Dynamic Policy Development and Implementation: An Electoral Accountability Model

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Abstract

We study a model in which a politician chooses whether and when to implement a policy during a two-period term before an election. Politicians differ in their ability to develop a policy that will produce outcomes voters value. In each period, the politician observes the policy's quality and decides whether to implement it. Once implemented, a well-designed policy may succeed before the election, whereas a badly designed policy never does. Voters observe whether and when policy is implemented, but not its quality, absent visible success. In equilibrium, competent politicians implement policy if and only if it is well-designed. Incompetent politicians implement poorly designed policy—especially late in their term—to mimic a competent politician who either failed to develop a well-designed policy or whose policy has yet to produce results. A central implication is that policies implemented early are, in expectation, of higher quality than those implemented later.

Word Count: 9,813

1 Introduction

Democratic responsiveness—the idea that democratic processes induce governments to pursue policies that reflect citizens' interests and welfare—is a central normative commitment of democratic theory and a core justification for democracy (Powell, 2004). Elections are the core institutional mechanism through which democracies are thought to generate responsiveness, giving voters a means to retain effective officials and replace those who are not. Yet formal models of electoral accountability show that this mechanism is often weak. Informational frictions and strategic behavior can loosen the link between voter welfare and politicians' actions, resulting in broad conditions under which elections may fail to reliably produce democratic responsiveness (e.g., Canes-Wrone, Herron and Shotts, 2001; Ashworth and Shotts, 2010; Maskin and Tirole, 2004).

Interestingly, despite its considerable breadth, the literature on electoral accountability conceptualizes responsiveness almost entirely in substantive terms, focusing on how electoral incentives shape the *content* of a politician's policy choices (i.e., which policies a politician chooses from a menu of options). But responsiveness also has an essential *temporal* dimension. A politician who allows undesirable conditions to persist for extended periods is not responsive, even if they eventually adopt a policy aligned with the public interest. Nor is a politician responsive if they move too quickly, enacting a policy before it is adequately prepared, rendering it unlikely to succeed.

In this paper, we explore the extent to which elections induce an incumbent politician to be temporally responsive to a voter in a setting where there is uncertainty about the politician's ability to develop effective policies. Our analysis focuses on two informational frictions that complicate electoral accountability. The first arises during the policy development process. Developing a well-designed policy—one that may succeed if implemented—takes time. As a presidential staffer quoted in Kingdon (2003) put it:

> Just attending to all the technical details of putting together a real proposal

> takes a lot of time. There's tremendous detail in the work. It's one thing to lay out a statement of principles or a general kind of proposal, but it's quite another thing to staff out all the technical work that is required to actually put a real, detailed proposal together (p. 132).

Yet voters may not clearly observe the policy development process. When this is the case, they cannot distinguish whether delays between the beginning of the policy development process and policy implementation reflect a politician who is carefully developing a proposal or one who lacks a viable policy altogether.

For example, following the collapse of its 1994 health care reform effort, the Clinton administration attributed inaction to congressional opposition and institutional constraints rather than shortcomings in policy design or a failure of leadership (Hacker, 1999). Without directly observing the actual policy development process, voters had a limited ability to evaluate which explanation was correct. A similar problem arises when a politician acts quickly: voters may be unsure whether the politician put sufficient time into developing the policy.

A second informational friction arises once a politician implements a policy: visible policy success may not materialize immediately. When this is the case, voters may struggle to adjudicate whether the policy is well-designed but slow to bear fruit or poorly designed and unlikely to ever succeed. Consequently, assessing the ability of a politician who implemented the policy may be difficult, potentially creating incentives for politicians to request patience when a new policy is enacted but fails to show positive effects.

Such appeals are common. In 1982, for example, Ronald Reagan confronted skepticism about his economic program by acknowledging in a speech to the Oklahoma state legislature that "unemployment remains far too high in too much of the country," but insisting that:

> Returning America to steady economic growth is the answer, not quick fixes. And that's what our program is all about, and it will work if we give it time to

take hold.[1]

In 2010, speaking in Maine one week after signing the Affordable Care Act, Barack Obama similarly cautioned that the public should not expect immediate results. "It will not bring down the cost of health care overnight," he explained, emphasizing that "over time, costs will come down for families, businesses, and the federal government," and noting that "it will take about four years to implement this entire plan."[2]

Because voters often cannot determine whether slow progress reflects a sound policy still taking effect or a flawed policy that is unlikely to succeed, leaders who find themselves incapable of developing a sound plan may try to exploit this uncertainty by taking action anyway and appealing to voter patience when results inevitably fail to materialize. Accordingly, it is not obvious that voters should take such appeals uncritically, even when they are sincere. Ultimately, what voters infer about a politician based on when they implement a promised policy during their term—and whether they implement it at all—and from policies that succeed before the election versus those that do not, depends on the strategic behavior of the politician. Relatedly, whether an electorally-motivated politician will be temporally responsive depends on what voters believe about the politician's ability, depending on when and whether they act.

To study this, we develop a dynamic model in which an incumbent politician decides whether and when to implement a policy over the course of a two-period term prior to an election. In each period, the politician privately observes whether a well-designed version of the policy is available. Well-designed policies may generate visible success before the election, while poorly designed policies never do. Politicians differ in their ability to develop well-designed policies: high-ability types sometimes do; low-ability types never do. The politician values reelection and may also receive a direct benefit from implementing the policy, while the voter prefers a well-designed policy to the status quo and the status quo to

[1] Ronald Reagan, "Address Before a Joint Session of the Oklahoma State Legislature, Oklahoma City," March 16, 1982. The American Presidency Project.

[2] Barack Obama, "Remarks on Health Care Reform—Portland, Maine," April 1, 2010. The American Presidency Project.

a poorly-designed policy.

We characterize the unique welfare-maximizing equilibrium. In it, high-ability politicians behave in a temporally responsive manner: they implement the policy immediately once a well-designed version becomes available and never implement a badly-designed version. Low-ability politicians, by contrast, never develop a well-designed policy and instead randomize across early implementation, late implementation, and inaction. Their objective is to mimic an "unlucky" high-ability politician—either one who implements a well-designed policy that fails to show visible success before the election or one who never develops a viable policy at all. As a result, elections discipline high-ability politicians to be temporally responsive but fail to prevent less competent ones from implementing poorly-designed policies in an effort to appear capable.

We then study how equilibrium behavior and outcomes vary with three features of the policymaking environment: the rate at which high-ability politicians develop viable policies, the likelihood that well-designed policies generate visible success before the election, and the direct benefit politicians receive from implementing the policy. When high-ability politicians are more likely to develop well-designed policies, they implement more frequently and earlier in their terms. Because low-ability politicians seek to remain indistinguishable from unlucky high types, they respond by increasing their own frequency of implementation as well. In contrast, when policy success becomes more visible, unsuccessful implementation becomes stronger evidence of low ability. Moreover, this effect is sharper when policy is implemented early in the politician's term since a well-designed policy has more time to visibly succeed before the election when implemented early than when implemented late. Low-ability politicians therefore implement less often and, when they do act, shift implementation to later in the term. Increases in the direct benefit of implementation raise the overall frequency of policy enactment by low-ability politicians, who distribute this additional implementation across early and late periods in fixed proportions so as to remain observationally equivalent to high-ability politicians following unsuccessful policy outcomes.

These strategic responses generate several substantive implications. First, policies implemented early in the politician's term are systematically more likely to be well designed than those implemented later, because low-ability politicians disproportionately delay implementation until later in their term where well-designed policies are less likely to succeed before the election. Second, this quality gap is larger in policy areas where outcomes are expected to materialize quickly, since the degree to which low type prioritizes late implementation over early is more pronounced compared to policy areas where results are unlikely to become apparent before the election even if implemented early. Third, stronger direct incentives for politicians to implement policy reduce the likelihood of early action overall. Although such incentives do not affect either type's timing conditional on implementation, they increase the share of policy enactment by low-ability politicians, who act later on average, shifting the aggregate distribution of policy timing toward delay.

These timing patterns also shape what voters infer about a politician's ability. Policy success, whenever it occurs, fully reveals high ability. In contrast, a policy that does not visibly succeed before the election leads voters to draw pessimistic inferences regardless of when the policy was enacted. Although early implementation is initially viewed more favorably—because it is more likely to originate from a high-ability politician—this informational advantage erodes over time when success fails to materialize. By election day, unsuccessful early and late policies are observationally equivalent, reflecting the low-ability politician's equilibrium strategy of imitating an unlucky high type across policy timing. Beliefs following outcomes without visible success also vary systematically with the policy environment: when policy success is expected to materialize quickly, the absence of success becomes stronger evidence of low ability, making both unsuccessful implementation and inaction more damaging. By contrast, as the direct benefit from implementation rises, unsuccessful policies are interpreted more negatively while inaction is viewed more favorably, since low-ability politicians implement more often in order to capture private rewards.

We conclude by examining how these dynamics affect voter and politician welfare. Voter welfare declines when politicians face stronger direct incentives to implement policy and when successful outcomes are less likely to become visible before the election, as both forces induce greater implementation of poorly designed policies. Politicians' welfare, by contrast, rises with the direct benefits of implementation and diverges by type with respect to the policy environment: high-ability politicians benefit from settings rich in opportunities and visible outcomes that allow them to demonstrate competence, while low-ability politicians prefer environments in which success is rare and policy windows are scarce, making it easier to imitate an unlucky high type.

2 Related Literature

This paper contributes to the formal literature on electoral accountability, which studies how elections discipline politicians under informational frictions (e.g., Canes-Wrone, Herron and Shotts, 2001; Maskin and Tirole, 2004; Ashworth and Shotts, 2010). While this literature provides a rich account of how electoral incentives shape *which* policies politicians choose, it largely abstracts from *when* a politician chooses to act. We shift attention to the timing of policy implementation, showing how a politician's desire to win reelection affects when he acts in a setting where there is uncertainty about how long it takes a policy to develop and yield a visible outcome.

Gibbs (2025) also studies policy timing under electoral incentives by extending the canonical framework of Canes-Wrone, Herron and Shotts (2001) to allow for uncertainty over when a policymaker receives an informative signal, which affects his decision of which policy to choose out of a menu of options. This approach highlights how elections affect when a politician acts when he chooses between two competing policies. By contrast, we focus on uncertainty about how long it takes to *develop* a high-quality policy, emphasizing the time required to generate a viable policy rather than uncertainty about which option is correct.

In our focus on policy development, we are similar to Shaver (2025); Judd (2017); Hitt, Volden and Wiseman (2017), all of which ignore dynamic considerations. In our incorporation of a direct benefit, which the politician enjoys if he implements the policy before the end of his term, our model is most similar to Shaver (2025), which focuses on how an incumbent politician's ideological preferences shape what voters infer from his decision to implement a reform. Like Shaver (2025), we show that as the politician prefers reform more, the voter updates less positively about his ability given reform.

Outside the electoral accountability literature, several scholars have studied policy timing driven by policy-motivated actors, examining strategic delay in judicial decisions, executive nominations, and regulation (Krehbiel, 2021; Ostrander, 2016; Binder and Maltzman, 2002; Thrower, 2018; Potter, 2017). In these accounts, timing reflects ideological conflict or institutional constraints rather than electoral incentives. Our model incorporates both policy and electoral motivations, allowing the direct benefits of implementation to interact with reputational concerns and voter inference. As a result, policy motivations affect not only when politicians act but also how voters interpret action and inaction.

Our analysis also relates to the distinction between *inside* and *outside lag* in macroeconomic policy (Mankiw, 2021, p. 382). In that literature, the inside lag—the time between a shock and a policy response—is typically treated as exogenous, reflecting institutional or technical constraints, while the outside lag captures the time between policy implementation and observable effects (e.g., Loisel, 2024). In our model, the outside lag is exogenous, but the inside lag is endogenous: it depends both on the rate at which viable policies become available and on politicians' strategic timing decisions under electoral pressure.

Finally, our model is closely related to formal work on reputation and dynamic information disclosure (e.g., Acharya, DeMarzo and Kremer, 2011; Guttman, Kremer and Skrzypacz, 2014; Zhou, 2024; Gieczewski and Li, 2022). The closest paper is Gratton, Holden and Kolotilin (2018), in which a sender cares about his reputation and privately learns when an opportunity to disclose information arrives. Our model differs in two key respects. First, both types of politicians can act at any time, but only high-ability types can implement policies that may succeed. Second, politicians in our model receive a direct payoff from implementation. Despite these differences, the equilibrium structure is similar when the direct benefit is not too large: high types act when opportunities arise, while low types randomize in order to mimic an unlucky high type.[3] The key to this is the fact that although the high type has the ability to act before developing a well-designed policy, he strictly prefers to delay when he might be able to develop one in the future. Thus, in equilibrium, it is equivalent to him not having the opportunity to act.

3 Model

We study a model in which an incumbent *politician* ("he") decides whether and when to implement a particular policy over a two-period term prior to an election in which a *voter* ("she") chooses whether to reelect him. The politician chooses whether to implement the policy in each period, $t \in \{1, 2\}$, with implementation ($a_t = 1$) being a one-time, irreversible action. If the policy is implemented in the first period, policymaking ends; otherwise, the politician may implement the policy in the second period. An unmodeled election occurs after the second period.

Politician Types The politician's type is his private information: $\theta \in \Theta = \{H, L\}$, where H denotes a *high-ability* type and L a *low-ability* type. The prior probability that the politician is the high type is $p \equiv \Pr(\theta = H) \in (0, 1)$.

Policy Quality and Development In each period, the policy available to the politician is either *well designed* or *badly designed*. At the start of period t, the politician privately observes the policy's quality, $q_t \in \{0, 1\}$, where $q_t = 1$ denotes that the policy is well designed.

A high-ability politician develops a well-designed policy with probability $\lambda \in (0, 1)$ at the start of each period. Once developed, a well-designed policy remains available until

[3] Gratton, Holden and Kolotilin (2018) focus on the essentially unique divine equilibrium, but other equilibria exist with different structures.

implemented. A low-ability politician never develops a well-designed policy.

Policy Success Once implemented, a policy may generate visible success. A well-designed policy implemented in period t succeeds in that period, $s_t = 1$, with probability $\rho \in (0, 1)$. Otherwise, $s_t = 0$. If implemented in period 1 and not immediately successful, a well-designed policy may succeed in period 2 with the same probability. A badly-designed policy never generates visible success.

Voter Information and Beliefs The voter observes the politician's actions, (a_1, a_2). The politician may implement early $(a_1, a_2) = (1, \emptyset)$, implement late, $(0, 1)$, or not implement at all, $(0, 0)$. If the policy is implemented, the voter also observes whether it succeeds before the election. Because only high-ability politicians can generate success, the voter updates in the same way following success in either period. We denote success by $\hat{s} = 1$, no success by $\hat{s} = 0$, and no implementation by $\hat{s} = \emptyset$. An information set for the voter is therefore

$$\sigma = (a_1, a_2, \hat{s}) \in \Sigma = \{(1, \emptyset, 0), (1, \emptyset, 1), (0, 1, 0), (0, 1, 1), (0, 0, \emptyset)\}.$$

At each information set, the voter forms a posterior belief about the politician's type, denoted $\mu(\sigma) \equiv \Pr(\theta = H \mid \sigma)$.

Payoffs The politician values his reputation for competence and may also enjoy a direct benefit from policy implementation. His utility is

$$U_P = \mu(\sigma) + b \cdot \mathbb{1}\{(a_1, a_2) \neq (0, 0)\},$$

where $b \geq 0$ captures the direct benefit from implementing the policy. The reputation term reflects the politician's probability of reelection in the unmodeled election following the policymaking stage.[4] The direct benefit may reflect distributive, symbolic, or ideological

[4]This payoff structure can be microfounded in a model with an explicit election in which the voter reelects the politician if and only if $\mu(\sigma)$ exceeds the challenger's expected ability, drawn from a uniform distribution

gains from initiating policy.

The voter prefers a well-designed policy to the status quo and the status quo to a badly-designed policy. Her utility is

$$U_V = \begin{cases} 1 & \text{if } a_1 = q_1 = 1 \text{ or } a_1 = 0,\ a_2 = q_2 = 1, \\ 0 & \text{if } a_1 = a_2 = 0, \\ -\zeta & \text{otherwise,} \end{cases}$$

where $\zeta > 0$. The voter's payoff does not depend on whether a policy succeeds before the election; success affects only her inference about the politician's type.

Sequence of Play To summarize, the sequence of play is as follows:

0. Nature draws the politician's type $\theta \in \{H, L\}$ and a policy-quality sequence $(q_1, q_2) \in \{(1,1), (0,1), (0,0)\}$.

1. The politician observes (θ, q_1) and chooses $a_1 \in \{0, 1\}$. If $a_1 = 0$, the game proceeds to (3).

2. If $a_1 = 1$ and $q_1 = 1$, the policy succeeds with probability ρ; otherwise, $s_1 = 0$ and the game proceeds to (4).

3. The politician observes q_2 and chooses $a_2 \in \{0, 1\}$. If $a_2 = 0$, the game proceeds to (5).

4. If a well-designed policy has been implemented and has not yet succeeded, it succeeds with probability ρ; otherwise, $s_2 = 0$.

5. The voter observes $(a_1, a_2, \hat{s})$, forms beliefs, and payoffs are realized.

on the unit interval after policymaking concludes.

Strategies and Solution Concept A strategy specifies, for each nonterminal history, the probability with which the politician implements the policy given his type and available policy quality. Formally:

(i.) In $t = 1$, for each $(\theta, q_1) \in \{(H, 1), (H, 0), (L, 0)\}$, a distribution over $a_1 \in \{0, 1\}$.

(ii.) In $t = 2$, for each $(\theta, q_1, q_2) \in \{(H, 1, 1), (H, 0, 1), (H, 0, 0), (L, 0, 0)\}$, a distribution over $a_2 \in \{0, 1\}$.

The solution concept is perfect Bayesian equilibrium satisfying D1 (Banks and Sobel, 1987).

4 Discussion of the Model

Before analyzing the model, we briefly discuss its main assumptions and their substantive interpretations.

4.1 Politician's Type and λ

The parameter λ governs the development or availability of well-designed policies. Its relationship to the politician's type can be interpreted in two complementary ways. In both cases, differences across types reflect variation in politicians' ability or capacity rather than differences in preferences.

Type-Dependent Capacity to Generate Well-Designed Policies One interpretation of λ is that politicians differ in their capacity to generate well-designed policies. Some executives possess the leadership, managerial skill, and access to policy networks that allow viable reforms to emerge with some regularity, while others do not. Differences in competence may reflect variation in coordination ability, staff quality, access to external expertise, or the politician's own capacity to formulate feasible proposals. Executives who are effective along these dimensions generate a steady flow of viable policy opportunities ($\theta = H \implies$ high λ), while those who lack such abilities face a much thinner stream ($\theta = L \implies$ low λ, set to zero for simplicity).

Under this interpretation, variation in λ reflects how sharply executive ability translates into policy generation. In some settings, capable executives greatly expand the set of feasible proposals, while weaker ones generate almost none; in others, institutional constraints or policy complexity leave less room for differentiation. As a result, the effective λ-gap may vary across issue areas, institutional environments, and historical periods.

Type-Dependent Capacity to Exploit Stochastic Policy Windows A second interpretation is that λ reflects the stochastic arrival of opportunities to implement new policies—policy windows that executives do not fully control. Under this interpretation, both types face the same underlying probability that an opportunity arises, but differ in their ability to exploit it. Executives with stronger managerial and political skills can transform a window into a viable, well-designed policy, whereas less capable executives cannot.

Such opportunities may arise following crises, court decisions, shifts in public opinion, or changes in coalition structure that temporarily relax political constraints. Variation in λ therefore captures how frequently the political environment generates such openings. Institutional change, coalition volatility, or rapid shifts in public opinion can raise λ, while stable governance or entrenched polarization can suppress it. Across policy domains, new or rapidly evolving issue areas may generate frequent opportunities, while mature domains offer fewer and more technically constrained ones.

4.2 Voter Information

A central informational asymmetry in the model is that voters do not observe whether a well-designed policy is available to the politician—or, under the second interpretation of λ, whether a policy window has emerged. Many determinants of feasibility, including bureaucratic or legal constraints, preferences of veto players, and the coherence of the technical details of policy, are internal to the policymaking process and not directly observable to the public. As a result, voters cannot reliably infer whether inaction reflects the absence of a viable opportunity or a failure of political competence until a policy is implemented and its consequences begin to unfold.

4.3 Visibility of Policy Success

Another key feature of the model is that until an implemented policy succeeds, voters cannot distinguish between a policy that is badly designed and one that is well designed but slow to show results. The parameter ρ captures the speed with which well-designed policy becomes visibly successful and is analogous to the outside lag in macroeconomic policy—the expected time between a policy action and its observable effects. Higher ρ corresponds to domains in which outcomes become visible relatively quickly, while lower ρ reflects policy areas where even successful reforms may take years to bear fruit.

We assume that badly-designed policies are observationally equivalent to well-designed policies that have not yet succeeded. Allowing badly-designed policies to generate distinctively negative outcomes would weaken the incentive to pursue them; abstracting from this force yields a cleaner characterization of the incentives at the center of the analysis. Substantively, this assumption captures settings in which unsuccessful policy change appears to the public less like active harm than the continuation of a bad status quo—for example, anti-inflationary measures that fail to stabilize prices.

4.4 Politician's Payoff

The politician's utility reflects two concerns: maintaining a reputation for competence and obtaining a direct benefit from policy implementation. The reputation component captures the electoral incentive to be perceived as the high-ability type.

The direct benefit, captured by b, represents a payoff from implementing the policy that is unrelated to its eventual success. This benefit may reflect constituency-based, rent-seeking, or ideological motives—for example, rewards from initiating projects favored by allied interest groups or satisfaction from moving policy closer to the politician's ideal point. A higher b therefore reflects policy environments in which politicians face stronger incentives to "do something," independent of policy quality.

The parameter b is assumed to be publicly understood. Voters know, for example, when a politician's coalition benefits from implementation or when a policy aligns closely with the politician's ideological preferences. As a result, voters correctly anticipate how b shapes the politician's behavior, treating it as an observable component of his incentives rather than as a source of uncertainty about his type.

5 Analysis

5.1 Preliminaries

We begin by refining notation for strategies and beliefs and by stating basic properties that must hold in any equilibrium.

There are five possible information sets for the voter. Because only the high type can generate visible success ($\hat{s} = 1$), success fully reveals the politician's type:

$$\Pr(\theta = H \mid a_1 = 1, \hat{s} = 1) = \Pr(\theta = H \mid a_1 = 0, a_2 = 1, \hat{s} = 1) = 1.$$

Accordingly, we focus on the remaining three *no-success* information sets, indexed by $i \in$

$\{1, 2, \phi\}$, where

$$i = \begin{cases} 1 \quad \text{if } a_1 = 1 \text{ and } \hat{s} = 0 \quad \text{(early implementation, no success)}, \\ 2 \quad \text{if } a_1 = 0,\ a_2 = 1 \text{ and } \hat{s} = 0 \quad \text{(late implementation, no success)}, \\ \phi \quad \text{if } a_1 = a_2 = 0 \quad \text{(no implementation)}. \end{cases}$$

We write $\mu_i \equiv \Pr(\theta = H \mid i)$ for the voter's posterior belief at each $i \in \{1, 2, \phi\}$.

The politician's strategy specifies whether to implement the policy in each period, conditional on his type and, for the high type, the quality of the available policy. The low type's strategy can be summarized by the probabilities

$$\gamma_1 \equiv \Pr(a_1 = 1 \mid \theta = L), \qquad \gamma_2 \equiv \Pr(a_1 = 0, a_2 = 1 \mid \theta = L), \qquad \gamma_\phi \equiv 1 - \gamma_1 - \gamma_2,$$

where γ_ϕ denotes the probability of no implementation.[5]

Lemma 1 characterizes properties that must hold in any equilibrium.

Lemma 1. *In any equilibrium:*

1. *The low type implements the policy with positive probability in each period:* $\gamma_1 \in (0, 1)$ *and* $\gamma_2 \in (0, 1)$.

2. *The high type implements the policy in* $t = 2$ *if it is well designed and in* $t = 1$ *if and only if it is well-designed:*

$$\Pr(a_2 = 1 \mid \theta = H, a_1 = 0, q_2 = 1) = 1$$
$$\Pr(a_1 = 1 \mid \theta = H, q_1 = 1) = 1$$
$$\Pr(a_1 = 1 \mid \theta = H, q_1 = 0) = 0$$

[5]Formally, (γ_1, γ_2) is sufficient to describe the low type's strategy if $\gamma_1 < 1$, since $\Pr(a_2 = 1 \mid a_1 = 0, \theta = L) = \gamma_2/(1 - \gamma_1)$. Lemma 1 establishes that $\gamma_1 = 1$ cannot occur in equilibrium.

To see why the low type must mix between implementation and non-implementation in both periods, suppose instead that $\gamma_1 = 0$. Then any early implementation would be off the equilibrium path since if the high type implemented early with positive probability, early implementation would fully reveal the incumbent to be a high type, even if policy does not yield visible success. But because visible success always fully reveals the high type, and because D1 assigns deviations to the type with the strongest incentive to deviate, early implementation without success would be attributed to a high type with a well-designed policy. Anticipating this, the low type would strictly prefer to deviate by implementing early, contradicting $\gamma_1 = 0$. A symmetric argument rules out $\gamma_2 = 0$.[6]

Given that the low type mixes between early and late implementation, he must be indifferent across these actions and weakly prefer implementation to inaction: $b + \mu_1 = b + \mu_2 \geq \mu_\phi$. It follows that the voter assigns the same posterior belief following unsuccessful early and late implementation, so $\mu_1 = \mu_2$. Given this belief structure, a high type strictly prefers to implement a well-designed policy immediately, in order to maximize the probability of visible success, and strictly prefers to delay when the policy is badly designed, since he may develop a well-designed policy in the next period.

Lemma 1 therefore rules out an equilibrium in which both types behave in a temporally responsive manner—implementing the policy immediately when it is well designed and delaying otherwise. If both types followed such a strategy, the voter would infer that any implementation must come from the high type, even absent success, implying $\mu_1 = \mu_2 = 1$ and $\mu_\phi < 1$. The low type would then strictly prefer to implement in either period to avoid being mistaken for incompetent, and the high type would strictly prefer to implement a badly-designed policy late rather than be mistaken for the low type.

[6] Lemma 1 does not rule out $\gamma_1 + \gamma_2 = 1$: while the low type must mix across periods, no implementation need not occur with positive probability.

5.2 Welfare-Maximizing Equilibrium

The first part of Lemma 1 pins down the low type's equilibrium behavior given any strategy of the high type consistent with the second part. However, multiple equilibria may arise because the high type may, with some probability, implement the policy in the second period even when it is badly designed. In particular, there always exists an equilibrium in which the high type implements the policy with probability one in $t = 2$ after failing to develop a well-designed policy in either period.[7]

When the direct benefit from implementation is sufficiently large, this equilibrium is unique: if b is large enough, the high type strictly prefers implementing the policy—even at the cost of certain electoral defeat—to refraining and securing reelection. To focus on environments in which electoral incentives discipline policymaking, we restrict attention to cases in which the direct benefit is small enough that the high type refrains from implementing a badly-designed policy. Assumption 1 formalizes this restriction.[8]

Assumption 1. *The direct benefit from policy implementation is sufficiently small that the politician's electoral incentives deter the high type from implementing a badly-designed policy:*

$$b < \bar{b} \equiv \frac{1-p}{(1-p) + p\lambda(1-\rho)(2-\lambda-\rho)}.$$

Under Assumption 1, a continuum of equilibria exist that differ in the probability with which the high type implements the policy in $t = 2$ after failing to develop a well-designed version. Denote this probability by ω. Among these equilibria, the voter's welfare—defined

[7]In such equilibria, the low type implements as well in order to mimic the high type, mixing between early and late implementation so that $\mu_1 = \mu_2$. As long as voter beliefs following unexpected non-implementation are sufficiently unfavorable, neither type has an incentive to deviate from implementing in $t = 2$; such beliefs satisfy D1. We formally characterize this equilibrium in the Appendix.

[8]The condition in Assumption 1 is derived in the Appendix.

as her *ex ante* expected equilibrium payoff,

$$V^* \equiv p\big(1-(1-\lambda)^2\big) - \zeta(1-p)\big(\gamma_1+\gamma_2+\omega\big), \tag{1}$$

—is maximized when $\omega = 0$. We refer to this equilibrium as the *welfare-maximizing equilibrium.*

Lemma 2. *There exists a unique welfare-maximizing equilibrium. In this equilibrium, the high type implements the policy in the second period if and only if it is well designed,* $\omega = 0$*, and the low type chooses no implementation with positive probability,* $\gamma_\phi \in (0,1)$*.*

The intuition is straightforward. As the high type becomes more likely to implement a badly-designed policy in $t = 2$, he implements the policy more often overall. The low type must then increase the probability he implements the policy as well in order to remain indistinguishable, increasing the frequency with which badly-designed policies are implemented in equilibrium. Voter welfare therefore declines both because the high type sometimes implements a badly-designed policy and because the low type mimics this behavior. Setting $\omega = 0$ minimizes these distortions and uniquely maximizes voter welfare. For the remainder of the paper, we focus on this welfare-maximizing equilibrium (hereafter, *the equilibrium*).

5.3 Equilibrium Characterization

We now fully characterize the equilibrium. To build intuition for the general case, $b \in [0, \bar{b})$, we begin with a benchmark case $b = 0$, in which the politician values only his reputation.

Remark 1. *If* $b = 0$*, the low type's equilibrium strategy is*

$$\gamma_1^* = \frac{\lambda(1-\rho)^2}{\mathcal{H}}, \qquad \gamma_2^* = \frac{(1-\lambda)\lambda(1-\rho)}{\mathcal{H}},$$

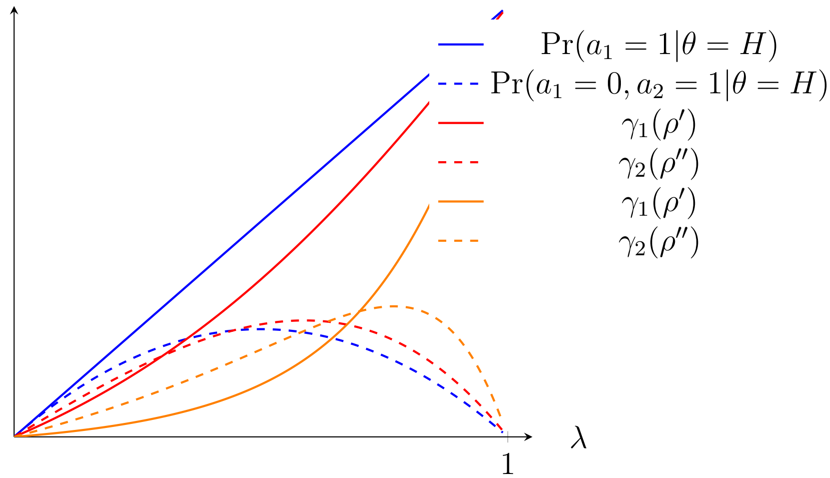


Figure 1: Probability of early and late implementation by politician type when $b = 0$; $\rho' = \frac{3}{10}$ and $\rho'' = \frac{7}{10}$

and the voter's posterior beliefs satisfy

$$\mu_i = \frac{p}{p + \frac{1-p}{\mathcal{H}}}$$

for each $i \in \{1, 2, \phi\}$*, where* $\mathcal{H} = \Pr(i \in \{1, 2, \phi\} \mid \theta = H)$*.*

The low type's objective is to mimic the behavior of the high type subject to the constraint that, unlike the high type, he can never generate visible policy success. We therefore begin by characterizing the distribution of no-success information sets generated by the high type.

By Lemmas 1 and 2, the high type implements the policy in period 1 with probability λ, in period 2 with probability $(1-\lambda)\lambda$, and not at all with probability $(1-\lambda)^2$. Conditional on these actions failing to generate visible success, the induced distribution over the no-success information sets is

$$h_1 = \lambda(1 - \rho)^2 \quad \text{(early implementation, no success)},$$

$$h_2 = (1 - \lambda)\lambda(1 - \rho) \quad \text{(late implementation, no success)},$$

$$h_\phi = (1 - \lambda)^2 \quad \text{(no implementation)}.$$

Let $\mathcal{H} \equiv h_1 + h_2 + h_\phi < 1$ denote the probability that a high type generates a no-success information set.

The low type mixes over early implementation, late implementation, and no implementation with probabilities $(\gamma_1, \gamma_2, \gamma_\phi)$. By Bayes' rule, the voter's posterior belief following a no-success information set i is

$$\mu_i = \frac{p\, h_i}{p\, h_i + (1-p)\gamma_i}.$$

In equilibrium, the low type chooses $(\gamma_1, \gamma_2, \gamma_\phi)$ so that these posteriors coincide across all no-success information sets,

$$\mu_1 = \mu_2 = \mu_\phi, \tag{2}$$

which implies proportional likelihoods,

$$\frac{h_1}{\gamma_1} = \frac{h_2}{\gamma_2} = \frac{h_\phi}{\gamma_\phi}.$$

Thus, the low type's equilibrium strategy uniquely satisfies

$$\gamma_1 = \frac{h_1}{\mathcal{H}}, \qquad \gamma_2 = \frac{h_2}{\mathcal{H}}, \qquad \gamma_\phi = \frac{h_\phi}{\mathcal{H}},$$

yielding the expressions in Remark 1.

Notably, the low type does not perfectly imitate the high type's implementation frequencies. Perfect imitation would imply $\mu_\phi = p$, since non-implementation would be equally likely under both types. But because policies implemented by the high type may succeed while those implemented by the low type never do, unsuccessful implementation is worse news for the voter than inaction, implying $\mu_1 < \mu_\phi$. Perfect imitation would therefore make early implementation strictly unattractive for the low type.

Instead, the low type behaves like an "unlucky" high type—one who either implements a policy that fails to show visible success or never develops a well-designed policy. By mixing across early implementation, late implementation, and inaction in the appropriate proportions, he reproduces the distribution of no-success information sets generated by the high type. When $b = 0$, this requires the low type to implement the policy less frequently than the high type.

We now extend this characterization to the general case $b \in [0, \bar{b})$. When $b > 0$, the low type trades off reputational concerns against the direct benefit from implementation, so the equilibrium indifference condition becomes

$$\mu_1 + b = \mu_2 + b = \mu_\phi. \tag{3}$$

Let $\mu_R = \mu_1 = \mu_2$ denote the posterior following unsuccessful implementation.

Proposition 1. *The low type's equilibrium strategy is*

$$\gamma_1 = k(b)h_1, \qquad \gamma_2 = k(b)h_2, \qquad \gamma_\phi = 1 - k(b)(h_1 + h_2),$$

where $k(b) : [0, \bar{b}] \to [\mathcal{H}^{-1}, (h_1 + h_2)^{-1}]$ is strictly increasing. The high type implements the policy in period t if and only if it is well designed:

$$\Pr(a_t = 1 \mid \theta = H, q_t = 1) = 1, \qquad \Pr(a_t = 1 \mid \theta = H, q_t = 0) = 0.$$

The voter's equilibrium beliefs are

$$\mu_R = \frac{p}{p + (1-p)k(b)}, \qquad \mu_\phi = \frac{ph_\phi}{ph_\phi + (1-p)(1 - k(b)(h_1 + h_2))}.$$

As b increases, the low type implements the policy more frequently, but allocates this additional implementation proportionally across early and late periods so as to preserve the relative likelihoods that equalize voter beliefs across no-success information sets. This adjustment is summarized by the function $k(b)$.[9]

5.4 Comparative Statics

Having characterized equilibrium behavior, we now study how variation in λ, ρ, and b affects the politician's behavior and equilibrium outcomes.

5.4.1 Probability of Policy Implementation

We first examine how the probability of policy implementation varies across environments, both overall and conditional on the politician's type.

Proposition 2. *In equilibrium:*

1. *The probability that the low type implements the policy, $\gamma_1 + \gamma_2$, decreases in ρ and increases in λ and b.*
2. *The probability that the high type implements the policy, $1 - h_\phi$, is increasing in λ and constant in ρ and b.*

The implication of Proposition 2 for the overall probability of policy implementation follow immediately.

Corollary 1. *The unconditional probability that the policy is implemented,*

$$p(\gamma_1 + \gamma_2) + (1 - p)(1 - h_\phi),$$

decreases in ρ and increases in λ and b.

The intuition behind Proposition 2 and Corollary 1 follows from the low type's incentive to mimic the high type across no-success information sets.

[9] We characterize $k(b)$ formally in the Appendix.

An increase in ρ raises the probability that a well-designed policy produces visible success before the election. Although this does not affect the high type's implementation decision, it reduces the likelihood that his actions lead to unsuccessful implementation, shrinking $h_1 + h_2$ relative to h_ϕ. Unsuccessful implementation therefore becomes stronger evidence of low ability, inducing the low type to implement the policy less often.

An increase in λ makes the high type more likely to develop and implement a well-designed policy, shifting probability mass away from no implementation and toward unsuccessful implementation. Because implementation—conditional on no success—becomes more characteristic of the high type, the low type must increase his own frequency of implementation to remain indistinguishable.

Finally, an increase in b raises the direct payoff from implementation for the low type. The equilibrium condition $b + \mu_R = \mu_\phi$ implies that a larger b makes implementation more attractive, leading the low type to implement the policy more frequently. Since the high type's strategy is unaffected by b, this adjustment occurs through changes in voter beliefs: μ_R falls and μ_ϕ rises until indifference is restored.

5.4.2 Timing of Policy Implementation

We now examine how λ, ρ, and b affect the *timing* of policy implementation. We focus on the probability of early versus late implementation *conditional on implementation occurring*, abstracting from variation in the overall frequency of implementation.

Proposition 3. *Conditional on the politician implementing the policy during his term:*

1. *The odds that the high type implements early are increasing in λ and constant in ρ and b.*

2. *The odds that the low type implements early are increasing in λ, decreasing in ρ, and constant in b.*

3. *The odds that the policy is implemented early, unconditional on type, are decreasing in b.*

For the high type, the odds of early relative to late implementation are

$$\Omega_H \equiv \frac{\Pr(\text{early} \mid \text{implementation}, \theta = H)}{\Pr(\text{late} \mid \text{implementation}, \theta = H)} = \frac{1}{1-\lambda}.$$

Because the high type implements if and only if the policy is well designed, his odds of implementing early depend only on λ. As λ increases, he is more likely to develop a viable policy in the first period, raising the likelihood of early implementation relative to late implementation.

For the low type, the odds of early relative to late implementation are

$$\Omega_L \equiv \frac{\Pr(\text{early} \mid \text{implementation}, \theta = L)}{\Pr(\text{late} \mid \text{implementation}, \theta = L)} = \frac{h_1}{h_2} = \frac{1-\rho}{1-\lambda}.$$

The low type's odds of implementing early therefore depend on both λ and ρ. As λ increases and the high type becomes more likely to implement early, the low type shifts toward earlier implementation to remain indistinguishable. By contrast, as ρ increases, unsuccessful early implementation becomes relatively less likely than unsuccessful late implementation, since early policies have more time to succeed. The low type therefore shifts probability mass toward late implementation to preserve the distribution of no-success information sets. Although an increase in b raises the low type's overall frequency of implementation, it does not affect his odds of early implementation: the additional implementation probability is distributed proportionally across both periods to maintain observational equivalence.

Figure 2 summarizes these patterns. In equilibrium, the odds of early implementation are always lower for the low type than for the high type, since

$$\Omega_L = (1-\rho)\Omega_H.$$

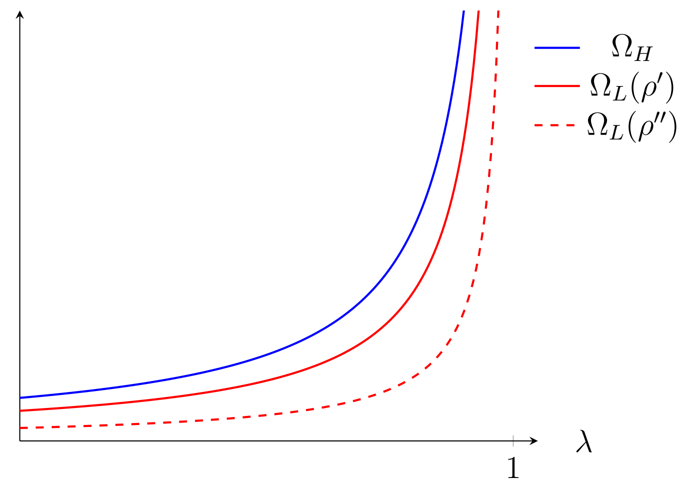


Figure 2: Odds of early relative to late implementation for the low and high types; $\rho' = \frac{3}{10}$ and $\rho'' = \frac{7}{10}$

Were this not the case, the voter would correctly interpret a lack of visible success after early policy implementation as stronger evidence of low ability than a late policy that similarly fails to visibly succeed. Low types therefore implement policy later on average.

Corollary 2. *The odds of early implementation are always lower for the low type than for the high type: $\Omega_H > \Omega_L$ for all $\lambda, \rho, p,$ and b.*

The overall odds of early implementation, unconditional on type, are

$$\Omega \equiv \frac{\Pr(\text{early} \mid \text{implementation})}{\Pr(\text{late} \mid \text{implementation})} = \frac{p\,\lambda + (1-p)\,k(b)\,h_1}{p\,(1-\lambda)\lambda + (1-p)\,k(b)\,h_2}.$$

Although b does not affect the odds of early implementation conditional on type, it does affect the overall odds of early implementation. In particular, as b increases, the share of policy implementation carried out by low types, who are systematically more likely to implement late, also increases. Hence, Ω increases. As a result, stronger direct incentives for policy implementation shift the aggregate distribution of implementation towards the second period. This yields a potentially counterintuitive empirical implication: holding other factors fixed, policies associated with larger direct benefits to politicians should be less likely to be implemented early in the politician's term.

5.4.3 Policy Quality Conditional on Timing

We now examine how the quality of an implemented policy varies with when it is implemented. Specifically, we study the probability that a policy is well designed, conditional on whether it is implemented early or late in the politician's term. Using equilibrium strategies, these probabilities are

$$\Pr(\text{well-designed} \mid a_1 = 1) = \frac{p\lambda}{p\lambda + (1-p)\gamma_1} = \frac{p}{p + \left(\frac{1-p}{k(b)\mathcal{H}}\right)(1-\rho)^2},$$

$$\Pr(\text{well-designed} \mid a_1 = 0, a_2 = 1) = \frac{p(1-\lambda)\lambda}{p(1-\lambda)\lambda + (1-p)\gamma_2} = \frac{p}{p + \left(\frac{1-p}{k(b)\mathcal{H}}\right)(1-\rho)}.$$

As before, we summarize differences across periods using odds, defined as the ratio of the probability that a policy is well designed to the probability that it is badly designed conditional on when it is implemented:

$$\Omega_1 = \frac{p\lambda}{(1-p)\gamma_1}, \qquad \Omega_2 = \frac{p(1-\lambda)\lambda}{(1-p)\gamma_2}.$$

The odds ratio Ω_1/Ω_2 captures how much more likely the policy is to be well designed when implemented early in the politician's term relative to late.

Proposition 4.

1. *Policies implemented early are always more likely to be well designed than policies implemented late:*

$$\Pr(\textit{well-designed} \mid a_1 = 1) > \Pr(\textit{well-designed} \mid a_1 = 0, a_2 = 1) \quad \forall\, \lambda, \rho, p, b.$$

2. *The odds that policy implemented early is well designed relative to policy implemented*

late are increasing in ρ and constant in λ, p, and b:

$$\frac{\Omega_1}{\Omega_2} = \frac{1}{1-\rho}.$$

The intuition for the first result follows from Corollary 2. When the low type implements policy, he does so early less frequently compared to the high type in order to mimic an unlucky high type. Thus a larger share of early policy implementations are carried out by the high type, meaning policies implemented early are more likely to be well designed.

The second result describes how the quality gap between policies implemented early versus late varies. As ρ increases, well-designed policies that have been implemented are revealed as such more often, and this advantage is disproportionately concentrated among early implementations, which have more time to succeed. The low type responds by shifting further away from early implementation, widening the quality gap between early and late policies. In contrast, changes in λ, p, or b affect the frequency of policy implementation but not its relative quality by timing.

These results yield clear empirical implications. Policies implemented earlier in a politician's term should, holding ρ fixed, be well designed more often than those implemented later. Moreover, this quality gap should be small in domains where policy effects are slow to materialize and grow larger as outcomes become more quickly observable. Because the odds ratio Ω_1/Ω_2 is independent of λ, p, and b, these patterns should arise without conditioning on politician quality, direct implementation incentives, or the rate at which viable policy opportunities emerge.

5.4.4 Voter Beliefs

We now examine the voter's beliefs about the incumbent's ability. We begin by studying how the voter's interim and terminal beliefs are ordered and how variation in the model's parameters shape this ordering. We then study how variation in the model's parameters influence beliefs formed at the end of the term when success has not materialized.

Let $\hat{\mu}_t$ denote the voter's belief that the incumbent is the high type at the moment he implements the policy in period t:

$$\hat{\mu}_1 \equiv \Pr(\theta = H \mid a_1 = 1), \qquad \hat{\mu}_2 \equiv \Pr(\theta = H \mid a_1 = 0, a_2 = 1),$$

and let

$$\hat{\mu}_\phi \equiv \Pr(\theta = H \mid a_1 = 0)$$

denote the voter's belief following delay in the first period.

Proposition 5.

1. *If b is sufficiently low and λ is sufficiently low, then*

$$\hat{\mu}_1 > \hat{\mu}_2 > p > \hat{\mu}_\phi > \mu_\phi \geq \mu_R.$$

2. *If b is sufficiently low and λ is sufficiently high, then*

$$\hat{\mu}_1 > p > \hat{\mu}_\phi > \hat{\mu}_2 > \mu_\phi \geq \mu_R.$$

3. *If b is sufficiently high and λ is sufficiently low, then*

$$\mu_\phi > \hat{\mu}_\phi > p > \hat{\mu}_1 > \hat{\mu}_2 > \mu_R.$$

4. *If b is sufficiently high and λ is sufficiently high, then*

$$\mu_\phi > \hat{\mu}_1 > p > \hat{\mu}_\phi > \hat{\mu}_2 > \mu_R.$$

Despite this heterogeneity in different regions of the parameter space, the voter's interim beliefs when the politician implements policy early versus late satisfy a consistent ordering.

Corollary 3. *The voter's interim belief is always higher following early implementation than following late implementation:* $\hat{\mu}_1 > \hat{\mu}_2$.

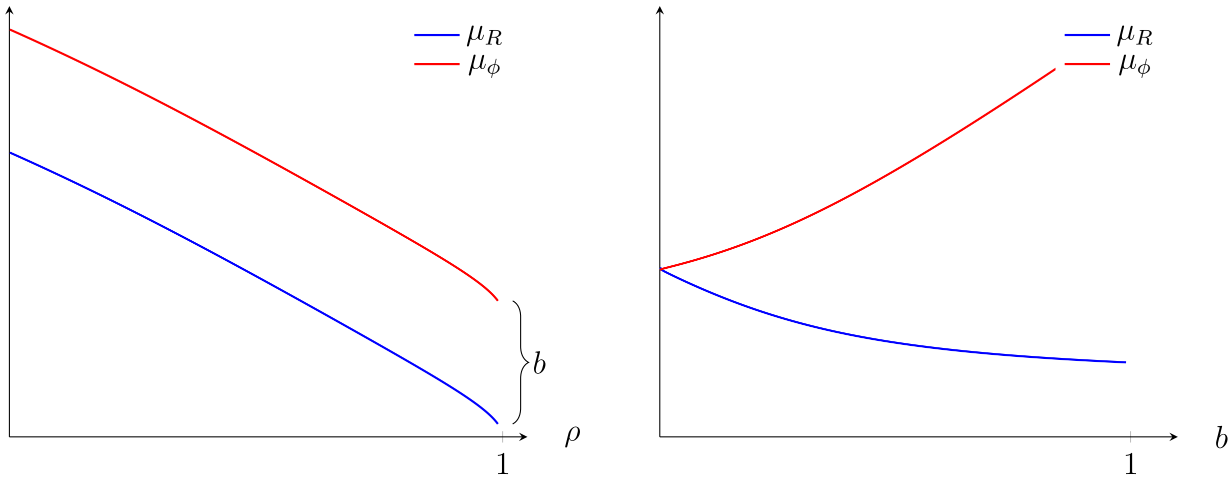
Because the low type delays implementation to imitate an unlucky high type, late implementation is more likely to be undertaken by a low type. Early implementation therefore provides a stronger interim signal of competence. However, as time progresses without visible success, the voter's posterior declines such that when an unsuccessful policy was implemented is no longer informative on election day.

Relatedly, the voter's beliefs are always most pessimistic when the politician's term ends with an implemented policy that has failed to produce visible success.

Corollary 4. *The voter's posterior belief is always lowest following implementation without visible success:* $\mu_R < \min\{p, \hat{\mu}_2, \hat{\mu}_\phi\}$ *and* $\mu_R \leq \mu_\phi$ *with strict inequality if* $b > 0$.

This follows because, when success fails to materialize by the end of the term, the possibility of future success has been exhausted. When $b > 0$, the low type's equilibrium indifference condition $b + \mu_R = \mu_\phi$ further implies that non-implementation is strictly more favorable than unsuccessful implementation.

Whether implementation initially improves or harms the incumbent's reputation depends on b and λ. When b is low, the low type implements less frequently than the high type early in the term, so early implementation improves the incumbent's interim reputation. When λ is also low, the high type delays sufficiently often that late implementation may also provide a temporary reputational boost. When b is high, by contrast, the low type implements more frequently than the high type, particularly in the second period, making late implementation initially harmful to the incumbent's reputation and non-implementation beneficial. Early inaction can also send an initial signal of competence in such settings if high types are



(a) $p = \lambda = \frac{1}{2}$ and $b = \frac{1}{5}$ (b) $p = \rho = \lambda = \frac{1}{2}$

Figure 3: Voter's posterior as a function of ρ and b

sufficiently unlikely to develop a well-designed policy early in their term, i.e., when λ is sufficiently low.

We now turn to comparative statics of the voter's terminal beliefs.

Proposition 6.

1. *μ_R is decreasing in ρ, decreasing in b, decreasing in λ when b is small, and non-monotonic in λ when b is large.*

2. *μ_ϕ is decreasing in ρ, increasing in b, decreasing in λ when b is small, and non-monotonic in λ when b is large.*

An increase in ρ makes the absence of success increasingly inconsistent with high ability, lowering both μ_R and μ_ϕ. This is illustrated in the left panel of Figure 3. The gap between these posteriors equals b, reflecting the equilibrium condition $b + \mu_R = \mu_\phi$.

An increase in b shifts beliefs in opposite directions, as shown in the right panel of Figure 3. Because a higher b induces low types to implement more frequently, unsuccessful implementation becomes more indicative of low ability, reducing μ_R, while non-implementation becomes rarer among low types, raising μ_ϕ.[10]

[10]When b is interpreted as reflecting the ideological benefit the politician enjoys from implementing the

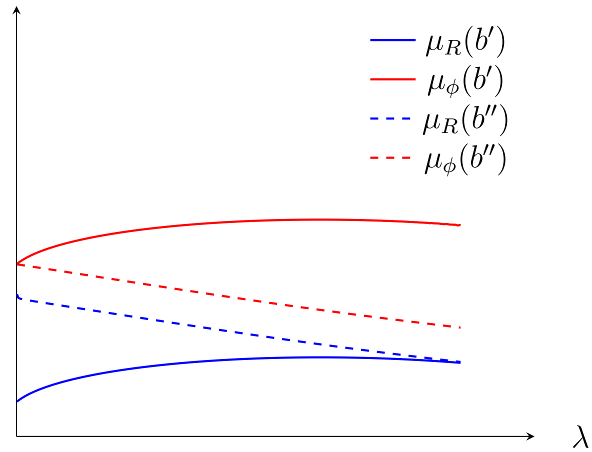


Figure 4: Voter's posterior as a function of λ; $p = \rho = \frac{1}{2}$, $b' = \frac{2}{5}$, and $b'' = \frac{1}{10}$

The effect of λ is more nuanced. When b is small, increases in λ monotonically reduce voter posteriors following non-success: as high types become more likely to develop viable policies, the absence of visible success becomes stronger evidence of incompetence. When b is large, the effect of λ is non-monotonic. For very low λ, policy implementation is rare for both types, and unsuccessful implementation is overwhelmingly attributable to a low type pursuing the direct benefit. As λ increases from this baseline, the likelihood that non-success reflects an unlucky high type initially rises, since the effect of λ on the high type's overall probability of developing a well-designed policy, $1 - (1 - \lambda)^2$, is sharpest when λ is low. Beyond a threshold, however, the high type becomes sufficiently likely to develop a well-designed policy that further increases in λ only marginally affect his behavior, restoring the logic of the low-b case and causing voter posteriors to decline.

5.4.5 Welfare

We conclude by examining how the model's parameters affect equilibrium *ex ante* welfare for the voter and politician.

Proposition 7. *The voter's welfare is decreasing in b and increasing in ρ.*

policy, this result parallels the insight from Shaver (2025) that the politician's ideological preferences shape what is conveyed about the the incumbent's type through policy change. However, in Shaver (2025), this result arises because both types of politician are willing to implement lower-quality reforms. Whereas in our model, this result emerges from the low type implementing the policy more often.

The effect of ρ and b on voter welfare follows directly from Proposition 2. An increase in b or a decrease in ρ raises the frequency with which the low type implements the policy. Because the low type only implements badly-designed policies, these changes reduce voter welfare. Since neither parameter affects the high type's probability of implementing a well-designed policy, this increase in low-quality implementation is the sole channel through which b and ρ affect voter welfare.[11]

We next examine the politician's welfare.

Proposition 8.

1. *If the politician is the low type, his welfare is decreasing in ρ, increasing in b, decreasing in λ when b is sufficiently small, and non-monotonic in λ when b is sufficiently large.*

2. *If the politician is the high type, his welfare is increasing in b. When b is sufficiently small, his welfare is increasing in both λ and ρ.*

Because the low type is indifferent across all no-success histories in equilibrium, his expected payoff is identical in each such information set; his welfare is

$$V_L^* = b + \mu_R = \mu_\phi.$$

The comparative statics follow immediately from Proposition 6. The only subtly is the comparative static for b since μ_R is decreasing in b while μ_ϕ is increasing in b. However, since (3) must be satisfied in equilibrium, an increase in b has a positive effect overall.

The high type, by contrast, produces visible success with a positive probability, yielding

[11] The model does not yield robust comparative statics for voter welfare with respect to λ. As both types implement more frequently when λ rises, the welfare effect depends on parameter values and on how voter utility weights well-designed versus badly-designed policies.

a payoff of one. His equilibrium welfare is

$$
\begin{aligned}
V_H^* &= b(1 - h_\phi) + (1 - \mathcal{H}) + \mu_\phi h_\phi + \mu_R(h_1 + h_2) \\
&= b + (1 - \mathcal{H}) + \mathcal{H}\mu_R
\end{aligned}
$$

where the second equality follows from the fact that $\mu_\phi = b + \mu_R$ in equilibrium.

As b rises, the high type directly benefits whenever he develops well-designed policy. When he fails to develop a well-designed policy and thus does not implement policy, he indirectly obtains an equivalent benefit through $\mu_\phi = b + \mu_R$. Thus the benefit and cost of an increase in b on the high type's welfare can be decomposed into a unit increase in V^* and a decrease in μ_R scaled by the probability that he is unlucky. Since $\mu_\phi = b + \mu_\phi$ is increasing in b (Proposition 6), it follows that μ_R declines at a lower rate than b rises. Thus for the high type, the benefit of an increase in b outweighs the cost.

Increases in λ or ρ have offsetting effects on V_H^*. When b is small, as λ or ρ increase, the voter's posterior at a no-success information set decreases. On the other hand, as λ or ρ increase, the probability of reaching a no-success information set decreases. When b is sufficiently small, the latter effect dominates, so the high type benefits from environments with more frequent policy opportunities and faster policy feedback. In addition, higher λ raises the probability that the high type receives the direct benefit from implementation.

Substantively, these results highlight a divergence in preferences over policymaking environments. When reputational concerns dominate (low b), capable politicians benefit from settings with frequent opportunities and visible outcomes, which allow them to demonstrate competence, while less capable politicians prefer environments in which opacity or delay obscures performance differences. High λ and ρ environments expose low types to greater scrutiny, whereas low λ and ρ environments make it more plausible to the voter that he is unlucky rather than incompetent.

6 Conclusion

Democratic responsiveness depends on what politicians do and when they do it. In this paper, we explore whether elections induce politicians to be temporally responsive to voters in a setting where politicians differ in their ability to develop well-designed policies, policies take time to show results once implemented, and politicians have private information about their own ability and the quality of the policy they develop. By focusing on policy timing, the analysis highlights an important but underexplored dimension of democratic responsiveness and electoral accountability.

We focus on the best-case equilibrium for the voter wherein high-ability politicians behave in a responsive manner: they delay policy implementation until a well-designed version becomes available and refrain from acting if no such policy emerges before the election. While a well-designed policy may visibly succeed before the election, it is possible that its results take longer to be felt by voters. These informational and policymaking frictions provide a low-ability politician with a viable means of obscuring his incompetence from the voter. In equilibrium, a low-ability politician adopts a strategy that mimics an "unlucky" high type—one who either developed a well-designed policy that failed to succeed before the election or failed to develop a well-designed policy at all. Rather than act in the best interest of the voter—which requires him to refrain from implementing a badly-designed policy—the low type implements bad policy with positive probability.

A key contribution of the model is the insight that the low type delays implementation in equilibrium in the sense that the odds of early implementation are always lower for the low type than the high type. The reason is that early implementation by a high-ability politician has more time to generate visible success before the election. Low-ability politicians cannot generate success, so they concentrate implementation later and choose mixing probabilities that make the distribution of early and late policies that fail to visibly succeed consistent with that of an unlucky high type. As a result, by election day, unsuccessful early and late policies are observationally equivalent, even though early implementation is initially interpreted more favorably at the moment it occurs. This timing asymmetry yields a sharp prediction about policy quality: policies implemented early in a term are more likely to be well designed than policies implemented later. Moreover, this quality gap is larger in policy domains where success is expected to materialize quickly and smaller in domains characterized by longer lags.

This pattern—that poorly designed policies are disproportionately implemented late in a politician's term—resembles a traditional implication of the political business cycles literature (Nordhaus, 1975; Rogoff, 1990; Rogoff and Sibert, 1988). The mechanism, however, is different. In our model, delay arises not because late policy generates short-term electoral benefits, but because low-ability politicians allocate implementation toward the end of the term in order to remain indistinguishable from an unlucky competent incumbent when policy success fails to appear.

This result similarly relates to work on strategic information disclosure. Implementing a policy initiates a process through which information about policy quality—and indirectly about politician ability—is revealed over time. In this respect, our results parallel those in models such as Gratton, Holden and Kolotilin (2018), where low types delay the onset of information revelation relative to high types. A key difference is that in our setting neither type is exogenously constrained in when action can occur. Similar timing patterns arise endogenously because the high type delays until a well-designed policy is available and the low type then chooses implementation timing to match the high type's relative likelihood of no-success information sets.

Our welfare analysis clarifies the consequences of the strategic policymaking dynamics we identify. Voter welfare declines when policy outcomes are less likely to become visible before elections and when politicians face stronger direct incentives to implement policy, since both forces increase the frequency of poorly designed policy. Mapping outcome visibility to real-world policy environments helps clarify the substantive implications of this result. Policies with longer time horizons—where successful outcomes take longer to become observable—can be interpreted as more complex and resource-intensive, such as health care reform, climate change policy, emergency preparedness, or large-scale infrastructure projects, whereas shorter-horizon settings involve more routine or incremental tasks, such as municipal service provision. In these longer-horizon policy areas, failures involve greater resource commitments and higher stakes. In our welfare analysis, however, the voter's loss from poorly designed policy is invariant to outcome visibility. To the extent that failures in longer-horizon policy areas are in fact more costly than failures in shorter-horizon ones, the welfare consequences identified by the model may be more troubling than the formal analysis suggests.

The model also sheds light on voter behavior. In particular, it offers an alternative to accounts that attribute electoral punishment of incumbents who pursue long-horizon or low-visibility policies to shortsightedness of voters. In our model, voters punish incumbents whose policies fail to show success by election day not because they undervalue long-term projects or investments but because uncertainty about the outcomes that these policies may or may not produce creates scope for incompetent politicians to obscure poor performance. Precisely because delay, complexity, and long time horizons are sometimes legitimate features of competent policymaking, they also provide a credible cover for low-ability incumbents. Treating policies that have not demonstrably succeeded with skepticism is therefore a rational response to the informational environment voters face.

The model also yields nuanced implications for how voters respond to political action and inaction over the course of a politician's term. Early action is always interpreted more favorably than late action at the moment it occurs, yet the reputational consequences of action, delay, and restraint depend systematically on the political environment. Where politicians face strong direct incentives to implement policy, restraint can improve voter beliefs; where such incentives are weak, delay and inaction are interpreted as signals of low ability. These patterns can help to clarify why public opinion sometimes rewards caution and at other times demands decisiveness.

More generally, the analysis speaks to a basic feature of policymaking: uncertainty both about when action becomes feasible and about when its consequences become observable. Scholars—most prominently in work on macroeconomic stabilization—have described these frictions using the concepts of the inside lag, the time between the emergence of a problem and policy action, and the outside lag, the time between policy action and observable effects. These concepts have natural analogs in our model. The speed with which outcomes become visible is an exogenous feature of the policy environment, while the timing of action is determined endogenously through politicians' strategic response to electoral incentives. A key implication is that the inside lag is not purely institutional or technological, but responds to expectations about the outside lag: when outcomes take longer to become observable, politicians—especially low-ability ones—adjust the timing of implementation in order to shape voter inference. Although these features are fundamental to policymaking in any domain, they have received relatively little systematic attention from political scientists. Our analysis highlights how these two fundamental dynamic features of policymaking interact through strategic behavior, and why they matter for understanding democratic responsiveness.

Finally, our model provides a solid foundation for future research. The politician welfare results in particular suggest extending the analysis to settings in which politicians choose which policy areas to engage. High-ability politicians benefit from opportunity-rich and highly visible domains, while low-ability politicians prefer environments where opportunities are scarce or outcomes are slow to become observable. This suggests incentives for politicians to sort into policy areas based on their ability. Such choices, however, may themselves convey information to voters. A natural direction for future work, then, is to study policy-area selection as an endogenous strategic choice.

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A Online Appendix

Overview

This Appendix contains proofs of all formal claims in the main text: Lemmas 1-2 and Propositions 1-8.[12] We also state and prove three additional lemmas not stated in the main text, Lemmas 3-5, which we use in our proofs. The Appendix is organized as follows. We first prove Lemma 1. We then state and prove Lemma 3 which characterizes and proves the existence of an equilibrium in which the high type chooses $a_2 = 1$ with probability one in $t = 2$ when $q_2 = 0$. Next we state and prove Lemma 4 which fully characterizes the set of all equilibria, identifies the unique welfare maximizing equilibrium, and derives $b > \bar{b}$ as a necessary and sufficient condition for the set of equilibria to be a singleton containing only the equilibrium characterized in Lemma 3. Next we use Lemmas 3 and 4 to prove Lemma 2 and Proposition 1. At the end of our proof of Proposition 1, we derive a closed-form expression for $k(b)$ (Equation 8). We then state and prove Lemma 5 which characterizes how variation in λ affects $k(b)$ and is used throughout our subsequent proofs of comparative static results. The remainder of the Appendix contains proofs Propositions 2-8 in their numbered order.

Contents

[12]Remark 1 is an immediate corollary of Proposition 1. Each Corollary 1-4 follows directly from a proposition which we note in the main text where each corollary appears.

A.1 Proof of Lemma 1

We first show that there is no equilibrium in which $\gamma_1 = 0$. To do so, we consider $\gamma_1 = 0$ and show that the high type's first-period strategy must also play $a_1 = 1$ with probability zero, that is, $\Pr(a_1 = 1|\theta = H) = 0$. We then show that, given that neither type plays $a_1 = 1$, in order for equilibrium to survive D1, the low type must play $a_2 = 1$ with positive probability in equilibrium, that is, $\gamma_2 > 0$. It follows from this that a high type with a well-designed policy in $t = 2$ receives a strictly higher payoff from implementing the policy than a low type (since $\mu_\phi < 1$ by Bayes rule given $\gamma_2 > 0$ and because successful policy yields the high type with $q_2 = 1$ a reputation payoff of $1 > \mu_\phi$ which occurs with probability $\rho > 0$). We use this to pin down equilibrium continuation values in the first period for the low type and a high type with $q_1 = 1$. We then use these continuation values to show that the net gain from deviation by a high type with $q_1 = 1$ in $t = 1$ to $a_1 = 1$ is strictly greater than the net gain from deviation for a low type. Hence D1 requires $\mu_1 = 1 > \mu_2$. We complete the proof by observing that $\mu_1 \leq \mu_2$ is necessary to prevent deviation from the low type which implies that no equilibrium with $\gamma_1 = 0$ survives D1.

Proof that $\gamma_1 > 0$.

Suppose that $\gamma_1 = 0$ in equilibrium.

Step 1: Show $\Pr(a_1 = 1|\theta = H) = 0$.

The low type's equilibrium payoff from $a_1 = 1$ is $b + \mu_1$ and his equilibrium payoff from $a_1 = 0$ is $\max\{b + \mu_2, \mu_\phi\}$. Thus $\gamma_1 = 0$ in equilibrium requires that

$$b + \mu_1 \leq \max\{b + \mu_2, \mu_\phi\}.$$

If $\Pr(a_1 = 1|\theta = H) > 0$, then $\mu_1 = 1$ by Bayes' rule. Hence if $\Pr(a_1 = 1|\theta = H) > 0$, it must be that $b + 1 \leq \max\{b + \mu_2, \mu_\phi\}$. Since $b + 1 > 1$ and $\mu_\phi \leq 1$, it follows that $\max\{b + \mu_2, \mu_\phi\} = b + \mu_2 = b + 1$. Since $b + \mu_2 = b + 1 > \mu_\phi$, the low type's equilibrium strategy, given $\gamma_1 = 0$ and $\Pr(a_1 = 1|\theta = H) > 0$, must play $a_1 = 0, a_2 = 1$ with probability one, i.e., $\gamma_2 = 1$. But then $\mu_2 < 1$ by Bayes' rule which implies a profitable deviation for the low type from $a_1 = 0, a_2 = 1$ to $a_1 = 1$. Hence if $\gamma_1 = 0$ in equilibrium, then $\Pr(a_1 = 1|\theta = H) = 0$ too. Thus in any equilibrium with $\gamma_1 = 0$, it must be that $a_1 = 1$ is off the equilibrium path.

Step 2: Show $\gamma_2 > 0$.

In $t = 2$, for both types, $a_2 = 0$ yields a payoff of μ_ϕ. For a high type with $q_2 = 0$ and a low type, $a_2 = 1$ yields a payoff of $b + \mu_2$. For a high type with $q_2 = 1$, choosing $a_2 = 1$ provides an expected payoff of $b + \rho + (1-\rho)\mu_2$ since $\Pr(\theta = H|s = 1) = 1$ in every equilibrium.

If $\gamma_2 = 0$ in equilibrium and the high type plays $a_2 = 1$ with positive probability, then $\mu_\phi < 1$ and $b + \mu_2 = b + 1$ by Bayes' rule. But then there is clearly a profitable deviation from $a_2 = 0$ to $a_2 = 1$ for the low type since $b + \mu_2 > \mu_\phi$. Hence if $\gamma_2 = 0$ in equilibrium, then $\Pr(a_2 = 1|\theta = H) = 0$ too. In this case, the only action profile on the equilibrium path is $a_1 = a_2 = 0$. By Bayes' rule $\mu_\phi = p$. The net gain for a high type with $q_2 = 1$ from deviating from $a_2 = 0$ to $a_2 = 1$ is $b + \rho + (1-\rho)\mu_2 - p$ whereas the same deviation yields a net gain of $b + \mu_2 - p$ for a low type. Note that $\mu_2 < 1$ is necessary to prevent deviations from both types. Since $b + \rho + (1-\rho)\mu_2 - p - [b + \mu_2 - p] = \rho(1 - \mu_2) > 0$ for all $\mu_2 < 1$, D1 requires the voter to infer from $a_2 = 1$ that the incumbent is a high type with $q_2 = 1$. Hence $\mu_2 = 1$ under D1 in any equilibrium with $\gamma_1 = \gamma_2 = 0$. But then the low type has a profitable deviation from $a_1 = a_2 = 0$ to $a_1 = 0, a_2 = 1$. Thus for any equilibrium in which $\gamma_1 = 0$, surviving D1 requires $\gamma_2 > 0$.

Step 3: Derive Equilibrium Continuation Values.

Notice that $\gamma_2 > 0$ implies that the low type's equilibrium payoff is $b + \mu_2 \in [\mu_\phi, b + 1)$ where $\mu_2 < 1$ by Bayes' rule and $b + \mu_2 \geq \mu_\phi$ follows from the sequential rationality of the low type's strategy. This further implies that $\Pr(a_2 = 1|\theta = H, q_2 = 1, a_1 = 0) = 1$ since $b + \rho + (1-\rho)\mu_2 > b + \mu_2 \geq \mu_\phi$. Let $v_L = b + \mu_2$, $v_{H1} = b + \rho + (1-\rho)\mu_2$, and $v_{H0} = \lambda v_{H1} + (1-\lambda)v_L$ denote the equilibrium continuation value in $t = 1$ for a low type, high type with $q_1 = 1$, and high type with $q_1 = 0$, respectively. Note that $1 + b > v_{H1} > v_{H0} > v_L \geq \mu_\phi$.

Step 4: Equilibrium requires $\mu_1 \leq \mu_2 < 1$ but D1 requires $\mu_1 = 1$.

In $t = 1$, a low type and a high type with $q_1 = 0$ receive a payoff of $b + \mu_1$ if they deviate to $a_1 = 1$ whereas a high type with $q_1 = 1$ receives a deviation payoff of $b + (1 - (1-\rho)^2) + (1-\rho)^2\mu_2$. The net gains (relative to expected equilibrium payoff from choosing $a_1 = 0$) for a low type, a high type with $q_1 = 0$, and a high type with $q_1 = 1$ respectively from deviating to $a_1 = 1$ are therefore

$$b + \mu_1 - v_L,$$
$$b + \mu_1 - v_{H0}, \text{ and}$$
$$b + \mu_1(1-\rho)^2 + 1 - (1-\rho)^2 - v_{H1}.$$

Since $v_L < v_{H0}$, it follows that $b + \mu_1 - v_L > b + \mu_1 - v_{H0}$. Thus under D1, the voter infers that a deviation from $a_1 = 0$ to $a_1 = 1$ is weakly more likely to come from a low type than a high type with $q_1 = 0$. Therefore the relevant comparison under D1 for a deviation from $a_1 = 0$ to $a_1 = 1$ is between a high type with $q_1 = 1$ and a low type. The difference in net gains from deviation between a high type with $q_1 = 1$ and a low type is

$$[b + \mu_1(1-\rho)^2 + 1 - (1-\rho)^2 - v_{H1}] - [b + \mu_1 - v_L]$$

$$= [1 - (1-\rho)^2](1-\mu_1) + v_L - v_{H1} = [1 - (1-\rho)^2](1-\mu_1) - (1-\rho)\mu_2$$

If $[1-(1-\rho)^2](1-\mu_1) - (1-\rho)\mu_2 > 0$, then D1 requires $\mu_1 = 1$ since the inequality implies that any deviation to $a_1 = 1$ is more likely to come from a high type with $q_1 = 1$ than a low type. Given $\mu_1 = 1$, then each type receives a payoff of $1 + b$ from choosing $a_1 = 1$. Because $v_L < 1 + b$, a profitable deviation exists for the low type. Hence an equilibrium with $\gamma_1 = 0$ does not survive D1 if $[1-(1-\rho)^2](1-\mu_1) - (1-\rho)\mu_2 > 0$ for some $\mu_1 < 1$. We now show that this inequality must be satisfied.

To prevent deviation from the low type in $t = 1$, it must be that $\mu_1 \leq \mu_2$. Thus minimizing the positive term in the inequality subject to this equilibrium condition yields

$$[1-(1-\rho)^2](1-\mu_2) - (1-\rho)\mu_2 = 1 - (1-\rho)^2 - \mu_2[1 - (1-\rho)^2 - (1-\rho)]$$

Since $1 - (1-\rho)^2 > 1 - (1-\rho)^2 - (1-\rho)$ and $\mu_2 < 1$, it follows that

$$1 - (1-\rho)^2 - \mu_2[1 - (1-\rho)^2 - (1-\rho)] > 0.$$

Thus there is no equilibrium with $\gamma_1 = 0$ that survives D1. ■

An analogous proof shows that there is no equilibrium in which $\gamma_2 = 0$. Since $\gamma_1 > 0$ and $\gamma_2 > 0$ in equilibrium, it follows that $\gamma_1 \in (0,1)$ and $\gamma_2 \in (0,1)$.

We now show that $\Pr(a_t = 1 | \theta = H, q_t = 1) = 1$ for $t \in \{1,2\}$. Consider a high type in $t = 2$ with $q_2 = 1$. The low type's strategy, $\gamma_1 \in (0,1)$ and $\gamma_2 \in (0,1)$, implies that $1 + b > b + \mu_2 \geq \mu_\phi$ since $\mu_2 < 1$ by Bayes' rule and the low type must weakly prefer $a_2 = 1$

to $a_2 = 0$. Thus

$$\begin{aligned} EU[a_2 = 1|\theta = H, q_2 = 1, a_1 = 0] &= b + \rho + (1-\rho)\mu_2 \\ &> b + \mu_2 \geq \mu_\phi \\ &= EU[a_2 = 0|\theta = H, q_2 = 1, a_1 = 0]. \end{aligned}$$

Hence the high type must play $a_2 = 1$ in $t = 2$ with probability one in equilibrium if $q_2 = 1$. Now consider a high type in $t = 1$ with $q_1 = 1$. Since $q_1 = 1$ implies $q_2 = 1$ if $a_1 = 0$, the high type must choose $a_2 = 1$ in $t = 2$ if $a_1 = 1$. Moreover, $\gamma_1 \in (0,1)$ and $\gamma_2 \in (0,1)$ imply that $b + \mu_1 = b + \mu_2 < b + 1$. Thus,

$$\begin{aligned} EU[a_1 = 1|\theta = H, q_1 = 1] &= b + 1 - (1-\rho^2) + (1-\rho)^2\mu_1 \\ &> b + \rho + (1-\rho)\mu_1 \\ &= b + \rho + (1-\rho)\mu_2 \\ &= EU[a_2 = 1|\theta = H, q_2 = 1, a_1 = 0] \\ &= EU[a_1 = 0|\theta = H, q_1 = 1]. \end{aligned}$$

Therefore the high type must play $a_1 = 1$ with probability one in equilibrium if $q_1 = 1$.

Finally, we show that $\Pr(a_1 = 1|\theta = H, q_1 = 0) = 0$. To do so, we need to characterize the high type's continuation value from choosing $a_1 = 0$ when $q_1 = 0$. With probability λ, he receives $q_2 = 1$ in $t = 2$ in which case he plays $a_2 = 1$ with probability one which yields a payoff of $b + \rho + (1-\rho)^2\mu_2$. With probability $1 - \lambda$, the high type receives $q_2 = 0$. For a high type in $t = 2$ with $q_2 = 0$, his expected payoff from each action is identical to the low type's. Since $\gamma_1 \in (0,1)$ and $\gamma_2 \in (0,1)$, the low type's expected payoff in $t = 2$ must be $b + \mu_2 = b + \mu_1$. Thus the high type's expected payoff in $t = 2$ when $q_2 = 0$ is also $b + \mu_2 = b + \mu_1$. Thus:

$$\begin{aligned} EU[a_1 = 1|\theta = H, q_1 = 0] &= b + \mu_1 \\ &< \lambda[b + \rho + (1-\rho)\mu_1] + (1-\lambda)[b + \mu_1] \\ &= \lambda[b + \rho + (1-\rho)\mu_2] + (1-\lambda)[b + \mu_2] \\ &= \lambda EU[a_2 = 1|\theta = H, q_2 = 1, a_1 = 0] \\ &+ (1-\lambda)EU[a_2 = 1|\theta = H, q_2 = 0, a_1 = 0] \\ &= EU[a_1 = 0|\theta = H, q_1 = 0]. \end{aligned}$$

Thus $\Pr(a_1 = 1|\theta = H, q_1 = 0) = 0$ in equilibrium. $\square$

A.2 Lemmas 3 and 4

Lemma 3. *For all b, there exists an equilibrium in which the high type chooses $a_2 = 1$ with probability one if $q_2 = 0$, $\gamma_1 = \frac{\lambda(\rho-1)^2}{\lambda^2\rho+\lambda(\rho-3)\rho+1}$, and $\gamma_2 = 1 - \gamma_1$.*

Proof: It follows from Lemma 1 that if the high type chooses $a_2 = 1$ with probability one when $q_2 = 0$ in equilibrium, then the low type's strategy must satisfy

$$b + \mu_1 = b + \mu_2 \geq \mu_\phi.$$

If $\gamma_1 + \gamma_2 < 1$, then $\mu_\phi = 0$ by Bayes' rule. Since the high type's strategy plays both $a_1 = 1$ and $(a_1, a_2) = (0, 1)$ with positive probability, Bayes' rule implies $\mu_1 = \mu_2 > 0$. The low type must therefore play $(a_1, a_2) = 0, 0$ with probability zero. Otherwise, a profitable deviation from $(a_1, a_2) = (0, 0)$ to either $a_1 = 1$ or $(a_1, a_2) = (0, 1)$ exists for the low type. Thus in equilibrium, $\gamma_1 = 1 - \gamma_2$. The low type's indifference condition, $\mu_1 = \mu_2$, is therefore equivalent to

$$\frac{p\lambda(1-\rho)^2}{p\lambda(1-\rho)^2 + (1-p)\gamma_1} = \frac{p(1-\lambda)[\lambda(1-\rho) + (1-\lambda)]}{p(1-\lambda)[\lambda(1-\rho) + (1-\lambda)] + (1-p)(1-\gamma_1)}.$$

Solving explicitly for γ_1 yields the expression in Lemma 3. It is straightforward to check that $\gamma_1 \in (0, 1)$ and that γ_1 is independent of b. Thus the equilibrium exists for all b. □

Lemma 4. *A unique welfare-maximizing equilibrium exists. If $b \leq \bar{b}$, then in the unique welfare-maximizing equilibrium, the high type chooses $a_2 = 0$ with probability one if $q_2 = 0$, $\gamma_1 \in (0, 1)$, and $\gamma_2 \in (0, 1)$; moreover, $1 - \gamma_1 - \gamma_2 > 0$ if $b < \bar{b}$. If $b > \bar{b}$, then the unique welfare-maximizing equilibrium is characterized by Lemma 3.*

Proof

It follows from Lemma 1 that strategy profiles in equilibrium can vary only with the low type's strategy, characterized by (γ_1, γ_2), and the high type's strategy in $t = 2$ when $q_2 = 0$,

$$\omega \equiv Pr(a_2 = 1|\theta = H, q_2 = 0, a_1 = 0).$$

Lemma 1 also implies that the voter's equilibrium welfare is

$$V^* = p(1 - (1-\lambda)^2) - \zeta p(1-\lambda)^2\omega - \zeta(1-p)(\gamma_1 + \gamma_2)$$

Additionally, since both the low and high type choose $a_1 = 1$ and $(a_1, a_2) = (0, 1)$ with positive probability in equilibrium, Lemma 1 implies

$$\mu_1 = \left[1 + \left(\frac{1-p}{p}\right)\left(\frac{\gamma_1}{\lambda(1-\rho)^2}\right)\right]^{-1},$$
$$\mu_2 = \left[1 + \left(\frac{1-p}{p}\right)\left(\frac{\gamma_2}{(1-\lambda)[\lambda(1-\rho)+\omega(1-\lambda)]}\right)\right]^{-1}.$$

Because the low type's strategy requires that $b+\mu_1 = b+\mu_2$, we can express γ_2 in terms of ω and γ_1 as

$$\gamma_2(\gamma_1,\omega) = \gamma_1\left(\frac{1-\lambda}{1-\rho}\right)\left[1+\frac{\omega}{\lambda}\left(\frac{1-\lambda}{1-\rho}\right)\right]$$

which is obtained by solving $\mu_1 = \mu_2$ for γ_2. Substituting $\gamma_2(\gamma_1,\omega)$ into μ_1 and μ_2 yields

$$\mu_1 = \mu_2 = \left[1 + \left(\frac{1-p}{p}\right)\left(\frac{\gamma_1}{\lambda(1-\rho)^2}\right)\right]^{-1}$$

Additionally, if $1-\gamma_1-\gamma_2+\omega > 0$, then μ_ϕ is determined by Bayes' rule. Substituting $\gamma_2(\gamma_1,\omega)$ into μ_ϕ yields

$$\mu_\phi = \left[1 + \left(\frac{1-p}{p}\right)\left(\frac{1}{(1-\lambda)^2(1-\omega)}\right)\left(1-\gamma_1\left(1+\left(\frac{1-\lambda}{1-\rho}\right)+\frac{\omega}{\lambda}\left(\frac{1-\lambda}{1-\rho}\right)^2\right)\right)\right]^{-1}$$

if $\omega < 1$ and $\mu_\phi = 0$ otherwise.

Substituting the above expressions for $\mu_1 = \mu_2$ and μ_ϕ into the indifference condition $b+\mu_1 = \mu_\phi$ and rearranging yields a quadratic equation in γ_1,

$$f(\gamma_1) = \gamma_1^2 P^2 Z(\omega) + \gamma_1[P(1-b)Y(\omega) + \lambda(1-\rho)^2(1+b)Z(\omega) - bP^2] - \lambda(1-\rho)^2[bY(\omega)+P(1+b)] = 0$$

where

$$Y(\omega) = (1-\lambda)^2(1-\omega),$$
$$Z(\omega) = \left(1+\left(\frac{1-\lambda}{1-\rho}\right)+\frac{\omega}{\lambda}\left(\frac{1-\lambda}{1-\rho}\right)^2\right), \text{ and}$$
$$P = \frac{1-p}{p}$$

The positive leading coefficient, $P^2Z(\omega) > 0$, in $f(\gamma_1)$ implies that $f(\gamma_1)$ is convex and $f(0) < 0$ implies that there exist two real solutions to $f(\gamma_1) = 0$, one negative and one positive. It follows that $\gamma_1 \in (0,1)$ is uniquely characterized by

$$\gamma_1 = \gamma_1(\omega, b) \equiv \left(\frac{-\beta(\omega, b) + \sqrt{D(w,b)}}{2Z(\omega)P^2} \right)$$

where

$$\begin{aligned}\beta(\omega, b) &= P(1-b)Y(\omega) + \lambda(1-\rho)^2(1+b)Z(\omega) - bP^2, \text{ and} \\ D(\omega, b) &= [\beta(\omega, b)]^2 + 4P^2\lambda(1-\rho)^2[bY(\omega) + P(1+b)]Z(\omega).\end{aligned}$$

Note that for a given ω,

$$\gamma_1 + \gamma_2 = \gamma_1(\omega, b) + \gamma_2(\gamma_1(\omega, b), \omega) = \gamma_1(\omega, b)Z(\omega)$$

Direct computations show that $\gamma_1(0,b)Z(0) > 0$ and that $\gamma_1(\omega, b)Z(\omega)$ is strictly increasing in ω. Solving $\gamma_1(\omega, b)Z(\omega) = 1$ for ω yields a unique solution,

$$\eta(b) = \frac{b\left(\lambda^2(-p)(\rho-1) - \lambda p\left(\rho^2 - 3\rho + 2\right) + p - 1\right) - p + 1}{b(\lambda-1)^2 p}.$$

It is straightforward to check that $\eta(b)$ is strictly decreasing in b. Thus if $\eta(b) > 0$, there exists an equilibrium for each $\omega \in [0, \eta(b)]$. Solving $\eta(b) = 1$ for b yields

$$\underline{b} \equiv \frac{1-p}{\lambda p \rho(\lambda + \rho - 3) + 1}.$$

Thus if $b \leq \underline{b}$, then all $\omega \in [0,1]$ are consistent with equilibrium. Moreover, for all $b \leq \underline{b}$, the equilibrium for $\omega = 1$ corresponds to the equilibrium characterized in Lemma 3. Solving $\eta(b) = 0$ for b yields

$$\bar{b} = \frac{1-p}{(1-p) + p\lambda(1-\rho)(2-\lambda-\rho)} > \underline{b}.$$

Thus for $b \in (\underline{b}, \bar{b}]$, $\omega < 1$ characterizes an equilibrium if and only if $\omega \in [0, \eta(b)]$. If $b > \bar{b}$, then $\gamma_1(\omega, b)Z(\omega) > 1$ for all $\omega \in [0,1]$ which implies that no $\omega < 1$ is consistent equilibrium. Thus the existence of any equilibrium with $\omega < 1$ implies the existence of an equilibrium with $\omega = 0$ and such an equilibrium exists if and only if $b \leq \bar{b}$.

Because $\gamma_1 + \gamma_2 = \gamma_1(\omega, b)Z(\omega)$ is increasing in ω, it follows that $\omega = 0$ characterizes the unique welfare-maximizing equilibrium if $b \leq \bar{b}$. If $b > \bar{b}$, then the set of equilibria is a singleton, containing only the equilibrium characterized in Lemma 3 and is therefore, trivially, the welfare-maximizing equilibrium. $\square$

A.3 Proof of Lemma 2

Under Assumption 1, the result follows directly from Lemma 4. □

A.4 Proof of Proposition 1

Under Assumption 1, it follows from Lemma 4 that in the unique welfare maximizing equilibrium,

$$\mu_1 + b = \mu_2 + b = \mu_\phi$$

where

$$\mu_1 = \frac{ph_1}{ph_1 + (1-p)\gamma_1}, \qquad \mu_1 = \frac{ph_2}{ph_2 + (1-p)\gamma_2}, \qquad \mu_\phi = \frac{ph_\phi}{ph_\phi + (1-p)\gamma_\phi}.$$

Note that

$$\mu_1 + b = \mu_2 + b \implies \frac{\gamma_1}{\gamma_2} = \frac{h_1}{h_2}.$$

Since $\gamma_\phi = 1 - \gamma_1 - \gamma_2 \in (0, 1)$, it follows that

$$\gamma_1 = kh_1, \qquad \gamma_2 = kh_2, \qquad \gamma_\phi = 1 - k\mathcal{H}_{12}$$

for some $k \in [0, \mathcal{H}^{-1})$ where $\mathcal{H}_{12} = (h_1 + h_2)$. Substituting $\gamma_1 = kh_1$ into μ_1 and $\gamma_2 = kh_2$ into μ_2 yields

$$\mu_1 = \mu_2 = \mu_R = \frac{p}{p + (1-p)k}.$$

Thus $b + \mu_R = \mu_\phi$ becomes

$$b + \frac{p}{p + (1-p)k} = \frac{ph_\phi}{ph_\phi + (1-p)\gamma_\phi}.$$

Rearranging and simplifying yields a quadratic equation in k,

$$G \equiv c_2k^2 + c_1k + c_0 = 0 \tag{4}$$

where

$$c_0 = p\left(b + (1-p) - bp(1 - h_\phi)\right) \tag{5}$$
$$c_1 = -(1-p)\left(bp(1 + \mathcal{H}_{12} - h_\phi) + p\mathcal{H} - b\right) \tag{6}$$
$$c_2 = -\mathcal{H}_{12}b(1-p)^2. \tag{7}$$

Analyzing the roots of the equation shows that for every $b \in [0, \bar{b}]$,

$$k = k(b) \equiv \frac{-c_1 - \sqrt{\Delta}}{2c_2}, \qquad \text{where } \Delta \equiv c_1^2 - 4c_2c_0, \tag{8}$$

is the unique root such that $k \in [0, \mathcal{H}_{12}^{-1}]$ and that $k(b) : [0, \bar{b}] \to [\mathcal{H}^{-1}, \mathcal{H}_{12}^{-1}]$ is a strictly increasing bijection. □

A.5 Lemma 5

Lemma 5. *If b is sufficiently low, then $k(b)$ is monotonically increasing in λ. If b is sufficiently high, then $k(b)$ is decreasing in λ if λ is sufficiently low and increasing in λ if λ is sufficiently high.*

Proof:

From (4), $k(b)$ is implicitly characterized by $G = 0$. By the implicit function theorem,

$$k_\lambda = -\frac{G_\lambda}{G_k}. \tag{9}$$

Since $k(b) = (-c_1 - \sqrt{\Delta})/(2c_2)$ by (8), the derivative of G with respect to k evaluated at $k = k(b)$ satisfies the quadratic identity

$$G_k = 2c_2k + c_1 = -\sqrt{\Delta} < 0. \tag{10}$$

Thus (9)-(10) imply that

$$\text{sign}\left(k_\lambda(b)\right) = \text{sign}\left(G_\lambda|_{k=k(b)}\right). \tag{11}$$

Therefore to establish the sign of k_λ, it is sufficient to identify the sign of G_λ evaluated at $k = k(b)$.

Because c_2, c_1, and c_0 are continuous in (b, λ), and because $\Delta > 0$ for $b < \bar{b}$, it follows that $k(b)$ is continuous in (b, λ). Since G_λ is continuous (λ, k, p), the mapping

$$(b, \lambda) \mapsto G_\lambda|_{k=k(b)}$$

is too on $(0, \bar{b}) \times (0, 1)$.

Next, direct calculations show that for all $b < \bar{b}$,

$$\lim_{\lambda \to 1} G_\lambda|_{k=k(b)} = \rho(1-\rho)(1-p)[b(1-p)k(b)^2 + p(1+b)k(b)] > 0$$

since $k(b) > 0$. By continuity, there exists $\lambda_H < 1$ such that $G_\lambda|_{k=k(b)} > 0$ for all $\lambda \in (\lambda_H, 1)$.

Now consider $b > p$. As $\lambda \downarrow 0$, $h_\phi = (1-\lambda)^2 \to 1$ and $\mathcal{H}_{12} \sim (1-\rho)(2-\rho)\lambda$. Since $b > p$, we have $c_1 = (1-p)(b-p) > 0$ while $c_2 \to 0^-$. Thus $k(b)$ satisfies

$$k(b) \sim \frac{b-p}{b(1-\rho)(2-\rho)} \cdot \frac{1}{\lambda} \qquad (\lambda \downarrow 0, b > p).$$

Substituting into $G_\lambda|_{k=k(b)}$ yields the leading order expansion

$$G_\lambda|_{k=k(b)} = -\frac{(b-p)^2}{b(1-\rho)(2-\rho)} \frac{1}{\lambda^2} + O\left(\frac{1}{\lambda}\right) < 0$$

for all sufficiently small λ whenever $b > p$. Hence $k(b)$ is strictly decreasing for all λ in a neighborhood $(0, \lambda_L)$ if $b > p$.[13] $\square$

A.6 Proof of Proposition 2

We first prove the result for λ. Since $h_\phi = (1-\lambda)^2$ is strictly decreasing in λ, it follows immediately that $1 - h_\phi$ is strictly increasing. Moreover, $h_1 + h_2 = \lambda(1-\rho)^2 + \lambda(1-\lambda)(1-\rho)$ is strictly increasing. In equilibrium, the low type's strategy must satisfy $b + \mu_R = \mu_\phi$, which can be expressed as

$$b + \frac{p(h_1+h_2)}{p(h_1+h_2) + (1-p)(1-\gamma_\phi)} = \frac{ph_\phi}{ph_\phi + (1-p)\gamma_\phi}.$$

Note that h_ϕ is strictly decreasing and $h_1 + h_2$ strictly increasing in λ. This implies that, holding γ_ϕ fixed, as λ increases, μ_ϕ decreases and μ_R increases. Since μ_ϕ is strictly decreasing and μ_R strictly increasing in γ_ϕ, it follows that γ_ϕ must strictly decrease in order to maintain equality. Since $1 - \gamma_\phi = 1 - (\gamma_1 + \gamma_2)$, this implies that $\gamma_1 + \gamma_2$ is strictly increasing in λ.

Next we prove the result for ρ. As ρ increases, $h_1 + h_2$ strictly decrease while h_ϕ remains constant. Thus, holding γ_ϕ constant, μ_R strictly decreases and μ_ϕ remains constant if ρ increases. Since μ_R strictly increases and μ_ϕ strictly decreases in γ_ϕ, it must be that γ_ϕ increases in order to reestablish equality. Therefore $\gamma_1 + \gamma_2 = 1 - \gamma_\phi$ is strictly decreasing in ρ.

Finally, we prove the result for b. Proposition 1 establishes that in equilibrium, $\gamma_1 + \gamma_2 = k(b)(h_1 + h_2)$ and that $k(b)$ is strictly increasing in b. Since b enters $\gamma_1 + \gamma_2$ only through $k(b)$ and $h_1 + h_2 > 0$, it follows that $\gamma_1 + \gamma_2$ is strictly increasing in b. $\square$

[13] This condition is sufficient, not necessary; if $\bar{b}|_{\lambda=0} < p$, the nonmonotonicity can still obtain, but we do not pursue the sharper b threshold here.

A.7 Proof of Proposition 3

Given the high type's equilibrium strategy, the odds that the high type implements policy in $t = 1$, conditional on him implementing policy in either period, are

$$\begin{aligned}\Omega_H &\equiv \frac{\Pr(a_1 = 1|\theta = H, (a_1, a_2) \neq (0,0))}{\Pr((a_1, a_2) = (0,1)|\theta = H, (a_1, a_2) \neq (0,0))} \\ &= \left(\frac{\lambda}{\lambda + (1-\lambda)\lambda}\right)\left(\frac{\lambda(1-\lambda)}{\lambda + (1-\lambda)\lambda}\right)^{-1} \\ &= \frac{1}{1-\lambda}.\end{aligned}$$

Clearly Ω_H is constant in ρ and b and strictly increasing in λ. Analogously, for the low type,

$$\Omega_L \equiv \frac{\Pr(a_1 = 1|\theta = L, (a_1, a_2) \neq (0,0))}{\Pr((a_1, a_2) = (0,1)|\theta = L, (a_1, a_2) \neq (0,0))} = \frac{k(b)h_1}{k(b)h_2} = \frac{1-\rho}{1-\lambda}.$$

Thus Ω_L is increasing in λ, decreasing in ρ, and constant in b.

The odds that the politician, unconditional on type, implements policy in $t = 1$, conditional on him implementing policy in either period, are

$$\begin{aligned}\Omega &= \frac{\Pr(a_1 = 1|(a_1, a_2) \neq (0,0))}{\Pr((a_1, a_2) = (0,1)|(a_1, a_2) \neq (0,0))} = \frac{p\,\lambda + (1-p)\,k(b)\,h_1}{p\,(1-\lambda)\lambda + (1-p)\,k(b)\,h_2}. \\ &= \left(\frac{p + (1-p)k(b)(1-\rho)^2}{p + (1-p)k(b)(1-\rho)}\right)\left(\frac{1}{1-\lambda}\right)\end{aligned}$$

Then

$$\frac{\partial \Omega}{\partial b} = -\left(\frac{p(1-p)(1-\rho)\rho}{(1-\lambda)[p + (1-p)k(b)(1-\rho)]^2}\right)\left(\frac{\partial k(b)}{\partial b}\right) < 0$$

since $k(b)$ is increasing in b by Proposition 1. □

A.8 Proof of Proposition 4

Define Pr(well-designed | $a_t = 1$) as the probability that a policy implemented in period t is well-designed. Using equilibrium strategies, these probabilities are:

$$\Pr(\text{well-designed} \mid a_1 = 1) = \frac{p\lambda}{p\lambda + (1-p)\gamma_1^*} = \frac{p}{p + \left(\frac{1-p}{k(b)\mathcal{H}}\right)(1-\rho)^2},$$

$$\Pr(\text{well-designed} \mid a_1 = 0, a_2 = 1) = \frac{p(1-\lambda)\lambda}{p(1-\lambda)\lambda + (1-p)\gamma_2^*} = \frac{p}{p + \left(\frac{1-p}{k(b)\mathcal{H}}\right)(1-\rho)}.$$

We then have

$$\Omega_1 = \frac{\Pr(\text{well-designed} \mid a_1 = 1)}{1 - \Pr(\text{well-designed} \mid a_1 = 1)} = \frac{p\lambda}{(1-p)\gamma_1^*}$$

and

$$\Omega_2 = \frac{\Pr(\text{well-designed} \mid a_1 = 0, a_2 = 1)}{1 - \Pr(\text{well-designed} \mid a_1 = 0, a_2 = 1)} = \frac{p(1-\lambda)\lambda}{(1-p)\gamma_2^*}.$$

Therefore

$$\frac{\Omega_1}{\Omega_2} = \frac{1}{1-\rho}.$$

Thus $\frac{\Omega_1}{\Omega_2} > 1$ which implies the first part of the proposition. Clearly $\frac{\Omega_1}{\Omega_2}$ is constant in b and λ and strictly increasing in ρ, thus establishing the second part. $\square$

A.9 Proof of Proposition 5

We start by providing complete expressions for interim beliefs.

$$\hat{\mu}_1 = \left(1 + Pk(b)(1-\rho)^2\right)^{-1}$$

$$\hat{\mu}_\phi = \left(1 + P\left(\frac{1 - k(b)\lambda(1-\rho)^2}{1-\lambda}\right)\right)^{-1}$$

$$\hat{\mu}_2 = (1 + Pk(b)(1-\rho))^{-1}$$

For reference,

$$\mu_\phi = \left(1 + P\left(\frac{1 - k(b)\lambda(1-\rho)(2-\lambda-\rho)}{(1-\lambda)^2}\right)\right)^{-1}$$

$$\mu_R = (1 + Pk(b))^{-1}$$

We prove the results for b sufficiently low by showing that the results hold for $b = 0$. Then the continuity of beliefs in b implies the result for $b \in (0, b_\varepsilon)$ for some $b_\varepsilon > 0$.

For $b = 0$, we have $k(0) = \mathcal{H}^{-1}$. Thus

$$\hat{\mu}_1 = \left(1 + P\left(\frac{(1-\rho)^2}{\mathcal{H}}\right)\right)^{-1}$$

$$\tilde{\mu}_1 = \left(1 + P\left(\frac{(1-\rho)}{\mathcal{H}}\right)\right)^{-1}$$

$$\hat{\mu}_2 = \left(1 + P\left(\frac{\lambda(1-\rho) + (1-\lambda)}{\mathcal{H}}\right)\right)^{-1}$$

$$\mu_R = \mu_\phi = \left(1 + P\left(\frac{1}{\mathcal{H}}\right)\right)^{-1}$$

Thus

$$(1-\rho)^2 < (1-\rho) < \lambda(1-\rho) + (1-\lambda) < 1$$

for all $\lambda \in (0,1)$ and $\rho \in (0,1)$ implies that

$$\hat{\mu}_1 > \hat{\mu}_2 > \hat{\mu}_\phi > \mu_R = \mu_\phi.$$

Next we show $\hat{\mu}_1 > p$ for all λ:

$$\hat{\mu}_1 > p \impliedby \frac{(1-\rho)^2}{\mathcal{H}} < 1$$

and is straightforward to verify that

$$(1-\rho)^2 - \mathcal{H} < 0$$

reduces to $\rho < 1$ which is true for all λ.

We prove that $\hat{\mu}_\phi < p$ for all λ similarly:

$$\hat{\mu}_\phi < p \impliedby \frac{\lambda(1-\rho) + (1-\lambda)}{\mathcal{H}} > 1$$

so

$$\lambda(1-\rho) + (1-\lambda) - \mathcal{H} = \lambda\rho(2-\lambda-\rho) > 0$$

for all λ implies the result. It immediately follows that $\mu_\phi = \mu_R < p$ since $\hat{\mu}_\phi > \mu_\phi = \mu_R$.

Next we show that $\hat{\mu}_2 > p$ for sufficiently low λ and that $\hat{\mu}_2 < p$ for sufficiently high λ. We have that

$$\frac{(1-\rho)}{\mathcal{H}} < 1 \implies (1-\rho) - \mathcal{H} < 0.$$

Substituting and rearranging shows that

$$(1-\rho) - \mathcal{H} = -\rho[\lambda^2 - \lambda(3-\rho) + 1]$$

It is straightforward to check that $\lambda^2 - \lambda(3-\rho) + 1 = 0$ has two real roots with a unique root in $(0,1)$:

$$\lambda_- = \frac{3-\rho-\sqrt{(3-\rho)^2-4}}{2} \in (0,1) \qquad \text{for all } \rho \in (0,1)$$

and
$$\lambda_+ = \frac{3-\rho+\sqrt{(3-\rho)^2-4}}{2} > 0 \qquad \text{for all } \rho \in (0,1).$$

Since $\lambda^2 - \lambda(3-\rho)+1$ has a positive leading coefficient, it follows that $\lambda^2-\lambda(3-\rho)+1 > 0$ if $\lambda \in (0, \lambda_-)$ and $\lambda^2 - \lambda(3-\rho)+1 < 0$ if $\lambda \in (\lambda_-, 1)$. Thus $(1-\rho) - \mathcal{H} < 0$ if $\lambda < \lambda_-$ and $(1-\rho)-\mathcal{H} > 0$ otherwise which implies the result.

We now turn to the b sufficiently large case. We prove the result by showing that the inequalities hold for $b \uparrow \bar{b}$. The continuity of beliefs in $\bar{b}$ and λ then implies the result on $b \in (b', \bar{b})$ for some $b' \in (0, \bar{b})$.

Since $\lim_{b\to\bar{b}} k(b) = \mathcal{H}_{12}^{-1} = \frac{1}{(1-\rho)\lambda(2-\lambda-\rho)}$, it follows that $\lim_{b\to\bar{b}} \gamma_\phi = 0$. Hence $\mu_\phi \to 1$ as $b \to \bar{b}$.

Next we have
$$\lim_{b\to\bar{b}} \hat{\mu}_1 = \left(1 + P\left(\frac{1-\rho}{\lambda(2-\lambda-\rho)}\right)\right)^{-1}$$
$$\lim_{b\to\bar{b}} \hat{\mu}_2 = \left(1 + P\left(\frac{1}{\lambda(2-\lambda-\rho)}\right)\right)^{-1}$$
$$\lim_{b\to\bar{b}} \hat{\mu}_\phi = \left(1 + P\left(\frac{1}{2-\lambda-\rho}\right)\right)^{-1}$$
$$\lim_{b\to\bar{b}} \mu_R = \left(1 + P\left(\frac{1}{(1-\rho)\lambda(2-\lambda-\rho)}\right)\right)^{-1}$$

We then have that
$$1, \frac{1-\rho}{\lambda} < \frac{1}{\lambda} < \frac{1}{\lambda(1-\rho)} \implies \hat{\mu}_1, \hat{\mu}_\phi > \hat{\mu}_2 > \mu_R$$

for all $\lambda \in (0,1)$. Then
$$\frac{1}{\lambda(2-\lambda-\rho)} > 1 \quad \text{for all} \quad \lambda, \rho \in (0,1)^2 \implies p > \hat{\mu}_2.$$

Next, $\hat{\mu}_1 < p$ if and only if $(1-\rho) > \lambda(2-\lambda-\rho) \implies \lambda < (1-\rho)$. Similarly, $\hat{\mu}_\phi < p$ if and only if $1 > 2-\lambda-\rho \implies \lambda > (1-\rho)$. Thus $\hat{\mu}_1 < p < \hat{\mu}_\phi$ if $\lambda < (1-\rho)$ and $\hat{\mu}_1 > p > \hat{\mu}_\phi$ if $\lambda > (1-\rho)$. $\square$

A.10 Proof of Proposition 6

In equilibrium,
$$F \equiv b + \mu_R - \mu_\phi = 0$$

where

$$\mu_R = \frac{p(h_1+h_2)}{p(h_1+h_2)+(1-p)(\gamma_1+\gamma_2)} = \frac{p(h_1+h_2)}{p(h_1+h_2)+(1-p)(h_1+h_2)k} = \frac{p}{p+(1-p)k}$$

and

$$\mu_\phi = \frac{ph_\phi}{ph_\phi+(1-p)\gamma_\phi} = \frac{ph_\phi}{ph_\phi+(1-p)(1-(h_1+h_2)k)}.$$

To prove that μ_R and μ_ϕ are both decreasing in ρ, we first show that $k(b)$ is increasing in ρ. Note that $\frac{\partial \mu_R}{\partial k} < 0$ and $\frac{\partial \mu_\phi}{\partial k} > 0$. Therefore

$$F_k \equiv \frac{\partial F}{\partial k} = \frac{\partial \mu_R}{\partial k} - \frac{\partial \mu_\phi}{\partial k} < 0$$

Additionally, holding k fixed, $\frac{\partial \mu_\phi}{\partial \rho} < 0$ since $h_1 + h_2 = \lambda(1-\rho)(2-\lambda-\rho)$ and $h_\phi = (1-\lambda)^2$. Now applying the implicit function theorem to $F = 0$ shows that

$$\frac{\partial k}{\partial \rho} = -\left(\frac{1}{F_k}\right)\left(-\frac{\partial \mu_\phi}{\partial \rho}\right) = \left(\frac{1}{F_k}\right)\left(\frac{\partial \mu_\phi}{\partial \rho}\right) > 0$$

since $\frac{\partial \mu_\phi}{\partial \rho}|_k < 0$ and $F_k < 0$. Now totally differentiating μ_R respect to ρ, we have that

$$\frac{d\mu_R}{d\rho} = \frac{\partial \mu_R}{\partial \rho} + \frac{\partial \mu_R}{\partial k}\frac{\partial k}{\partial \rho} = \frac{\partial \mu_R}{\partial k}\frac{\partial k}{\partial \rho} < 0$$

since $\frac{\partial k}{\partial \rho} > 0$ and $\frac{\partial \mu_R}{\partial k} < 0$. Then, because $b + \mu_R = \mu_\phi$, it follows that

$$\frac{d\mu_\phi}{d\rho} = \frac{d\mu_R}{d\rho} < 0.$$

Next we show that μ_R is decreasing and μ_ϕ increasing in b. We establish in Proposition 1 that $k(b)$ is strictly increasing in b. Thus

$$\frac{d\mu_R}{db} = \frac{\partial \mu_R}{\partial k}\frac{\partial k}{\partial b} < 0$$

and

$$\frac{d\mu_\phi}{db} = \frac{\partial \mu_\phi}{\partial k}\frac{\partial k}{\partial b} > 0$$

because $\frac{\partial \mu_R}{\partial k} < 0$ and $\frac{\partial \mu_\phi}{\partial k} > 0$.

Finally, we prove comparative static results with respect to λ. Differentiating μ_R with respect to λ yields

$$\frac{d\mu_R}{d\lambda} = \frac{\partial \mu_R}{\partial k}\frac{\partial k}{\partial \lambda}.$$

Then $b + \mu_R = \mu_\phi$ implies that

$$\frac{d\mu_\phi}{d\lambda} = \frac{d\mu_R}{d\lambda}.$$

Since $\frac{\partial \mu_R}{\partial k} < 0$, it follows that

$$\text{sign}\left(\frac{d\mu_R}{d\lambda}\right) = \text{sign}\left(\frac{d\mu_\phi}{d\lambda}\right) = -\text{sign}\left(\frac{\partial k}{\partial \lambda}\right).$$

The result then follows from Lemma 5. □

A.11 Proof of Proposition 7

The voter's welfare is

$$V^* = p\lambda - \zeta(1-p)(\gamma_1 + \gamma_2)$$

so

$$\text{sign}\left(\frac{\partial V^*}{\partial \rho}\right) = -\text{sign}\left(\frac{\partial(\gamma_1+\gamma_2)}{\partial \rho}\right)$$

and

$$\text{sign}\left(\frac{\partial V^*}{\partial b}\right) = -\text{sign}\left(\frac{\partial(\gamma_1+\gamma_2)}{\partial b}\right)$$

By Proposition 2, $(\gamma_1 + \gamma_2)$ is strictly increasing in b and strictly decreasing in ρ. □

A.12 Proof of Proposition 8

The result for the low type follows immediately from proposition 6. For the high type,

$$V_H = b(1-h_\phi) + (1-\mathcal{H}) + (h_1+h_2)\mu_R + h_\phi \mu_\phi$$

We then have

$$\frac{\partial V_H}{\partial b} = (h_1+h_2)\frac{\partial \mu_R}{\partial b} + h_\phi \frac{\partial \mu_\phi}{\partial b} + (1-h_\phi) = 1 + \mathcal{H}\frac{\partial \mu_R}{\partial b}$$

where the second equality follows from $b + \mu_R = \mu_\phi \implies \mu'_\phi = 1 + \mu'_R$. Thus a sufficient condition for V_H to be increasing in b is $\frac{\partial \mu_R}{\partial b} > -1$. Suppose for contradiction that $\frac{\partial \mu_R}{\partial b} \leq -1$.

Since $b + \mu_R = \mu_\phi$ in equilibrium, this implies that

$$\frac{\partial \mu_\phi}{\partial b} = 1 + \frac{\partial \mu_R}{\partial b} \leq 0.$$

But we know from Proposition 6 that μ_ϕ is strictly increasing in b. Thus our assumption that $\frac{\partial \mu_R}{\partial b} \leq -1$ must be false. Therefore V_H is strictly increasing in b.

Next we show that V_H is strictly increasing in λ and ρ for $b = 0$. The smoothness of V_H in $\lambda, \rho \in (0,1)^2$ then implies the result for sufficiently low b.

When $b = 0$, V_H is equivalent to

$$V_H = 1 - \mathcal{H} + \frac{p\mathcal{H}^2}{p\mathcal{H} + (1-p)}.$$

We then have

$$\frac{\partial V_H}{\partial \mathcal{H}} = -\frac{(1-p)^2}{p\mathcal{H} + (1-p)} < 0,$$

$$\frac{\partial \mathcal{H}}{\partial \lambda} = \rho(\rho - 3 + 2\lambda) < 0,$$

and

$$\frac{\partial \mathcal{H}}{\partial \rho} = -\lambda[2(1-\rho) + (1-\lambda)] < 0.$$

Thus

$$\frac{dV_H}{d\lambda} = \frac{\partial V_H}{\partial \mathcal{H}} \frac{\partial \mathcal{H}}{\partial \lambda} > 0$$

and

$$\frac{dV_H}{d\rho} = \frac{\partial V_H}{\partial \mathcal{H}} \frac{\partial \mathcal{H}}{\partial \rho} > 0. \square$$