\chi}{4|x_1|} + 2|x_1|)\Big),$$

where $\lambda_\chi = \ln\left(\frac{(1-\gamma)\overline{\gamma}_\chi}{\gamma(1-\overline{\gamma}_\chi)}\right)$.

Proof. By Bayes rule we have

$$\mu_\omega(x_1, U_1^p) = \frac{\gamma\phi\big(U_1^p + (x_1-1)^2\big)}{\gamma\phi\big(U_1^p + (x_1-1)^2\big) + (1-\gamma)\phi\big(U_1^p + (x_1+1)^2\big)}$$

Thus, using Lemma 1, the incumbent's probability of being re-elected is given by

$$Pr\left(\frac{\gamma\phi\big(U_1^p + (1-x_1)^2\big)}{\gamma\phi\big(U_1^p + (1-x_1)^2\big) + (1-\gamma)\phi\big(U_1^p + (-1-x_1)^2\big)} > \overline{\gamma}_\chi\right), \tag{1}$$

where ϕ is the PDF of the standard normal distribution.

From the incumbent's perspective, U_1^p is probabilistic, therefore 1 can be rewritten as

$$\gamma[Pr\left(\frac{\gamma\phi\big(-(x_I-1)^2 + \epsilon + (x_1-1)^2\big)}{\gamma\phi\big(-(x_I-1)^2 + \epsilon + (x_1-1)^2\big) + (1-\gamma)\phi\big(-(x_I+1)^2 + \epsilon + (x_1+1)^2\big)} > \overline{\gamma}_\chi\right)] \tag{2}$$
$$+(1-\gamma)[Pr\left(\frac{\gamma\phi\big(-(x_I+1)^2 + \epsilon + (x_1-1)^2\big)}{\gamma\phi\big(-(x_I+1)^2 + \epsilon + (x_1-1)^2\big) + (1-\gamma)\phi\big(-(x_I+1)^2 + \epsilon + (x_1+1)^2\big)} > \overline{\gamma}_\chi\right)].$$

Equation 2 further reduces to

$$\gamma[Pr\left(\frac{\gamma\phi(\epsilon)}{\gamma\phi(\epsilon) + (1-\gamma)\phi(4x_1+\epsilon)} > \overline{\gamma}_\chi\right)] + (1-\gamma)[Pr\left(\frac{\gamma\phi(-4x_1+\epsilon)}{\gamma\phi(-4x_1+\epsilon) + (1-\gamma)\phi(\epsilon)} > \overline{\gamma}_\chi\right)], \tag{3}$$

and we can rewrite this probability as

$$\gamma[p\left(e^{-\frac{\epsilon^2}{2}+\frac{(4x_1+\epsilon)^2}{2}} > \frac{\overline{\gamma}_\chi(1-\gamma)}{\gamma(1-\overline{\gamma}_\chi)}\right)] + (1-\gamma)[p\left(e^{-\frac{-(-4x_1+\epsilon)^2}{2}+\frac{\epsilon^2}{2}} > \frac{\overline{\gamma}_\chi(1-\gamma)}{\gamma(1-\overline{\gamma}_\chi)}\right)]. \tag{4}$$

Suppose that $x_1 > 0$. After rearranging and applying a logarithmic transformation, the above obligingly reduces to

$$\gamma[Pr(\epsilon > \frac{\lambda_\chi}{4x_1} - 2x_1)] + (1-\gamma)[Pr(\epsilon > \frac{\lambda_\chi}{4x_1} + 2x_1)], \tag{5}$$

as claimed. A similar derivation yields the expression for $x < 0$. □

Definition 3. *Let* $\Delta_\chi^- = \frac{\lambda_\chi}{4x} - 2x$ *and* $\Delta_\chi^+ = \frac{\lambda_\chi}{4x} + 2x$, *for* $\chi \in \{N, S, F\}$.

Lemma (A3).

1. $\frac{\partial \Delta_\chi^+}{\partial x} = \frac{-\lambda_\chi}{4x^2} + 2 = -\frac{1}{x}\Delta_\chi^-$, *and*

2. $\frac{\partial \Delta_\chi^-}{\partial x} = \frac{-\lambda_\chi}{4x^2} - 2 = -\frac{1}{x}\Delta_\chi^+$

Proof. Follows immediately by differentiating. □

Definition 4. *Let* $\Gamma_\chi(x) = \gamma\Delta_\chi^+\phi(\Delta^-) + (1-\gamma)\Delta_\chi^-\phi(\Delta_\chi^+)$ *and* $\Omega_\chi(x) = \gamma\phi(\Delta_\chi^-) + (1-\gamma)\phi(\Delta_\chi^+)$, *for* $\chi \in \{N, S, F\}$.

Lemma (A4). *We have* $\frac{\partial P_\chi}{\partial x} = \frac{1}{x}\Gamma_\chi(x)$ *and* $\frac{\partial^2 P_\chi}{\partial x^2} = -\frac{1}{x^2}\Gamma_\chi(x) + \frac{1}{x}\frac{\partial \Gamma_\chi}{\partial x}$, *where* $\frac{\partial \Gamma_\chi}{\partial x} = \frac{1}{x}\Big[\Delta_\chi^-\Delta_\chi^+\Gamma_\chi(x) - \Omega_\chi(x)\Big]$.

Proof. Taking the derivative of $P_\chi(x)$ with respect to x we get

$$\begin{aligned}\frac{\partial P_\chi}{\partial x} &= \gamma\phi(\frac{\lambda_\chi}{4x} - 2x)[\frac{\lambda_\chi}{4x^2} + 2] + (1-\gamma)\phi(\frac{\lambda_\chi}{4x} + 2x)[\frac{\lambda_\chi}{4x^2} - 2] \\ &= \frac{1}{x}\Gamma_\chi(x).\end{aligned} \tag{6}$$

Next, we differentiate Γ_χ and obtain

$$\begin{aligned}&\frac{\partial \Gamma}{\partial x} = \gamma\frac{\partial \Delta^+}{\partial x}\phi(\Delta^-) - \gamma\Delta^+\frac{\partial \Delta^-}{\partial x}\Delta^-\phi(\Delta^-) + (1-\gamma)\frac{\partial \Delta^-}{\partial x}\phi(\Delta^+) - (1-\gamma)\Delta^-\frac{\partial \Delta^+}{\partial x}\Delta^+\phi(\Delta^+) \\ &= \frac{1}{x}\gamma\phi(\Delta^-)(\Delta^-(\Delta^+)^2 - 1) + \frac{1}{x}(1-\gamma)\phi(\Delta^+)(\Delta^+(\Delta^-)^2 - 1) \\ &= \frac{1}{x}\Big[\Delta^-\Delta^+\Gamma(x) - \Omega(x)\Big].\end{aligned}$$

The second derivative of $P_\chi(x)$ then follows. □

Lemma 2. *Let x_c^* be an equilibrium policy under a crisis and x_n^* denote an equilibrium policy in normal times. In times of crisis, if x_c^* is an equilibrium policy then it solves*

$$2(x_I - x) + (\beta + 4x_I^2)\Big(\pi_I\frac{\partial P_S}{\partial x} + (1-\pi_I)\frac{\partial P_F}{\partial x}\Big) = 0.$$

In normal times, if x_n^* is an equilibrium policy then it solves

$$2(x_I - x) + (\beta + 4x_I^2)\frac{\partial P_N}{\partial x} = 0.$$

Proof. Assume there is no crisis. We show that any equilibrium policy must be interior and solve the first order condition. Note that the objective function is continuously differentiable in x. As $x \to 0$, the first order condition goes to $2x_I > 0$ because the normal PDF goes to 0 faster than any polynomial goes to ∞, sending $\frac{\partial P}{\partial x} \to 0$. Thus, the objective function is increasing as x increases away from 0. Finally, we must have $x_n^* < \infty$ because $\beta < \infty$. A similar argument yields that the first order condition characterizes the optimal .policy in times of crisis. $\square$

Definition 5. *For a given π_I, let $\overline{x}_{\pi_I}$ solve $4x^2(1+x^2) = \lambda_N^2$. Additionally, define x' as the positive solution to*

$$2\overline{\gamma}_N + \frac{\lambda_N}{8(x)^2} = 1. \tag{7}$$

Let $\pi^\dagger$ be the value of π_I for which equation 7 is satisfied at $x = x_I$.

Lemma 3. *Suppose $x > 0$.*

1. *If a crisis arises in the first period and it is solved, $\chi = S$, then I's probability of winning is decreasing in x.*

2. *If a crisis arises in the first period and it is not solved, $\chi = F$, then I's probability of winning is increasing in x.*

3. *In normal times, the following holds:*

   - *If $\pi_I > \max\{\pi_C, \tilde{\pi}\}$ then I's probability of winning is decreasing in x;*
   - *If $\pi_I < \min\{\pi_C, \tilde{\pi}\}$ then I's probability of winning is increasing in x;*
   - *If $\pi_I \in (\min\{\pi_C, \tilde{\pi}\}, \max\{\pi_C, \tilde{\pi}\})$, then I's probability of winning is single-peaked in x if $\gamma < \frac{1}{2}$ and it is decreasing then increasing in x if $\gamma > \frac{1}{2}$.*

Symmetric results hold for $x < 0$.

Proof. First, consider $\lambda_\chi < 0$. This implies either $\chi = S$ or $\chi = N$ and $\pi_I > \tilde{\pi}$. In this case, (6) is always negative if $\frac{\lambda_\chi}{2\alpha x^2} + \alpha < 0$, which holds for all $x \in [0, \sqrt{\frac{-\lambda_\chi}{2\alpha^2}}]$.

Now, assume $x > \sqrt{\frac{-\lambda_\chi}{2\alpha^2}}$. From (6) we have that $\frac{\partial P_\chi}{\partial x}$ is negative if and only if

$$\frac{\phi(\frac{\lambda_\chi}{2\alpha x} - \alpha x)}{\phi(\frac{\lambda_\chi}{2\alpha x} + \alpha x)} < \frac{1-\gamma}{\gamma}\left(\frac{-\frac{\lambda_\chi}{2\alpha x^2} + \alpha}{\frac{\lambda_\chi}{2\alpha x^2} + \alpha}\right). \tag{8}$$

Which we rewrite as

$$e^{-\frac{1}{2}(\frac{\lambda_\chi}{2\alpha x} - \alpha x)^2 + \frac{1}{2}(\frac{\lambda_\chi}{2\alpha x} + \alpha x)^2} < \frac{1-\gamma}{\gamma}\left(\frac{-\frac{\lambda_\chi}{2\alpha x^2} + \alpha}{\frac{\lambda_\chi}{2\alpha x^2} + \alpha}\right). \tag{9}$$

Applying a logarithmic transformation to both sides the above reduces to

$$\lambda_\chi < \ln\left(\frac{1-\gamma}{\gamma}\frac{\frac{-\lambda_\chi}{2\alpha x^2}+\alpha}{\frac{\lambda_\chi}{2\alpha x^2}+\alpha}\right), \tag{10}$$

which holds if and only if

$$\frac{\overline{\gamma}_\chi(1-\gamma)}{\gamma(1-\overline{\gamma}_\chi)} < \frac{1-\gamma}{\gamma}\frac{\frac{-\lambda_\chi}{2\alpha x^2}+\alpha}{\frac{\lambda_\chi}{2\alpha x^2}+\alpha}. \tag{11}$$

This condition further simplifies to

$$2\overline{\gamma}_\chi + \frac{\lambda_\chi}{2\alpha^2 x^2} < 1. \tag{12}$$

The above is satisfied at any x if $\overline{\gamma}_\chi < \frac{1}{2}$, which always holds when $\mu_\theta(\chi) > \pi_C$. If $\chi = S$ then $\mu_\theta(\chi) = 1 > \pi_C$ and (12) always holds. If $\chi = N$, then $\mu_\theta(\chi) = \pi_I$, thus (12) always holds when $\pi_I > \pi_C$. Recall that $\pi_C < \tilde{\pi}$ if and only if $\gamma < \frac{1}{2}$. Thus, when $\gamma < \frac{1}{2}$, $\pi_I > \tilde{\pi}$ implies $\pi_I > \pi_C$, and (12) is always satisfied. Next, suppose $\chi = N$, $\gamma > \frac{1}{2}$ and $\pi_I \in (\tilde{\pi}, \pi_C)$. Then, there exists a unique $x' > \sqrt{\frac{-\lambda_N}{2\alpha^2}}$ s.t. (12) holds for $x < x'$, and fails otherwise. x' satisfies (7).

Finally, consider $\lambda_\chi > 0$. This implies either $\chi = F$ or $\chi = N$ and $\pi_I < \tilde{\pi}$. (12) always fails when $\gamma_\chi > \frac{1}{2}$, which always holds when $\mu_\theta(\chi) < \pi_C$. If $\chi = F$, then $\mu_\theta = 0 < \pi_C$, and (12) never holds. If $\chi = N$, then $\mu_\theta(\chi) = \pi_I$ thus (12) fails when $\pi_I < \pi_C$. Recall that $\pi_C < \tilde{\pi}$ iff $\gamma < \frac{1}{2}$. Thus, when $\gamma > \frac{1}{2}$, $\pi_I < \tilde{\pi}$ implies $\pi_I < \pi_C$, and (12) is never satisfied. Finally, suppose $\chi = N$, $\gamma < \frac{1}{2}$ and $\pi_I \in (\pi_C, \tilde{\pi})$. In this case, it is straightforward that (12) holds for $x > x'$, and fails otherwise, where x' satisfies (7). □

Lemma (A5). *Define* $\widehat{\beta} = \frac{x^2(4\gamma-3)}{1-\gamma}$. *Assume* $\tilde{\pi}_I \in (0,1)$, *which holds if and only if*

$$\gamma \in \left(\frac{1}{2} - \frac{1-\pi_C}{2}\frac{pK}{x_I}, \frac{1}{2} + \frac{\pi_C}{2}\frac{pK}{x_I}\right).$$

The following hold:

1. $\lim_{\pi_I \to \tilde{\pi}^+} x_n^* = 0$.
2. *The optimal policy choice* x_n^* *is discontinuous in* π_I *at* $\pi_I = \tilde{\pi}$.
3. *The optimal policy choice* x_n^* *is differentiable in* π_I *for* $\pi_I \leq \tilde{\pi}$.
4. *The optimal policy choice* x_n^* *is differentiable in* π_I *for* $\pi_I > \tilde{\pi}$

Proof. First, we show that the $\tilde{\pi}$ politician's expected utility from any x is lower than her expected utility if she could choose $x = 0$ and win with probability 1. First, note that the $\tilde{\pi}$ politician's probability of winning is bound above by γ, since his probability of winning is either strictly increasing in x ($\gamma > 1/2$) or strictly decreasing ($\gamma < 1/2$). Thus, for $\tilde{\pi}$ we have $U_{\tilde{\pi}_I}(x) \leq \gamma\beta - 4x_I^2(1-\gamma)$. If the $\tilde{\pi}$ incumbent chooses $x = 0$ and wins with probability 1 her expected utility is $\beta - x_I^2$. Define $\tilde{U}_0 = \beta - x_I^2$. Thus, if $\beta - x_I^2 > \gamma\beta - 4x_I^2(1-\gamma)$ then $\tilde{U}_0 > U(x)$ for any policy x. This holds if and only if β is sufficiently large, which holds by assumption that $\beta > \widehat{\beta}$. For the $\tilde{\pi}$ incumbent and any $x > 0$ define $\Delta_x = \tilde{U}_0 - U(x)$. Next, we show that for any $x^\dagger > 0$ there exists δ_x such that if $|\pi_I - \tilde{\pi}| < \delta_x$ then $U_{\pi_I}(x = 0) - U_{\pi_I}(x^\dagger) > 0$. We have

$$\begin{aligned}
&U_{\pi_I}(x = 0) - U_{\pi_I}(x^\dagger) \\
&= U_{\pi_I}(x = 0) - U_{\pi_I}(x^\dagger) + U_{\tilde{\pi}_I}(x^\dagger) - U_{\tilde{\pi}_I}(x^\dagger) \\
&= U_{\pi_I}(x = 0) - U_{\tilde{\pi}_I}(x^\dagger) - |U_{\pi_I}(x^\dagger) - U_{\tilde{\pi}_I}(x^\dagger)| \\
&= \Delta_x - |U_{\pi_I}(x^\dagger) - U_{\tilde{\pi}_I}(x^\dagger)|,
\end{aligned}$$

where the final line follow from $U_{\pi_I}(x = 0) = \tilde{U}_0$ and $U_{\pi_I}(x^\dagger) > U_{\tilde{\pi}_I}(x^\dagger)$. Because $U(x)$ is continuous in (x, π_I) for $x > 0$, we have that

$$\lim_{\pi_I \to \tilde{\pi}} \Delta'_x - |U_{\pi_I}(x^\dagger) - U_{\tilde{\pi}_I}(x^\dagger)| = \Delta'_x > 0.$$

Since this holds for any $x^\dagger > 0$, we must have that $\lim_{\pi_I \to \tilde{\pi}} x_n^* = 0$.

Next, notice that for $\pi_I = \tilde{\pi}$, the equilibrium policy is bounded away from 0 which is verified by nothing that the incumbent's utility is increasing in x at $x = 0$ since the normal pdf goes to 0 faster than any polynomial goes to ∞. This proves point 2.

The proof of point 3 follows from two observations. First, as $\pi \to \tilde{\pi}$ from the left x_n^* is bounded away from zero (see the proof of point 2. above). Second, the objective function is differentiable in x and π_I when $x > 0$.

Point 4 follows from noting that the objective function is differentiable in x and π_I when $x > 0$, but it is not differentiable at $\tilde{\pi}$ when $x = 0$. The strict inequality then follows from point 1. □

Lemma (A6). *Assume there is no crisis and $\pi_I < \pi_I^\dagger$. If $x \in [0, \overline{x}_{\pi_I}]$ then $P_N(x)$ can only change concavity once. If $x > \overline{x}_{\pi_I}$ then $P_N(x)$ is concave in x.*

Proof. We have $\frac{\partial P_N}{\partial x} = \frac{1}{x}\Gamma(x)$. Differentiating Γ yields

$$\begin{aligned}
\frac{\partial \Gamma}{\partial x} &= \gamma \frac{\partial \Delta^+}{\partial x}\phi(\Delta^-) - \gamma\Delta^+ \frac{\partial \Delta^-}{\partial x}\Delta^-\phi(\Delta^-) + (1-\gamma)\frac{\partial \Delta^-}{\partial x}\phi(\Delta^+) - (1-\gamma)\Delta^- \frac{\partial \Delta^+}{\partial x}\Delta^+\phi(\Delta^+) \\
&= \frac{1}{x}\gamma\phi(\Delta^-)(\Delta^-(\Delta^+)^2 - 1) + \frac{1}{x}(1-\gamma)\phi(\Delta^+)(\Delta^+(\Delta^-)^2 - 1) \\
&= \frac{1}{x}\Big[\Delta^-\Delta^+\Gamma(x) - \Omega(x)\Big].
\end{aligned}$$

P_N is concave in x if and only if

$$\begin{aligned}
&\frac{\partial^2 P_N}{\partial x^2} < 0 \\
&\Leftrightarrow -\frac{1}{x^2}\Gamma(x) + \frac{1}{x}\frac{\partial \Gamma}{\partial x} < 0 \\
&\Leftrightarrow \frac{1}{x}\frac{\partial \Gamma}{\partial x} < \frac{1}{x^2}\Gamma(x) \\
&\Leftrightarrow \frac{1}{x^2}\Big[\Delta^-\Delta^+\Gamma(x) - \Omega(x)\Big] < \frac{1}{x^2}\Gamma(x) \\
&\Leftrightarrow 0 < (1-\Delta^-\Delta^+)\Gamma(x) + \Omega(x)
\end{aligned}$$

We have $\Omega(x) \geq 0$. Moreover, by $\pi_I < \pi^\dagger$, we have $\Gamma(x) > 0$ for any x which are possible solutions to the first-order condition. Thus, a sufficient condition for this inequality to hold is that $1 - \Delta^-\Delta^+ \geq 0$. By definition, this holds for all $x \geq \overline{x}_{\pi_I}$, completing the second part of the lemma.

Next, assume $x < \overline{x}_{\pi_I}$, so $1 - \Delta^-\Delta^+ < 0$. For P_N to be convex requires

$$0 > (1-\Delta^-\Delta^+)\Gamma(x) + \Omega(x) \tag{13}$$

Assume that (13) holds. We show this implies that the RHS of (13) is increasing in x. Differentiating yields

$$\frac{\partial RHS(13)}{\partial x} = \frac{1}{x}[(\Delta^+)^2 + (\Delta^-)^2]\Gamma(x) + \frac{1}{x}[1-\Delta^-\Delta^+]\Big[\Delta^-\Delta^+\Gamma(x) - \Omega(x)\Big]$$

We must have $\Delta^-\Delta^+\Gamma(x) - \Omega(x) < 0$, otherwise, (13) does not hold. Thus, if P_N is convex in x then $\frac{\partial RHS(13)}{\partial x} > 0$, which implies that once (13) no longer holds at some y it cannot again hold for $x > y$. □

Lemma (A7). *Assume there is no crisis and $\pi_I > \pi_I^\dagger$. If $x \in [0, \overline{x}_{\pi_I}]$ then $P_N(x)$ is concave. If $x > \overline{x}_{\pi_I}$ then $P_N(x)$ can only change concavity once.*

Proof. From the previous lemma we have that P_N is concave if and only if

$$0 < (1 - \Delta^- \Delta^+)\Gamma(x) + \Omega(x)$$

Since $\pi_I > \pi_I^\dagger$ we must have that $\Gamma(x) < 0$ for all x that are candidate solutions to the incumbent's problem. Additionally, $\Omega(x) > 0$. Therefore, a sufficient condition for this inequality to hold is $1 - \Delta^- \Delta^+ \leq 0$, which holds if and only if $x \leq \overline{x}_{\pi_I}$.

Next, assume $x > \overline{x}_{\pi_I}$, so $1 - \Delta^- \Delta^+ > 0$. Again, for P_N to be convex requires

$$0 > (1 - \Delta^- \Delta^+)\Gamma(x) + \Omega(x) \tag{14}$$

Assume that (14) holds. We show this implies that the RHS of (14) is decreasing in x. Differentiating yields

$$\frac{\partial RHS(14)}{\partial x} = \frac{1}{x}[(\Delta^+)^2 + (\Delta^-)^2]\Gamma(x) + \frac{1}{x}[1 - \Delta^- \Delta^+]\Big[\Delta^- \Delta^+ \Gamma(x) - \Omega(x)\Big]$$

Since $\pi_I > \pi^\dagger$ we have $\Gamma(x) < 0$, thus, the first term in $\frac{\partial RHS(14)}{\partial x}$ is negative. Now consider the second term of $\frac{\partial RHS(14)}{\partial x}$. For (14) to hold we must have $\Delta^- \Delta^+ \Gamma(x) - \Omega(x) > \Gamma(x)$. As such,

$$\Delta^- \Delta^+ \Gamma(x) - \Omega(x) < \Delta^- \Delta^+ (\Delta^- \Delta^+ \Gamma(x) - \Omega(x)) - \Omega(x)$$

The RHS of this inequality rearranges to $(\Delta^- \Delta^+)^2 \Gamma(x) - \Omega(x)(1 - \Delta^- \Delta^+) < 0$. Therefore, the second term of $\frac{\partial RHS(14)}{\partial x}$ is also negative. Consequently, if $P_N(x)$ is convex at $\hat{x}$, for $x' > \overline{x}_{\pi_I}$, then it is convex for all $x > \hat{x}$. □

Lemma (A8). *The equilibrium policy is unique for $\pi_I \leq \pi^\dagger$.*

Proof. Assume there is not a crisis. We have that U is concave in x if and only if

$$\frac{\partial^2 U}{\partial x^2} = (\beta + 2x_I)\frac{\partial^2 P_N}{\partial x^2} < 0$$

We show that I's optimal policy must lie in an interval over which his expected utility is concave.

If $\pi_I < \pi^\dagger$, then U is concave in x if and only if P_N is concave. By Lemma A6 either U is concave for all x, in which case we are done, or there is some $\tilde{x}$ such that U is convex over $[0, \tilde{x}]$ and concave for $x \geq \tilde{x}$. However, by $\pi_I < \pi^\dagger$ we must have $x^* \geq x_I > 0$. Thus, the optimal policy must lie in $[\tilde{x}, \infty)$, and U is concave over this interval. □

Proposition 1.

1. *The equilibrium policy in a crisis is decreasing in I's expected competence, $\frac{\partial x_c^*}{\partial \pi_I} < 0$.*

2. *There exists a unique cut-point $\hat{\pi}_I < \tilde{\pi}$ such that: if $\pi_I \in (\hat{\pi}_I, \tilde{\pi})$ then every equilibrium policy under no crisis is decreasing in I's expected competence, $\frac{\partial x_n^*}{\partial \pi_I} < 0$. Otherwise, it is increasing in I's expected competence, $\frac{\partial x_n^*}{\partial \pi_I} > 0$.*

Proof. Assume there is no crisis in the first period. First, we show that any solution x_n^* to the first-order condition must be increasing in π_I for $\pi_I > \tilde{\pi}$. Applying the implicit function theorem we have

$$\frac{\partial x_n^*}{\partial \pi_I} = -(\beta + 4x_I^2)\frac{\frac{\partial^2 P_N}{\partial \pi_I \partial x_1}}{\frac{-2+\partial^2 P_N}{\partial x^2}}.$$

Thus, $\frac{\partial x_n^*}{\partial \pi_I} < 0$ if and only if

$$\begin{aligned}
&\frac{\partial^2 P_N}{\partial \pi_I \partial x_1} < 0. \\
&\Leftrightarrow \frac{1}{2x^2}\frac{\partial \lambda_N}{\partial \pi_I}\Big(\gamma\phi(\Delta^-) + (1-\gamma)\phi(\Delta^+) + \gamma\phi'(\Delta^-)\Delta^+ + (1-\gamma)\phi'(\Delta^+)\Delta^-\Big) < 0,
\end{aligned}$$

Since $\frac{\partial \lambda_N}{\partial \pi_I} < 0$, the inequality holds if and only if

$$\begin{aligned}
&\gamma\phi(\Delta^-) + (1-\gamma)\phi(\Delta^+) + \gamma\phi'(\Delta^-)\Delta^+ + (1-\gamma)\phi'(\Delta^+)\Delta^- > 0 \\
&\Leftrightarrow \gamma\phi(\Delta^-) + (1-\gamma)\phi(\Delta^+) - \gamma\phi(\Delta^-)\Delta^-\Delta^+ - (1-\gamma)\phi(\Delta^+)\Delta^+\Delta^- > 0 \\
&\Leftrightarrow (1 - \Delta^-\Delta^+)(\gamma\phi(\Delta^-) + (1-\gamma)\phi(\Delta^+)) > 0.
\end{aligned}$$

Therefore, $\frac{\partial x_n^*}{\partial \pi_I} < 0$ if and only if $1 - \Delta^-\Delta^+ > 0$, which can be rewritten as

$$4x^2(1+x^2) > \lambda_N^2. \tag{15}$$

Lemma A5 point 1 implies that to the right of $\tilde{\pi}$, x_n^* must be increasing in π_I. Thus, (15) cannot hold. Consider now increasing π_I away from $\tilde{\pi}$. This increases both sides of the inequality. If the LHS remains smaller than the RHS for all $\pi_I \in (\tilde{\pi}, 1]$, then this implies that x_n^* is increasing in π_I over this range. Suppose instead there exists a point $\pi' > \tilde{\pi}$ s.t. (15) fails for $\pi < \pi'$, and holds with equality at $\pi = \pi'$. Then, increasing π_I away from π' increases the RHS decreases the LHS. But then, this implies that (15) continues to fail for any $\pi \geq \pi'$. Thus, it must be the case that (15) fails for all $\pi_I \in (\tilde{\pi}, 1]$, and x_n^* is increasing in π_I over this range.

Next, consider $\pi_I \leq \tilde{\pi}$. By construction, at $\pi_I = \tilde{\pi}_I$ we have $\lambda_N = 0$. As $x_n^* > 0$, inequality (15) must hold. Since x_n^* is continuous in π_I in this range, it must also hold for all π sufficiently close to $\tilde{\pi}_I$, i.e., for $\pi_I \in (\underline{\pi}_I, \tilde{\pi}]$. We now show that (15) can only hold over this interval. Note that λ_N^2 is increasing as π_I moves away from $\tilde{\pi}_I$. First, consider decreasing π_I down from $\tilde{\pi}$. Doing so increases λ_N^2 and increases x_n^*, which increases $4x^{*2}_n(1+x^{*2}_n)$. If $4x^{*2}_n(1+x^{*2}_n)$ remains greater than λ_N^2 for all $\pi_I < \tilde{\pi}_I$ then $\frac{\partial x_n^*}{\partial \pi_I} < 0$ for all $\pi_I \in (0, \tilde{\pi}_I)$. Next, assume that at some point λ_N^2 crosses $4x_n^{*2}(1+x_n^{*2})$, call it $\underline{\pi}$. Then $\frac{\partial x_n^*}{\partial \pi_I} \geq 0$ and decreasing π_I further from $\underline{\pi}_I$ decreases x_n^* which decrease $4x_n^{*2}(1+x_n^{*2})$ and increases λ_N^2. Thus, $4x_n^{*2}(1+x_n^{*2}) > \lambda_N^2$ for all $\pi_I < \underline{\pi}_I$. Moreover, $\underline{\pi}_I$ is unique by uniqueness of the equilibrium policy choice for $\pi_I < \pi^\dagger$.

Assume there is a crisis. Applying the implicit function theorem yields

$$\frac{\partial x_c^*}{\partial \pi_I} = -(\beta + 4x_I^2)\frac{\frac{\partial P_S}{\partial x_1} - \frac{\partial P_F}{\partial x_1}}{-2 + \pi_I \frac{\partial^2 P_S}{\partial x^2} + (1-\pi_I)\frac{\partial^2 P_F}{\partial x^2}}.$$

Thus, $\frac{\partial x_c^*}{\partial \pi_I} \leq 0$ if and only if $\frac{\partial P_S}{\partial x_1} - \frac{\partial P_F}{\partial x_1} \leq 0$. By Lemma 3 we have $\frac{\partial P_S}{\partial x_1} \leq 0$ and $\frac{\partial P_F}{\partial x_1} \geq 0$. Therefore, $\frac{\partial x_c^*}{\partial \pi_I} \leq 0$, as required. □

Corollary 1.

- *In normal times, there exists $\pi_n^* \leq \tilde{\pi}$ such that the incumbent gambles if and only if $\pi_I < \pi_n^*$.*
- *In a crisis, there exists $\pi_c^* \neq \pi_n^*$ such that the incumbent gambles if and only if $\pi_I < \pi_c^*$.*

Proof. To prove part 1, consider the case of no crisis. First, assume $\gamma < \frac{1}{2}$, which implies $\pi_C < \tilde{\pi}$.

By Lemma 3, the probability of winning is decreasing in x for $\pi_I > \tilde{\pi}$. Consequently, for any $x > x_I$ the incumbent can choose an $x < x_I$ that yields the same policy utility but a higher probability of winning. Thus, if $\pi_I > \tilde{\pi}$ we must have the incumbent's optimal policy $x_n^* \leq x_I$. Similarly, for $\pi_I < \pi_C$ the incumbent's probability of winning is increasing in x, and the incumbent's optimal policy is $x_n^* \geq x_I$.

Next, consider $\pi_I \in (\pi_C, \tilde{\pi})$. By Lemma 3, the incumbent's probability of winning is maximized at $x = x'$. If $x' < x_I$ then the incumbent's probability of winning is decreasing in x for $x > x_I$. Thus, we must have $x_n^* \leq x_I$. On the other hand, if $x' > x_I$ then the incumbent's probability of winning is increasing in x for $x < x_I$ and so it must be that $x_n^* \geq x_I$. Recall that $x' = \sqrt{\frac{\lambda_N}{8-16\overline{\gamma}_N}}$. We have $\lim_{\pi_I \to \pi_C} x' = \infty$, since $\overline{\gamma}_N = 1/2$ when evaluated at $\pi_I = \pi_C$, and $\lim_{\pi_I \to \tilde{\pi}} x' = 0$, since $\lambda_N = 0$ at $\pi_I = \tilde{\pi}$. Furthermore, $\frac{\partial x'}{\partial \pi_I} < 0$. Thus, the previously defined $\pi^\dagger$ is the unique π_I that solves $x' = x_I$ and defining $\pi^\dagger = \pi_n^* as this solution yields the result.$

Second, assume $\gamma > 1/2$. This implies $\pi_C > \tilde{\pi}$. By Lemma 3, the probability of winning is decreasing in x for $\pi_I > \pi_C$. Thus, if $\pi_I > \tilde{\pi}$ then $x_n^* \leq x_I$. Similarly, if $\pi_I < \tilde{\pi}$ then the incumbent's probability of winning is increasing in x and $x_n^* \geq x_I$.

Third, consider $\pi_I \in (\tilde{\pi}, \pi_C)$. For $x > x'$ the incumbent's probability of winning is increasing in x and bound above by γ. Thus, the incumbent's expected utility for $x \geq x_I$ is bound above by the expected utility to choosing $x = x_I$ and winning with probability γ, i.e., $U(x \geq x_I) < -4x_I^2(1-\gamma) + \gamma\beta$. Since $\pi_I > \tilde{\pi}$, if the incumbent chooses $x = 0$ then the incumbent wins with probability 1. Thus, the incumbent's expected utility for choosing $x < x_I$ is bound below by the expected utility for choosing $x = 0$ and winning, i.e., $U(x < x_I) \geq -x_I^2 + \beta$. Consequently, a sufficient condition to ensure $x_n^* < x_I$ is that

$$\begin{aligned} & -x_I^2 + \beta > -4x_I^2(1-\gamma) + \gamma\beta \\ & \Leftrightarrow \beta > \frac{x_I^2(4\gamma - 3)}{1-\gamma}, \end{aligned}$$

which holds by assumption that $\beta > \widehat{\beta}$. Therefore, defining $\pi^g = \tilde{\pi}$ for $\gamma > 1/2$ yields the result.

Finally, note that Lemma 3 implies $x_n^*(\pi_I = 0) \geq 1$, $x_c^*(\pi_I = 1) \leq x_I$. Then the existence of π_c^* from part 2 follows by Proposition 1.

□

Proposition 2. *There exists $\underline{\pi} < \overline{\pi}$ such that: If $\pi_I > \overline{\pi}$ then the incumbent enacts a more extreme reform during times of crisis than during normal times, $x_c^* > x_n^*$. If $\pi_I < \underline{\pi}$ then the incumbent implements a more moderate reform during times of crisis than during normal times, $x_c^* < x_n^*$. If $\pi_I \in (\underline{\pi}, \overline{\pi})$ then the crisis can lead to more or less reform.*

Proof. The claim for $\pi_I > \overline{\pi}$ follows from Proposition 1 and noting that at $\pi_I = 1$ we have $x_n^* = x_c^*$. For $\pi_I < \underline{\pi}$, Proposition 1 implies there exists $\underline{\pi} \in (\hat{\pi}, \tilde{\pi}]$ such that $x_n^* \geq x_c^*$, because x_n^* is increasing in π_I for $\pi_I < \hat{\pi}$ while x_c^* is decreasing in π_I over this range. That the crisis can lead to more or less reform for $\pi_I \in [\underline{\pi}, \overline{\pi}]$ follows from the proof of Corollary 2. □

Corollary 4. *Assume $\gamma > \frac{1}{2}$ and pK is sufficiently large. If π_C is sufficiently small then $\pi_n^* < \pi_c^*$. If π_C is sufficiently large then $\tilde{\pi} > \pi_c^*$.*

Proof. From the proof of Corollary 1 we have that if $\gamma > 1/2$ then $\pi_n^* = \tilde{\pi}$. If $\pi_C \leq \frac{4x_I}{pK}(2\gamma_c - 1)$ then $\tilde{\pi} \leq 0$. However, $\pi_C \leq \frac{4x_I}{pK}(2\gamma_c - 1)$ yields $\overline{\gamma}_F \in [1/2, \gamma]$, which implies $x_c^*(\pi_I = 0) > x_I$. Thus, $\pi_c^* > 0 \approx \pi_n^*$.

Letting $\pi_C = 1$ yields $\overline{\gamma}_S = 1/2$. Thus, $x_c^*(\pi_I = 1) < x_I$, which implies $\pi_c^* < 1$ for all pk. Additionally, if $\pi_C = 1$ then $\tilde{\pi} = 1 + \frac{4x_I}{pK}(1 - 2\gamma)$. Because $\lim_{pK \to \infty} 1 + \frac{4x_I}{pK}(1 - 2\gamma_c) = 1$ and this is continuous in pK, we can choose pK sufficiently large such that $\tilde{\pi}_C = \pi_n^* > \pi_c^*$. □

B Proofs for Extensions

Non-orthogonal Crisis

Proposition 3. *Assume γ_c is sufficiently large or sufficiently small. If π_I is sufficiently large, then the incumbent enacts a more extreme reform during times of crisis than during normal times.*

Otherwise, the incumbent implements a more moderate reform during times of crisis than during normal times.

Proof. At $\gamma_c = 1$, for almost all π_I the voter either strictly prefers to reelect the incumbent or the challenger, because the outcome on the policy dimension does not shift her prior belief. Consequently, the incumbent has no incentive to choose any $x \neq x_I$. For γ sufficiently high x_c^* is continuous in γ. Thus, for each π_I for any $\epsilon > 0$ we can find a γ sufficiently close to 1 such that $|x^*c - x_I| < \epsilon$, which yields the directional prediction. A similar argument yields the result for γ_c close to 0. $\square$

Endogenous Crisis

Proposition 4. *Suppose office benefit is sufficiently large. If $\pi_I \in [\gamma, \tilde{\pi}]$, then there exist parameter values such that I generates a crisis in equilibrium. Otherwise, if $\pi_I \notin [\gamma, \tilde{\pi}]$, then endogenous crises never emerge.*

Proof. To start, recall that in normal times the incumbent's equilibrium policy solves

$$\frac{-2(x - x_I)}{\beta + 4x_I^2} + \frac{\partial P_N}{\partial x} = 0.$$

As $\beta \to \infty$ the LHS of the FOC goes to $\frac{\partial P_N}{\partial x}$. Since the incumbent's problem is continuous in β we must have that x_n^* approaches the policy that simply maximizes I's winning probability. Denote this policy as $x_p^* = \operatorname{argmax} P_N(x)$. Moreover, we must have that $\lim_{\beta\to\infty} U_n(x_n^*) = (\beta + 2x_I)P_n(x_p^*)$. To see this, consider the ratio

$$\begin{aligned}\frac{U_N(x_n^*)}{(\beta + 2x_I)P_N(x_p^*)} &= \frac{-|x_n^* - x_I| + (\beta + 2x_I)P_N(x^*n)}{(\beta + 2x_I)P_n(x_p^*)} \\ &= \frac{P_N(x_n^*)}{P_N(x_p^*)} - \frac{|x_n^* - x_I|}{(\beta + 2x_I)P_N(x_P^*)}.\end{aligned}$$

Thus, $\lim_{\beta\to\infty} \frac{U_n(x_n^*)}{(\beta+2x_I)P_N(x_p^*)} = 1$. A similar argument yields that $\lim_{\beta\to\infty} \frac{U_c(x_n^*)}{(\beta+2x_I)\pi_I P_S(0)} = 1$ (note that $x = 0$ maximizes $(\beta + 4x_I^2)\pi_I P_S(0)$). Consequently, for β sufficiently high, $U_n(x_n^*) < U_c(x_c^*)$ if and only if $(\beta + 4x_I^2)P_N(x_p^*) < (\beta + 4x_I^2)\pi_I P_S(0)$, which reduces to $P_N(x_p^*) < \pi_I$.

We now show that if $\pi_I > \tilde{\pi}$ then the incumbent never wants to generate a crisis for β sufficiently high. In this case, $P_N(x_p^*) = P_N(0) = 1 > \pi_I$, and so the incumbent's equilibrium payoff is higher with no crisis.

Next, suppose $\pi_I < \gamma$. In this case, $\max P_N(x) \geq \gamma > \pi_I$, and so the incumbent's equilibrium policy is higher without a crisis. Moreover, this implies that if $\gamma > \tilde{\pi}_I$ then the incumbent is never better under a crisis.

Now suppose $\pi_I \in (\gamma, \tilde{\pi}_I)$. We show there exists parameters such that the incumbent's equilibrium payoff is higher under a crisis. Specifically, assume $\gamma > 1/2$. This implies $\tilde{\pi}_I < \pi_C$. Let $\gamma < \tilde{\pi}$. If $\pi_I \in [\gamma, \tilde{\pi}]$ then $\max P_N(x) = \gamma$, which is strictly less than π_I. Thus, if $\gamma > 1/2$, then for all $\pi_I \in [\gamma, \tilde{\pi}]$ the incumbent's equilibrium payoff is higher in a crisis. Moreover, our previous arguments imply that these are the only values of π_I for which the incumbent does better in a crisis when $\gamma > 1/2$.

To finish showing the result, next assume $\gamma < \min\{\tilde{\pi}, \pi_C\}$. Similar to before, we have that if $\pi_I \in (\gamma, \min\{\tilde{\pi}, \pi_C\})$ then $\max P_N(x) = \gamma < \pi_I$, and so the incumbent's equilibrium payoff is higher under a crisis. We also note that $\gamma < \pi_C$ also implies $1/2 < \tilde{\pi}$. Therefore, for all $\pi_I \in (1/2, \tilde{\pi}]$ we have $\max P_N(x) \leq 1/2 < \pi_I$. Thus, all $\pi_I \in (1/2, \tilde{\pi}_I]$ prefer crisis over no crisis. Furthermore, note that these two arguments together imply that if $\gamma < 1/2 < \pi_C$ then all $\pi_I \in [\gamma, \tilde{\pi}]$ prefer the crisis, and all $\pi_I \notin [\gamma, \tilde{\pi}]$ do better when there is no crisis. □

Asymmetric Information

Proposition 4. *Suppose there is a crisis. In every perfect Bayesian equilibrium, we always have that the incumbent chooses different policies following each signal, $x_c^a(0) \neq x_c^a(1)$. Furthermore, $x_c^a(0) = x_c^b(\pi_I = \psi_0)$ and $x_c^a(1) = x_c^b(\pi_I = \psi_1)$.*

Proof. Suppose a crisis emerges in the first period. In this case, the incumbent's type is always revealed via the crisis outcome, thereby making the voter's interim posterior $\mu_\theta(x_1)$ electorally irrelevant.[14] Therefore, the incumbent's policy choice influences his reelection chances only via experimentation and the voter learning on the policy dimension. Thus, in equilibrium the incumbent must act as if there is no asymmetry of information between him and the voter, and implement the dynamically optimal policy given the interim posterior ψ_ζ. □

Corollary 3. *The expected policy in times of crisis is decreasing in π_I.*

Proof. The ex-ante expected policy is given by

$$\begin{aligned} E[x_c^*] = &[\pi_I p(\zeta = 1|\theta = 1) + (1 - \pi_I)p(\zeta = 1|\theta = 0)]x_c^*(\psi_1) \\ &+[\pi_I p(\zeta = 0|\theta = 1) + (1 - \pi_I)p(\zeta = 0|\theta = 0)]x_c^*(\psi_0) \end{aligned}$$

This yields

[14] Here we are assuming that, if the voter's interim posterior and the posterior conditional on crisis outcome are incompatible, the voter only updates conditioning on o_1^c. Specifically, if the voter forms interim posterior that the incumbent is competent but then observes a failed crisis, we assume that she reaches final beliefs that $\theta_I = 0$.

$$\frac{\partial E[x_c^*]}{\partial \pi_I} = [p(\zeta = 1|\theta = 1) - p(\zeta = 1|\theta = 0)]x_c^*(\psi_1) + [\pi_I p(\zeta = 1|\theta = 1) + (1 - \pi_I)p(\zeta = 1|\theta = 0)]\frac{\partial x_c^*(\psi_1)}{\partial \pi_I}$$
$$+[p(\zeta = 0|\theta = 1) - p(\zeta = 0|\theta = 0)]x_c^*(\psi_0) + [\pi_I p(\zeta = 0|\theta = 1) + (1 - \pi_I)p(\zeta = 0|\theta = 0)]\frac{\partial x_c^*(\psi_0)}{\partial \pi_I}.$$

We know from the analysis in the main body that $x_c^*(\psi_\theta)$ is decreasing in ψ_θ, and therefore decreasing in π_I. Notice that this also implies that $x_c^*(0) > x_c^*(1)$. Further, recall that $p(\zeta = 1|\theta = 1) = p(\zeta = 0|\theta = 0) > p(\zeta = 0|\theta = 1) = p(\zeta = 1|\theta = 0)$. Therefore, we have that

$$[p(\zeta = 1|\theta = 1) - p(\zeta = 1|\theta = 0)]x_c^*(\psi_1) + [p(\zeta = 0|\theta = 1) - p(\zeta = 0|\theta = 0)]x_c^*(\psi_0) < 0,$$

and $\frac{\partial E[x_c^*]}{\partial \pi_I} < 0$. □

Lemma 5. *There always exists a perfect Bayesian equilibrium where the incumbent adopts $x_n^b(\pi_I)$ following either signal, $x_n^a(0) = x_n^a(1) = x_n^b(\pi_I)$.*

Proof. First, notice that fixing the voter's interim posterior $\mu_\theta(x_1)$, both types have the same dynamically optimal policy. Thus, fixing the voter's belief at the prior, the incumbent's optimal policy is the same as in the baseline, regardless of the private signal.

Suppose that, following a deviation from the conjectured equilibrium the voter forms interim beliefs $\mu_\theta = \psi_0$. Denote $x_1^d(\psi_0)$ the policy maximizing the incumbent's utility, conditional on the voter forming interim beliefs ψ_0. By definition of $x_n^*(\pi_I)$ (and the envelope theorem), it has to be the case that the incumbent's utility is higher at $x_1^*(\pi_I)$ than at $x_1^d(\psi_0)$. Thus, neither type has a profitable deviation from the conjectured □

Lemma (A9). *Suppose no crisis emerges in the first period. Among all possible pooling equilibria, the one where the incumbent adopts $x_n^*(\pi_I)$ is the one that maximizes the incumbent's utility.*

Proof. This follows from the definition of $x_n^*(\pi_I)$ and the observation that the private signal ζ does not influence the incumbent's expected utility when no crisis arises. □

Lemma (A10). *In any separating equilibrium, both types are indifferent between policies on the equilibrium path.*

Proof. Recall that, for any policy x_1, fixing the voter's interim beliefs $\mu_\theta(x_1)$, both types have the same expected utility. Thus, if one type strictly prefers the conjectured equilibrium policy to imitating the other type, separation cannot be sustained. In any separating equilibrium, therefore, both types have to be indifferent between policies on the equilibrium path. □

Proposition 5. *Suppose no crisis emerges in the first period. Among all perfect Bayesian equilibria, the one where the incumbent adopts $x^a_n(0) = x^a_n(1) = x^b_n(\pi_I)$ maximizes the expected utility of both types of the incumbent.*

Proof. First, suppose that the equilibrium is separating. Then, the $\zeta = 0$ type must be at his dynamic optimum $x^*_n(\psi_0)$. Here, the envelope theorem implies that his expected utility must be lower than in the pooling equilibrium where the voter's interim is at the prior $\pi_I > \psi_0$ and $x^*_n(\pi_I)$. Further, we know from the previous Lemma that in any separating equilibria both types are indifferent between policies on the equilibrium path. Recall that, fixing the voter's interim, the two types have the same expected utility. This implies that the $\zeta = 1$ type is also better off in the equilibrium identified in Lemma 5.

Combining the above with Lemma A9, we have the stated result. □