Signaling Competence Through Policy Revision

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Abstract

What strategic considerations incentivize political parties to alter or replace policies passed by their political opponents? I provide an answer to this question by studying a model in which a political party attempts to convey competence—the quality of their noisy signal about a payoff-relevant state—through their decision whether to revise a policy passed by their opponent. First, I show that when a representative voter wants to elect a competent party, the party's decision to revise their opponent's policy conveys competence while the decision to retain the opponent's policy conveys incompetence. Then, I show that reelection incentives push the party to revise their opponent's policy more frequently and with more extreme policies than they would without reelection concerns.

1 Introduction

Policy revision is an extremely common feature of policymaking in the United States. Sometimes, revision entails one party repealing a landmark piece of legislation passed by another party. For example, in 1996, Congressional Republicans passed the Personal Responsibility and Work Opportunity Act, which repealed the Social Security Act of 1935. In other cases, revision entails one party making small amendments to previously passed legislation–possibly even with the support of the opposing party, as was the case when Congressional Republicans passed the Health Care and Education Reconciliation Act of 2010. And in other instances, revision occurs outside the legislature. As was the case when the Trump administration withdrew the United States from the Trans-Pacific Partnership.

Despite the ubiquity of policy revision, there is relatively little research on the topic. In this paper, I use a theoretical model to offer one way to think about the topic. I begin with the observation that parties that differ in competence—in this model, the quality of signal they receive about the state—may be willing to make different revisions to existing policy. This is because when a party receives low quality information about the state, extreme revisions are very risky.

I formalize this intuition in a model with two parties and a voter, where the parties are motivated by policy quality and reelection, and the voter cares about the competence of the party in office. At the start of the game, the parties observe private signals about the state. The quality of signal that one party observes is known, while the other party may observe a higher quality or lower quality signal depending on whether they are competent or not. After observing their signal, the party with known competence implements an initial policy. Then the other party—now the incumbent party—has an opportunity to make a costly revision to the initial policy. The voter observes the initial policy and any revisions, and then decides whether to reelect the incumbent.

I begin by analyzing a benchmark version of the model without electoral incentives. In such a model, the incumbent doesn't consider the information conveyed by their decision to revise. They simply compare the benefit of increased policy quality to the cost, and revise when the optimal policy given their signal is sufficiently far from the initial policy. This benchmark reveals two things. First, the decision to retain the initial policy conveys incompetence; the voter never reelects the incumbent when they retain. On the other hand, drastic revisions convey competence, and there is a cutoff such that if both types of incumbent implement a policy more extreme than this cutoff by implementing the mean of their posterior, the voter will reelect them.

I proceed to analyzing the full model by focusing on equilibria where the voter either reelects the incumbent when they make an extreme revision or when they make a moderate revision or retain the initial policy. I first show that the only cutoff equilibria that exist are equilibria where the voter reelects the incumbent when they make an extreme revision. Then I characterize all cutoff equilibria of the model.

When reelection incentives are relatively small, the cutoff equilibria look similar to the benchmark. When the incumbent retains the initial policy, they are not reelected, and when they revise to the mean of their posterior, they are. However, the addition of reelection incentives drives the incumbent to revise more often than they do in the benchmark without electoral incentives.

As the reelection incentive increases, the voter needs to choose a more extreme cutoff to dissuade the incumbent from implementing moderate revisions because moderate revisions convey incompetence. As a result, a different type of cutoff equilibrium emerges. In this type of equilibrium, the incumbent retains for moderate signals and revises to the mean of their posterior for extreme signals, but due to the voter's relatively more extreme cutoff, the incumbent chooses a different action when they observe intermediate signals: they pool at the cutoff by implementing the most moderate policy that leads to reelection. As a result, the voter needs an even more extreme cutoff to dissuade the incumbent from pooling when they would have implemented the types of policies that would have led the voter to elect the other party.

When the voter adopts an especially extreme cutoff, a third type of equilibrium emerges. This type looks similar to the equilibria above, but the the incumbent now is willing to implement the mean of their posterior when they see an intermediate signal that is far enough from the initial policy that they don't want to retain, and is also far enough from the cutoff that the voter doesn't want to pool.

I show that in any cutoff equilibrium, the probability of revision is higher (weakly in the equilibrium where the voter uses a very stringent cutoff) when there are electoral incentives than when there are not. This is consistent with empirical findings that electoral incentives push legislators to allocate effort to measures of observable productivity (Fouirnaies and Hall, 2022). I also show that electoral incentives push the incumbent to implement weakly more extreme revisions than they do when there are not electoral incentives. This is bad for the voter because this means the the incumbent is choosing a more extreme policy than is optimal from a policy quality standpoint.

After analyzing the baseline model, I study an extension where the voter chooses whether to elect the party with unknown competence after the initial party is enacted. I have not completed this analysis yet, but preliminary results show that the voter seeks out revision by electing the incumbent even though the incumbent is ex-ante lower expected quality than the party that implemented the initial policy. This result provides an justification for why Democrats were punished in the 2010 Midterm elections even though the quality of the Affordable Care Act had not been revealed (Konisky and Richardson Jr, 2012).

2 Literature

In comparison to law creation, which has received considerable attention in American politics scholarship, what happens to legislation after its passage has received relatively less attention. Recent work on repeal (Ragusa, 2010; Ragusa and Birkhead, 2015, 2020; Berry et al., 2010; Thrower, 2017) offers a corrective.[1] Collectively, this work identifies a variety of factors that affect when policies are repealed such as the strength of the coalition that enacted the policy (Maltzman and Shipan, 2008) and shifts in the gridlock interval (Ragusa and Birkhead, 2015). In tandem, this work establish the relationship between repeal and the political environment, institutional features of the legislative environment, and bill level factors. This model contributes to this growing area of work by offering a novel justification for why a party would alter or replace a policy passed by the opposing party: signaling competence. Moreover, along with Delgado-Vega et al. (2023), this paper provides game theoretic analysis to a topic that has been studied empirically.

This model is also related to work on how politicians and parties signal competence. Much of this work focuses on platform choice before an election (Heidhues and Lagerlöf, 2003; Honryo, 2013; Bandyopadhyay et al., 2020; Frenkel, 2014), but other work considers actions by parties and legislators in Congress (Patty, 2016; Patty et al., 2019). In particular, my model is similar to Honryo (2013). In their model, candidates, who value policy quality and winning an election, commit to implement a specific policy if elected. Competent candidates learn the state before committing, so they are sometimes willing to choose the optimal policy for an ex-ante unlikely state, whereas incompetent candidates find such a platform costly. In any equilibrium, the probability a candidate wins the election after choosing an extreme policy is strictly higher than their probability of winning after selecting the moderate policy. My model utilizes a similar logic: a competent party is more likely to implement an extreme revision, so extreme revisions are a signal of competence.[2].

[1]There is also very interesting recent work on policy sabotage (Gieczewski and Li, 2022; Hirsch and Kastellec, 2022), but my model is less relevant to that work.

[2]Bandyopadhyay et al. (2020) also analyze a model with a similar logic, but their logic relies on the

However, there are differences between my model and theirs. In Honryo (2013), there is a stark difference between competent and incompetent candidates because incompetent candidates learn nothing about the state and competent candidates learn everything. In my model, both types of party learn about the state, and in fact both types may receive very similar quality information. Moreover, Honryo (2013) analyze discrete policy and state spaces, whereas I analyze continuous state and policy spaces. This, combined with the assumption that both types of party learn about the state, allows for both types of party to employ a richer set of actions in equilibrium.

Finally, in a broad sense, this model is related to models of career concerns. Prendergast and Stole (1996) analyze a similar informational environment—the state is normally distributed, an investor observes a signal equal to the state plus normal noise, and the more competent the investor, the smaller the variance of the distribution of the noise—but focus on how the agent responds to information over time rather than in a single period like my model. This introduces additional concerns that are not relevant to the model I study here. In a different career concerns model, Majumdar and Mukand (2004) study a dynaic model in which electoral concerns affect the incentives for policy experimentation. Similar to my model, they find that electoral concerns and the desire to signal competence may lead to inefficient policies.

3 Model

3.1 Setup

Consider a model with a voter and two parties r and l, who I refer to as the incumbent. At the start of the game, nature draws the state $\theta \sim \mathcal{N}(0,1)$, and the parties privately observe state-dependent noisy signals. In particular, r observes signal $s_r = \theta + \epsilon_r$ with $\epsilon_r \sim \mathcal{N}(0,1)$, and l observes signal $s_l = \theta + \epsilon_l$, where $\epsilon_l \sim \mathcal{N}(0,\sigma^2)$, $\sigma^2 \in \{\underline{\sigma}^2, \overline{\sigma}^2\}$, $\underline{\sigma}^2 < 1 < \overline{\sigma}^2$, and $\Pr(\sigma^2 = \overline{\sigma}^2) = q$. I refer to the incumbent as "competent" when $\sigma^2 = \underline{\sigma}^2$, and denote an incumbent of type σ^2 as l_{σ^2}.

After observing their signal, r implements policy $y_r = \frac{s_r}{2}$. Then, l decides whether to retain y_r ($y_l = y_r$) or to choose $y_l \neq y_r \in \mathbb{R}$. Finally, the voter decides whether reelect l ($e = l$) or to elect r ($e = r$).

Payoffs

presence of a profit-maximizing media firm

The incumbent is concerned with policy quality, the cost of revising the initial policy, and the value of winning reelection. These considerations are incorporated in the following utility function:

$$u_l = -(\theta - y_l)^2 - \mathbb{1}_{y_l \neq y_r} c + \mathbb{1} b_{e=l},$$

where $c > 0$ is the cost l incurs if they choose $y_l \neq y_r$ and $b \geq 0$ is the benefit l receives if they win reelection.

The voter's only concern is reelecting the more competent party, and they reelect the incumbent if

$$\mathbb{E}[\sigma^2 | y_l, y_r] \leq 1.$$

Equilibrium

Slightly abusing notation, a strategy for l, y_l, maps $\mathbb{R} \times \mathbb{R} \times \{\underline{\sigma}^2, \overline{\sigma}^2\}$ into a distribution over $\mathbb{R}$, and a strategy for the voter, e, maps $\mathbb{R} \times \mathbb{R}$ into a distribution over $\{l, r\}$. A Perfect Bayesian equilibrium (referred to as an equilibrium or PBE in the text) satisfies the following:

1. each player's strategy is sequentially rational given their beliefs and the other players' strategies,

2. and each player's beliefs satisfy Bayes' rule on the equilibrium path.

Preliminary Conditions

I make the following assumptions.

Assumption 1. $y_r = 0$.

Three distributions are relevant to analyzing this model: the distribution of the state given the initial policy, the distribution of the incumbent's signal given the initial policy, and the distribution of the mean of the incumbent's posterior given the initial policy. These distributions are symmetric around the initial policy and their variances do not depend on the initial policy, so it is without loss of generality to assume that $y_r = 0$.[3]

Assumption 2. *q, $\underline{\sigma}^2$, and $\overline{\sigma}^2$ satisfy $\mathbb{E}[\sigma^2] > 1$.*

When this assumption is satisfied, the voter prefers r ex-ante.

[3] To reduce notation, I suppress y_r when doing so doesn't result in confusion. For example, the voter's expectation is written as $\mathbb{E}[\sigma^2 | y_l]$ rather than $\mathbb{E}[\sigma^2 | y_l, y_r]$.

3.2 Discussion of the Model

Policy Revision

Once a policy is passed, there are multiple ways that it can be revised. For example, the policy can be repealed, which refers to removing text from a statutory volume (Ragusa and Birkhead, 2020). In some cases, repeal refers to make small changes to legislation. But in other cases, repeal refers to removing critical pieces or even the entire piece of legislation. Legislation can also be revised without without resorting to repeal. By passing amending laws, the initial policy may be strengthened or weakened (Adler and Wilkerson, 2013). This model encompasses a broad notion of revision that includes repeal, amendment, and outright replacement since Party l simply chooses a real number that is closer or further from the initial policy. This policy choice could either be an entirely new policy or the original policy with amendments. I abstract away from whether this change is an amendment or partial repeal or an entirely new piece of legislation.

Party Preferences

In the baseline model, I assume that Party l doesn't have partisan preferences over policy. Instead, the directly care about policy quality and indirectly care about how policy affects their ability to obtain reelection. I make this assumption because I want to isolate the informational incentives of revision. Below, I show that the voter rewards revision, and the desire for reelection pushes l to revise r's policy. Adding partisan preferences would only exacerbate this dynamic.

However, this assumption can also be motivated by considering settings where parties don't have divergent partisan preferences over policy. For example, foreign policy is an area where there has been some degree of partisan consensus on policy at different points(Tama, 2023; Hurst and Wroe, 2016). This model also applies to local politics where some issues lack a partisan structure (Burnett, 2019).

Party r's behavior

To focus attention on Party l's decision to revise or retain, I make the assumption that Party r's initial policy choice is mechanical: they always choose the mean of their posterior distribution. While this assumption might seem significant, I show in Section 6 that it is without loss of generality. If Party r is strategic, the equilibira are the same as when r is not strategic, except r's equilibrium strategy is to choose $y_r = \frac{s_r}{2}$.

Voter's Behaviour

I assume that the voter reelects the incumbent when l's expected variance is less than r's. But this assumption does not mean that the voter must value competence per se.

Instead, one can interpret the voter as caring about policy quality. Suppose there is unmodeled second policymaking period after the voter chooses whether to reelect l. In the Section 7, I show that if this second policymaking period has a reasonable structure, the voter reelects the incumbent when their expected variance is less than r's known variance. This is identical to the strategy used by the voter in the baseline model.

Information from Policy Quality

When the voter chooses whether to reelect the incumbent, the voter has not observed any information about the quality of l's policy. This assumption shuts down one pathway through which the voter might learn about l's competence. Once a policy is passed, it takes time for it to be implemented. During this period, voters may be unsure of whether the policy is effective or not . As a result, they can only use the decision of whether to revise to learn about the party's competence. In future versions of this paper, I plan to relax this assumption.

4 Policymaking Without Electoral Concerns

Before analyzing the full baseline model, it is instructive to consider the case where l doesn't have an electoral incentive or a cost to revise the policy. In this setting, they don't consider the information conveyed by their decision to change the policy, nor do they pay a cost to do so. They simply observe their private signal and change the policy to the mean of their posterior distribution. I refer to this strategy as Party l's *simple revision strategy*, and denote it as follows:

$$\tilde{y}_l(s_l) := \mathbb{E}[\theta | s_l].$$

Although l is not concerned with winning reelection, the voter still learns about their competence when they observe l's policy choice. Define the following,

$$G(y_l) := \frac{q\overline{\sigma}^2 \frac{1}{\sqrt{2\pi}\sqrt{\frac{\frac{1}{2}+\overline{\sigma}^2}{(2\overline{\sigma}^2+1)^2}}} e^{-\frac{y_l^2(2\overline{\sigma}^2+1)^2}{2(\frac{1}{2}+\overline{\sigma}^2)}} + (1-q)\underline{\sigma}^2 \frac{1}{\sqrt{2\pi}\sqrt{\frac{\frac{1}{2}+\underline{\sigma}^2}{(2\underline{\sigma}^2+1)^2}}} e^{-\frac{y_l^2(2\underline{\sigma}^2+1)^2}{2(\frac{1}{2}+\underline{\sigma}^2)}}}{q \frac{1}{\sqrt{2\pi}\sqrt{\frac{\frac{1}{2}+\overline{\sigma}^2}{(2\overline{\sigma}^2+1)^2}}} e^{-\frac{y_l^2(2\overline{\sigma}^2+1)^2}{2(\frac{1}{2}+\overline{\sigma}^2)}} + (1-q) \frac{1}{\sqrt{2\pi}\sqrt{\frac{\frac{1}{2}+\underline{\sigma}^2}{(2\underline{\sigma}^2+1)^2}}} e^{-\frac{y_l^2(2\underline{\sigma}^2+1)^2}{2(\frac{1}{2}+\underline{\sigma}^2)}}},$$

and

$$\hat{y} := \max\left\{\sqrt{\frac{\ln(\Sigma))}{2(\underline{\sigma}^2 - \overline{\sigma}^2)}}, 0\right\},$$

where $G(y_l)$ is l's expected competence given both types of l implement y_l using the simple revision strategy and

$$\Sigma := \frac{1-\underline{\sigma}^2}{\overline{\sigma}^1 - 1}\frac{1-q}{q}\frac{\sqrt{\frac{\frac{1}{2}+\overline{\sigma}^2}{(2\overline{\sigma}^2+1)^2}}}{\sqrt{\frac{\frac{1}{2}+\underline{\sigma}^2}{(2\underline{\sigma}^2+1)^2}}}.$$

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Lemma 1 establishes the monotonic relationship between the "extremeness" of policies implemented by the simple revision strategy and l's expected competence.

Lemma 1. *For any $\underline{\sigma}^2$ and $\overline{\sigma}^2$,*

(a) $G(y_l)$ is decreasing in $|y_l|$,

(b) and $\lim_{|y_l|\to\infty} G(y_l) = \underline{\sigma}^2$.

The key intuition behind this result comes from thinking about the distribution of y_l given y_r for Party l_{σ^2}. The variance of this distribution is *decreasing* in the variance of l_{σ^2}'s error term. This is because l_{σ^2} puts more weight on y_r when forming their posterior the larger the variance of their error term is. As a result, when the voter observes l make a significant change to the policy, they think it is unlikely that l is incompetent. That is, *drastic revisions convey competence.* This, along with Assumption 2, leads to the following corollary.

Corollary 1. *For any $\underline{\sigma}^2$ and $\overline{\sigma}^2$, there exists a unique $\hat{y} > 0$ such that if y_l is implemented by both types of l using the simple revision strategy and $|y_l| \geq \hat{y}$, $G(y_l) \leq 1$, and if $|y_l| < \hat{y}$, $G(y_l) > 1$.*

This corollary states that there is a unique cutoff such that for any policy that is implemented by both types utilizing the simple revision strategy, if the policy is more extreme than the cutoff, the voter will reelect l, and if the policy is less extreme than the cutoff, the voter will elect r.

Lemma 1 and its corollary are depicted in Figure 1, which plots l's expected competence as a function of y_l if y_l is implemented by both types using the simple revision strategy. As a result, l's expected variance is greater than one for y_l. On the other hand, the blue curve is a case where $\Sigma \geq 1$. As a result, l's expected competence is less than one for all policies. This case is ruled out by Assumption 2, which ensures $\hat{y}$ is strictly positive.

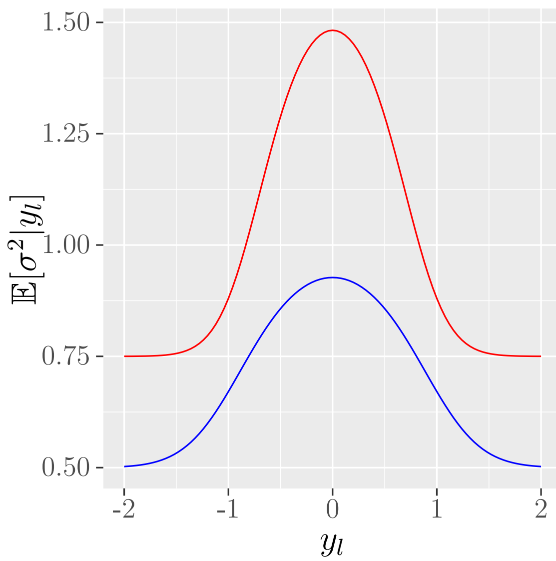

Figure 1: Expected competence when y_l is implemented via simple revision strategy. The red curve is when $\sigma^2 \in \{\frac{3}{4}, 2\}$ and the blue curve is when $\sigma^2 \in \{\frac{1}{2}, \frac{5}{4}\}$. In both cases $q = \frac{1}{2}$.

To continue to build intuition, next consider a benchmark where there are no electoral concerns but there is a cost to change the policy. In this case, l_{σ^2} retains the initial policy when they observe a moderate signal and uses the simple revision strategy when they observe an extreme signal. In particular, l_{σ^2} retains if

$$|s_l| < (2\sigma^2 + 1)\sqrt{c}.$$

In this case, l's implementation decision leads to two types of beliefs. When l revises the policy, they use the simple revision strategy so l's expected competence is described by Lemma 1. But when l retains the initial policy, the voter knows l observed a moderate signal. Lemma 2 describes the effect of retaining the initial policy on l's expected competence.

Lemma 2. *For any $\underline{\sigma}^2$, $\overline{\sigma}^2$, and $x > 0$, if both types of l retain y_l when $|s_l| < (2\sigma^2 + 1)x$,*

$$\mathbb{E}[\sigma^2|y_l = y_r] > 1$$

Retaining the initial policy has the opposite effect on l's expected competence than a drastic revision: *retaining conveys incompetence*. And when $\Sigma < 1$, not only does retaining convey incompetence, but it always leads to r winning the election.

The following proposition characterizes the equilibrium of the game without electoral concerns.

Proposition 1. *In the unique equilibrium when $b = 0$, for l_{σ^2},*

$$y_l^* = \begin{cases} y_r & \text{if } |s_l| < (2\sigma^2+1)\sqrt{c} \\ \frac{s_l}{2\sigma^2+1} & \text{if } |s_l| \geq (2\sigma^2+1)\sqrt{c}, \end{cases}$$

and

$$e^*(y_l) = \begin{cases} r \text{ if } y_l = y_r \\ r \text{ if } y_l \in [\sqrt{c}, \hat{y}) \\ l \text{ if } y_l \geq \max\{\sqrt{c}, \hat{y}\}. \end{cases}$$

In the equilibrium described by Proposition 1, the voter reelects l when they revise to an extreme policy, and they elect r when l retains.[4] Whether l is reelected every time they revise depends on the relationship between $\hat{y}$ and c. When c is relatively small ($\hat{y} > \sqrt{c}$), l revises and implements moderate policies that are not extreme enough to signal sufficient competence for the voter to reelect them. And when c is relatively large ($\hat{y} \leq \sqrt{c}$), the most moderate policy l implements is extreme enough that the voter reelects them when it is implemented.

Proposition 1 also illustrates that the support of the distribution of policies enacted by l_{σ^2} is the same, regardless of their type. This is a result of the bias-variance decomposition of Party l's quadratic-loss utility function. For a signal s_l, the variance portion of l_{σ^2}'s expected utility is the same whether they retain the policy or not. So l_{σ^2} changes the policy when

$$\left| \frac{s_l}{2\sigma^2+1} \right| \geq \sqrt{c}. \tag{1}$$

The LHS of 1 is equivalent to the mean of l_{σ^2}'s posterior distribution given s_l, which is the policy they implement if they don't retain. Hence, the support of the distribution of

[4] This equilibrium is robust to any off the equilibrium path beliefs in response to $y_l \in (0, \sqrt{c})$ since l does not care about reelection.

policies enacted by l_{σ^2} is

$$y_l \in \{(-\infty, -\sqrt{c}] \cup 0 \cup [\sqrt{c}, \infty)\},$$

regardless of type. The difference is the incompetent l needs to observe a more extreme signal to implement each policy.

5 Cutoff Equilibria

In this section, I analyze the full baseline model. To do so, I focus on cutoff equilibria where the voter elects l when $|y_l|$ is either below or above a cutoff. Proposition 2 formalizes an implication of Lemma 1 that simplifies the analysis of voter-cutoff equilibria.

Proposition 2. *No cutoff equilibria exist where the voter elects r when $|y_l| > k \geq 0$ and elects l otherwise.*

This is a result of two forces. First, regardless of the cost of policymaking and the presence of electoral concerns, if l_{σ^2} observes a significantly extreme signal, they will implement the mean of their posterior. Second, when both types of l utilize the simple revision strategy, there is always a cutoff such that when the implemented policy is more extreme than the cutoff, the voter reelects l. Together, this means there are always extreme policies that both types of l will implement using the simple revision strategy, and those policies will be extreme enough that the voter will want to reelect l.

In light of Proposition 2, I focus on the other type of voter-cutoff equilibria: equilibria where the voter elects l when $|y_l| \geq m \geq 0$. Since this is the only type of voter-cutoff equilibrium that may exist, I refer to equilibria with this form as *cutoff equilibria*. The following lemma illustrates that l uses three types of strategies in any cutoff equilibrium.

Lemma 3. *Fix s_l. In any cutoff equilibrium, Party l uses one of the following strategies:*

(a) Retain: $y_l(s_l) = y_r$

(b) Simple Revision: $y_l(s_l) = \tilde{y}(s_l) = \mathbb{E}[\theta|s_l]$

(c) Bunching at the Cutoff:

$$y_l(s_l) = \begin{cases} m & \text{if } \frac{s_l}{2\sigma^2+1} > 0 \\ -m & \text{if } \frac{s_l}{2\sigma^2+1} < 0 \end{cases}$$

The following proposition describes an equilibrium when the benefit of reelection is small relative to the cost of changing the initial policy.

Proposition 3. *If $c > b$ and $\hat{y} \leq \sqrt{c-b}$, a continuum of cutoff equilibria exist where $m^* \in (0, \sqrt{c-b}]$, and for l_{σ^2},*

$$y_l^* = \begin{cases} y_r & \text{if } |s_l| < (2\sigma^2+1)\sqrt{c-b} \\ \frac{s_l}{2\sigma^2+1} & \text{if } |s_l| \geq (2\sigma^2+1)\sqrt{c-b}. \end{cases}$$

Proposition 3 demonstrates that if an equilibrium of the benchmark without electoral concerns exists where l is reelected any time they change the policy, then a cutoff equilibrium exists as long as the benefit of reelection is sufficiently small. Moreover, the cutoff equilibrium looks very similar to the benchmark. When l_{σ^2} observes a moderate signal, they retain, and when they observe an extreme signal, they use the simple revision strategy.

As hypothesized, the addition of reelection concerns pushes both types of l to revise the policy more often than they do without electoral concerns. However, when the value of reelection gets large, this poses a problem. As the electoral incentive increases, both types of l are willing to make increasingly moderate revisions. This is the crux of the issue. Once $\hat{y} > \sqrt{c-b}$, l is willing to make moderate enough revisions that the voter doesn't want to elect l when they observe them. As a result, when b is sufficiently large, m^* cannot be less than $\sqrt{c-b}$.[5]. The next proposition examines what happens when this type of issue occurs.

Proposition 4. *Cutoff equilibria exist where*

(a) $\hat{y} < m^*$, $m^* \in [\{\sqrt{\max\{b-c, c-b\}}, \sqrt{c}+\sqrt{b}]$, and for l_{σ^2},

$$y_l^* = \begin{cases} y_r & \text{if } |s_l| < (2\sigma^2+1)\frac{m^{*2}+c-R}{2m^*} \\ m^* & \text{if } s_l \in ((2\sigma^2+1)\frac{m^{*2}+c-R}{2m^*}, (2\sigma^2+1)m^*) \\ -m^* & \text{if } s_l \in (-(2\sigma^2+1)m^*, -(2\sigma^2+1)\frac{m^{*2}+c-b}{2m^*}) \\ \frac{s_l}{2\sigma^2+1} & \text{if } |s_l| \geq (2\underline{\sigma}^2+1)m^*. \end{cases}$$

[5] This is also why existence of this equilibrium depends requires the equilibrium without electoral concerns to be one where Party l is reelected whenever they revise the initial policy. If $\hat{y} > \sqrt{c}$, then $\hat{y} > \sqrt{c-b}$

(b) $\hat{y} \in (m^* - \sqrt{b}, m^*)$*,* $m^* \geq \sqrt{c} + \sqrt{b}$*, and for* l_{σ^2}*,*

$$y_l^* \begin{cases} y_r & \text{if } |s_l| < (2\sigma^2+1)\sqrt{c} \\ \frac{s_l}{2\sigma^2+1} & \text{if } |s_l| \in ((2\sigma^2+1)\sqrt{c}, (2\sigma^2+1)(m^* - \sqrt{b})) \\ m^* & \text{if } s_l \in ((2\sigma^2+1)(m^* - \sqrt{b}), (2\sigma^2+1)m^*) \\ -m^* & \text{if } s_l \in (-(2\sigma^2+1)m^*, -(2\sigma^2+1)(m^* - \sqrt{b})) \\ \frac{s_l}{2\sigma^2+1} & \text{if } |s_l| \geq (2\sigma^2+1)m^*. \end{cases}$$

The equilibria described in Proposition 4 arise when the electoral incentive is too large for the equilibrium described in Proposition 3 to exist.[6] When $\hat{y} > \sqrt{c - R}$, there are moderate policies that both types of l would implement via their simple revision strategy if they could do so and obtain reelection, but when the voter observes such policies, they prefer to elect r. As a result, the voter counteracts the effect of the relatively larger benefit of reelection by choosing a more extreme cutoff. As a result, l can only utilize their simple revision strategy to obtain reelection after observing an extreme signal.

However, when the electoral incentive is relatively large and the voter chooses a relatively extreme cutoff, there are signals for which l_{σ^2} is willing to bunch at the cutoff to obtain reelection. Specifically, when l_{σ^2} observes a moderate signal—extreme enough that they don't want to retain but not extreme enough that they can implement the mean of their posterior distribution and be reelected—they are willing to forgo policy quality to obtain reelection by making the most moderate revision that leads to reelection, *even though that revision isn't the optimal policy.*

Of course, for this to work in equilibrium, the voter needs to believe that l is competent when they observe bunching. To ensure this is the case, the voter needs to choose an even more stringent cutoff. In doing so, they ensure l_{σ^2} is only willing to bunch when they would implement an extreme policy via simple revision strategy if given the chance.

The primary difference between the two equilibria described in Proposition 4 is that in the second equilibrium, the voter uses an especially stringent cutoff. As a result, there are signals that are extreme enough that l_{σ^2} doesn't want to maintain the initial policy yet are moderate enough that bunching at the cutoff would require implementing too inferior of a policy to make reelection worth it. As a result, l_{σ^2} revises the initial policy to the mean of their posterior even though it means they won't be reelected.

The next proposition rules out the existence of other cutoff equilibria.

[6] This equilibrium also arises when the equilibrium described in Proposition 3 does not exist because the cost of policy change is too small relative to $\hat{y}$.

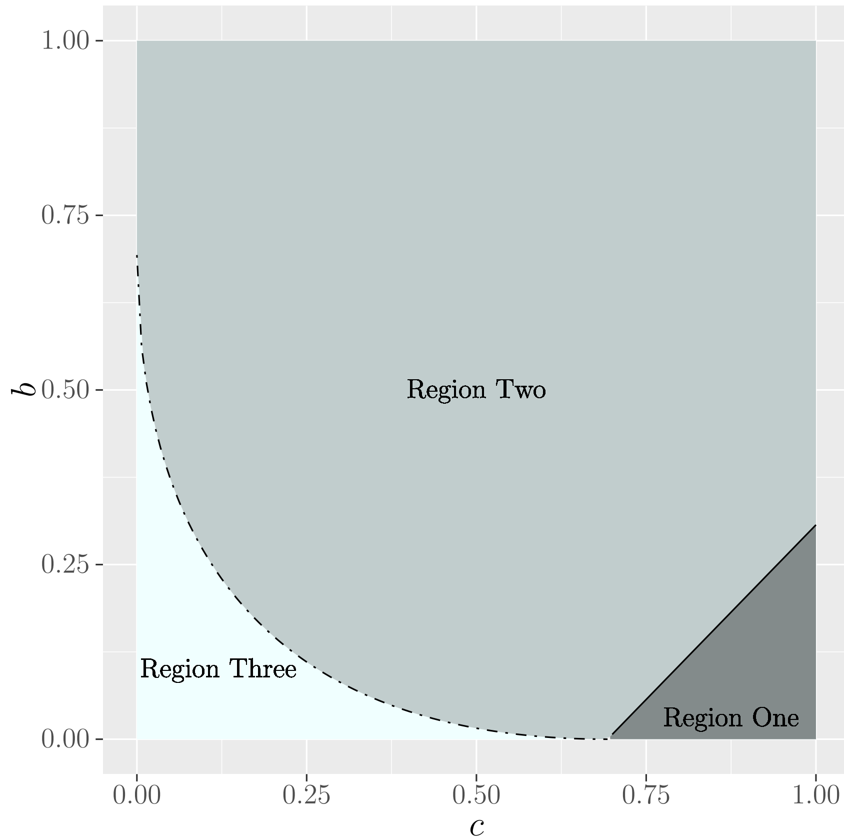

Figure 2: Regions of cutoff equilibria when $q = \frac{1}{2}$ and $\sigma^2 \in \{\frac{3}{4}, 2\}$. The solid line plots $\sqrt{c-b} = \hat{\gamma}$ and the dashed line plots $\sqrt{c} + \sqrt{b} = \hat{\gamma}$. Region One: Eqlm. (a) from Proposition 4 and the eqlm. from Proposition 3; Region Two: both eqla. from Proposition 4; Region Three: eqlm (b) from Proposition 4

Proposition 5. *Any cutoff equilibrium is of the types described in Propositions 3 and 4.*

This proposition rules out cutoff equilibria where $m^* \in [0, \sqrt{b-c}]$. For equilibria with such a cutoff to exist, the voter would need to be willing to always elect l. But assumption 2 rules this case out.

Figure 2 summarizes the different types of cutoff equilibria that exist. It also illustrates that multiple equilibria may exist simultaneously.

Corollary 2. *Fix $q, c, \overline{\sigma}^2$, and $\underline{\sigma}^2$. In any cutoff equilibrium where $b > 0$, the probability l revises the initial policy is weakly greater than the probability l revises the initial policy in the equilibrium with no electoral incentives.*

The implication of this corollary is that the value of reelection leads to more policy revision. This speaks to the concerns of political thinkers like James Madison, who worried that excessive policy repeal would ”poison the blessings of liberty” and Alexis de Tocqueville, who feared that excessive policy instability was a danger in the United States.

This result also resonates with empirical findings that individual electoral incentives push legislators to allocate effort toward measures of observable productivity (Fouirnaies and Hall (2022)).

Corollary 3. *Fix $q, c, \overline{\sigma}^2, \underline{\sigma}^2$, and s_l. In any equilibrium where $b > 0$, if l_{σ^2} revises the initial policy, they do so to a weakly more extreme policy than they do when $b = 0$.*

In the equilibrium when $b = 0$, l_{σ^2} always uses the simple revision strategy when the replace the initial policy. With the addition of reelection concerns, l_{σ^2} uses the simple revision strategy when the replace the initial policy, but they also bunch at the cutoff. When they do this, the resulting policy is more extreme than the resulting polict would be without reelection concerns because doing so leads to their reelection.

6 Strategic Party r

In the baseline version of the model, party r is assumed to be non-strategic; they observe their signal and mechanically implement the mean of their posterior distribution. Suppose instead that r is strategic and values policy quality and future electoral success. These concerns are represented by the following utility function:

$$u_R = -(\theta - y_l)^2 - (\theta - y_l)^2 + \mathbb{1}R_{e=A},$$

where the first portion is the utility they get from the quality of the policy implemented today and the second portion is the utility they get from the quality of the policy implemented by l in the future.

The following proposition establishes that the assumption about r being non-strategic is innocuous.

Proposition 6. *Fix a cutoff equilibrium. The strategy profile where Party r chooses $y_r = \frac{s_r}{2}$ and the voter and l employ the equilibrium strategies in that equilibrium constitutes a PBE.*

Given the equilibrium strategies of the voter and l, deviating from setting the policy equal to the mean of their posterior distribution has two effects on r's expected utility. First, it decreases the probability that l retains the initial policy, which means it decreases the probability that r is elected and receives the payoff for holding office. Second, it decreases the quality of the policy today and the quality of the policy tomorrow—whether the initial policy is retained or changed. Furthermore, Proposition 6 extends to the cases where r either only cares about policy, only cares about future electoral success, or only cares about policy quality today or policy quality tomorrow.

7 Voter's Preference for Revision

I make two assumptions about the voter in the baseline model. First, I assume that the voter elected Party l after Party r implemented their policy. Second, I assume the voter reelects l if l's expected competence exceeds Party r's. In this section, I relax these assumptions. To do so, I consider the following extension of the baseline model.

1. Nature draws a state, θ, the parties privately observe signals $s_{i,\theta}$ as in the baseline model, and Party r implements $y_r = \frac{s_{r,\theta}}{2}$.
2. Policymaking Period One:
   (a) The voter elects Party $e_1 \in \{l, r\}$.
   (b) The winner of the election chooses whether to revise or retain y_r.
3. Nature draws a state, $\omega \sim \mathcal{N}(0, 1)$, and the parties privately observe signals $s_{i,\omega} = \omega + \epsilon_i$.
4. Policymaking Period Two:
   (a) The voter elects Party $e_2 \in \{l, r\}$.
   (b) The winner of the election chooses a policy $z_i \in \mathbb{R}$.

Let $\tilde{y}$ and $\tilde{z}$ be the policies implemented in policymaking period. Then party i has the following utility function:

$$u_i = -(\tilde{y} - \theta)^2 - (\tilde{z} - \omega)^2 - \mathbb{1}_{\hat{y} \neq y_r \& e_1 = i} c + \mathbb{1}_{e_1 = i} b,$$

and the voter has a quadratic loss utility function over the policies.

This game is solved by backward induction. In the final period, incumbent i will choose $\tilde{z} = \mathbb{E}[\omega | s_{i,\omega}]$.

Lemma 4. *The voter elects Party l if and only if $\mathbb{E}[\sigma^2 | \hat{y}] \geq 1$.*

Lemma 4 shows that the cutoff that the voter uses in the baseline model is consistent with a second policymkaing period.

If Party l holds office in the first policymaking period, then the equilibrium in the subgame is one of the equilibria from the baseline game. And if Party r holds office, the voter will reelect them for certain because their competence is known, the voter will not learn anything about Party l's competence, and Assumption 2 ensures the voter prefers Party r to Party l ex-ante. Moreover, since Party r observes no additional information, they will retain the initial policy.

Proposition 7. *Fix the equilibrium of the baseline game where $m^* < \sqrt{c-b}$. Then there exists an equilibrium of this extension of the baseline game where*

- *The voter chooses $e_1 = l$ in the first policymaking period;*
- *Party r*
  - *chooses $\tilde{y} = \mathbb{E}[\theta | s_{r,\theta}]$,*
  - *and chooses $\tilde{z} = \mathbb{E}[\omega | s_{r,\omega}]$;*

and the equilibrium of the subgame starting in the first policymaking period where the voter elects Party l is the equilibrium of the baseline game.

The implication of this proposition is twofold. First, it shows that (at least some of) the results in the baseline model are robust to a richer an environment where the voter is concerned about more than just the Party l's expected competence. Second, it shows that the voter has a preference for Party l's party revision. This preference arises for two reasons. First, by electing Party l, the voter obtains additional information about the quality of the initial policy. Either l retains the policy, which means the policy was relatively good, or l replaces the policy, which means it was relatively bad–but the policy l revises to is relatively good. Second, by electing l, the voter learns something about l's competence. If l retains the initial policy or revises to a relatively moderate policy, the voter learns Party l is likely not competent. This leads the voter to return Party r to office. And if l revises to an extreme policy, the voter learns that l is likely competent. In this case, the voter reelects l. My intention is to strengthen this result by considering the other equilibria of the baseline model.

8 Conclusion

I presented a simple formal model that highlights how revising a policy passed by the opposing party signals competence. In equilibrium, drastic revisions convey competence, while retaining the original policy conveys incompetence. As a result, the voter rewards revision through reelection. This means that the reelection incentive motivates policy revision. Moreover, at least in some cases, the voter seeks out this revision by electing a party they know will revise to win reelection.

I am at an early stage of this project, and I am in the process of working on natural extensions of the baseline model. One extension is to allow the voter to learn about policy quality by observing the state of the world. Currently, I assume that the effects of Party l's policy are not realized until after the election, but policy quality may be revealed quickly. This introduces a new source of information for the voter. Preliminary work on this yields two results. First, even when the voter learns the state before voting, they will never reelect l when they retain if l uses a similar strategy that they use in the baseline. Second, when both types of Party l use the simple revision strategy, the probability of winning reelection is increasing the more drastic the revision. As a result, l may be willing to implement a worse policy since it may yield a higher payoff. Solving this extension will require considering the implication of these results.

Another extension I am working on is allowing for uncertainty about Party r's competence. In the current model, r's competence is known. But if their competence is unknown, l may have an incentive to retain the initial policy–especially if the voter may learn the state and thus learn that r's initial policy was far from the state.

Finally, I am interested in analyzing an extension where there is another opportunity for repeal after the election. One topic of study in the literature on repeal is when policies are most likely to be repealed. By introducing a dynamic component to the model, I can speak to this topic.

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9 Appendix: Proofs

9.1 Proof of Lemma 1

Proof. If both types of l utilize the simple revision strategy for all s_l, then the voter believes that for each l_{σ^2},

$$y_l|y_r \sim \mathcal{N}\bigg(0, \frac{\frac{1}{2}+\sigma^2}{(2\sigma^2+1)^2}\bigg).$$

Then, if the voter observes y_l, which is implemented via the simple revision strategy by both types of l, l's expected competence is given by

$$G(y_l) = \mathbb{E}[\sigma^2|y_l = y_l] = \frac{q\overline{\sigma}^2 \frac{1}{\sqrt{2\pi}\sqrt{\frac{\frac{1}{2}+\overline{\sigma}^2}{(2\overline{\sigma}^2+1)^2}}} e^{-\frac{y_l^2(2\overline{\sigma}^2+1)^2}{2(\frac{1}{2}+\overline{\sigma}^2)}} + (1-q)\underline{\sigma}^2 \frac{1}{\sqrt{2\pi}\sqrt{\frac{\frac{1}{2}+\underline{\sigma}^2}{(2\underline{\sigma}^2+1)^2}}} e^{-\frac{y_l^2(2\underline{\sigma}^2+1)^2}{2(\frac{1}{2}+\underline{\sigma}^2)}}}{q \frac{1}{\sqrt{2\pi}\sqrt{\frac{\frac{1}{2}+\overline{\sigma}^2}{(2\overline{\sigma}^2+1)^2}}} e^{-\frac{y_l^2(2\overline{\sigma}^2+1)^2}{2(\frac{1}{2}+\overline{\sigma}^2)}} + (1-q) \frac{1}{\sqrt{2\pi}\sqrt{\frac{\frac{1}{2}+\underline{\sigma}^2}{(2\underline{\sigma}^2+1)^2}}} e^{-\frac{y_l^2(2\underline{\sigma}^2+1)^2}{2(\frac{1}{2}+\underline{\sigma}^2)}}}. \tag{2}$$

(a) Differentiating (2) with respect to y_l,

$$\frac{\partial \mathbb{E}[\sigma^2|y_l = y_l]}{\partial y_l} = -\frac{4e^{2(1+\overline{\sigma}^2+\underline{\sigma}^2)y_l^2}(1-q)q\sqrt{\frac{1}{1+2\overline{\sigma}^2}}(\overline{\sigma}^2-\underline{\sigma}^2)^2\sqrt{\frac{1}{1+2\underline{\sigma}^2}}y_l}{(e^{2\overline{\sigma}^2y_l^2}\sqrt{\frac{1}{1+2\overline{\sigma}^2}}(q-1) - e^{2\underline{\sigma}^2y_l^2}q\sqrt{\frac{1}{1+2\underline{\sigma}^2}})^2}.$$

The derivative is positive when $y_l < 0$ and negative when $y_l > 0$. Therefore, $G(y_l)$ is monotonically decreasing in $|y_l|$.

(b) This follows from taking the limit of $G(y_l)$ as $y_l \to \infty$ and as $y_l \to -\infty$. In both cases, $G(y_l) \to \underline{\sigma}^2$.

(c) If both types of use the simple revision strategy for all s_l the voter will elect l following policy y_l when (2) ≤ 1. Rearranging this condition, the voter will reelect l when

$$y_l^2 \geq \frac{\ln(\Sigma)}{2(\underline{\sigma}^2 - \overline{\sigma}^2)}, \tag{3}$$

where

$$\Sigma := \frac{1-\underline{\sigma}^2}{\overline{\sigma}^1 - 1}\frac{1-q}{q}\frac{\sqrt{\frac{\frac{1}{2}+\overline{\sigma}^2}{(2\underline{\sigma}^2+1)^2}}}{\sqrt{\frac{\frac{1}{2}+\underline{\sigma}^2}{(2\underline{\sigma}^2+1)^2}}}$$

The LHS of (3) is always positive, while the RHS is positive when $\Sigma < 1$ (which implies that both the numerator and the denominator of the RHS are negative). Therefore, (3) is satisfied for any

$$|y_l| \geq \hat{y} := \max\left\{\sqrt{\frac{\ln(\Sigma)}{2(\underline{\sigma}^2 - \overline{\sigma}^2)}}, 0\right\}.$$

Moreover, $\hat{y} = 0$ when $\Sigma \geq 1$, and is strictly positive otherwise. Finally, by Assumption 2, $\frac{1-q}{q}\frac{1-\underline{\sigma}^2}{\overline{\sigma}^2-1} < 1$. Then, because $\frac{\sqrt{\frac{\frac{1}{2}+\overline{\sigma}^2}{(2\underline{\sigma}^2+1)^2}}}{\sqrt{\frac{\frac{1}{2}+\underline{\sigma}^2}{(2\underline{\sigma}^2+1)^2}}} < 1$ for any $\underline{\sigma}^2 < \overline{\sigma}^2$, Assumption 2 implies that $\hat{y} > 0$.

■

9.2 Proof of Lemma 2

Proof. Note that given y_l, for each l_{σ^2},

$$s_l|y_l \sim \mathcal{N}\left(0, \frac{1}{2} + \sigma^2\right)$$

If both types of l retain y_l when $s_l < (2\sigma^2 + 1)x$, then

$$\mathbb{E}[\sigma^2|y_l = y_r] = \frac{q\overline{\sigma}^2\frac{1}{\sqrt{2\pi}\sqrt{\frac{1}{2}+\overline{\sigma}^2}}\int_0^{(2\overline{\sigma}^2+1)x} e^{-\frac{t^2}{2(\frac{1}{2}+\overline{\sigma}^2)}}dt + (1-q)\underline{\sigma}^2\frac{1}{\sqrt{2\pi}\sqrt{\frac{1}{2}+\underline{\sigma}^2}}\int_0^{(2\underline{\sigma}^2+1)x} e^{-\frac{t^2}{2(\frac{1}{2}+\underline{\sigma}^2)}}dt}{q\frac{1}{\sqrt{2\pi}\sqrt{\frac{1}{2}+\overline{\sigma}^2}}\int_0^{(2\overline{\sigma}^2+1)x} e^{-\frac{t^2}{2(\frac{1}{2}+\overline{\sigma}^2)}}dt + (1-q)\frac{1}{\sqrt{2\pi}\sqrt{\frac{1}{2}+\underline{\sigma}^2}}\int_0^{(2\underline{\sigma}^2+1)x} e^{-\frac{t^2}{2(\frac{1}{2}+\underline{\sigma}^2)}}dt}$$

Then, $\mathbb{E}[\sigma^2|y_l = y_r] > 1$, when

$$\frac{\frac{1}{\sqrt{2\pi}\sqrt{\frac{1}{2}+\overline{\sigma}^2}}\int_0^{(2\overline{\sigma}^2+1)x} e^{-\frac{t^2}{2(\frac{1}{2}+\overline{\sigma}^2)}}dt}{\frac{1}{\sqrt{2\pi}\sqrt{\frac{1}{2}+\underline{\sigma}^2}}\int_0^{(2\underline{\sigma}^2+1)x} e^{-\frac{t^2}{2(\frac{1}{2}+\underline{\sigma}^2)}}dt} > \frac{1-\underline{\sigma}^2}{\overline{\sigma}^1 - 1}\frac{1-q}{q}. \tag{4}$$

The CDFs on the LHS of 4 can be converted to standard normal distributions using Z-scores. Therefore, (4) is equivalent to

$$\frac{\frac{1}{\sqrt{2\pi}}\int_0^{\frac{(2\overline{\sigma}^2+1)x}{\sqrt{\frac{1}{2}+\overline{\sigma}^2}}} e^{-\frac{t^2}{2}}dt}{\frac{1}{\sqrt{2\pi}}\int_0^{\frac{(2\underline{\sigma}^2+1)x}{\sqrt{\frac{1}{2}+\underline{\sigma}^2}}} e^{-\frac{t^2}{2}}dt} > \frac{1-\underline{\sigma}^2}{\overline{\sigma}^1 - 1}\frac{1-q}{q}. \tag{5}$$

The expression $\frac{(2\sigma^2+1)x}{\sqrt{\frac{1}{2}+\sigma^2}}$ is increasing in σ^2:

$$\frac{\partial}{\partial\sigma^2}\frac{(2\sigma^2+1)x}{\sqrt{\frac{1}{2}+\sigma^2}} = \frac{(2\sigma^2+1)x}{2(\sigma^2+\frac{1}{2})^{\frac{3}{2}}} > 0$$

for $x > 0$. Therefore, the LHS of 5 is larger than one for any $x > 0$. Moreover, by Assumption 2, $\frac{1-\sigma^2}{\bar{\sigma}^1-1}\frac{1-q}{q} < 1$. Hence, the voter will elect r.
■

9.3 Proof of Proposition 1

Proof. The best responses for both tyes of l are described in the text. Then, fix l's strategy. By Lemma 1, if $|y_l| \in [\sqrt{c}, \infty)$ and $|y_l| \geq \hat{y}$, the voter will elect l, and if $|y_l| \in [\sqrt{c}, \infty)$ and $|y_l| < \hat{y}$, the voter will elect r. Finally, by Lemma 2, the voter elects r when l retains y_l. ■

9.4 Proof of Proposition 2

Proof. Suppose not. Then there exists a $k \geq 0$ such that when $y_l \leq k$, the voter elects l and when $y_l > k$, the voter elects r.

Suppose first that $k > 0$. Then suppose that l observes s_l such that $\left|\frac{s_l}{2\sigma^2+1}\right| > k$. l will engage in informed repeal when

$$\begin{aligned}-\frac{\sigma^2}{2\sigma^2+1} - c \geq& -\frac{\sigma^2}{2\sigma^2+1} - \frac{s_l^2}{(2\sigma^2+1)^2} + b\\ \Leftrightarrow |s_l| \geq& (2\sigma^2+1)\sqrt{b+c}.\end{aligned}$$

Therefore, when $y_l \geq \max\{\hat{y}, \sqrt{b+c}\}$, l engages in informed repeal and the voter believes $\mathbb{E}[\sigma^2|y_l] \leq 1$, and hence elects l. This is a contradiction.

Now suppose $k = 0$. l will engage in informed repeal when

$$\begin{aligned}-\frac{\sigma^2}{2\sigma^2+1} - c \geq& -\frac{\sigma^2}{2\sigma^2+1} - \frac{s_l^2}{(s\sigma^2+1)^2}\\ \Leftrightarrow |s_l| \geq& (2\sigma^2+1)\sqrt{c}.\end{aligned}$$

Therefore, when $y_l \geq \max\{\hat{y}, \sqrt{c}\}$, l engages in informed repeal and the voter believes $\mathbb{E}[\sigma^2|y_l] \leq 1$, and hence elects l. This is a contradiction.
■

9.5 Proof of Lemma 3

Proof. Fix $m \geq 0$. l_{σ^2} has three possible strategies:

(a) Retain $y_l = y_l$

(b) Change the policy to the mean of their posterior $y_l = \frac{s_l}{2\sigma^2+1}$

(b) Change the policy to a policy that is not the mean of their posterior $y_l \neq \frac{s_l}{2\sigma^2+1}$.

Now suppose that l_{σ^2} observes a signal that is sufficiently extreme that they can implement the mean of their posterior distribution and win reelection. In this case, they will either implement the mean of their posterior or retain the initial policy since any other strategy will yield a lower expected utility since changing to any other policy at least lowers the policy payoff while incurring the cost to change policy. Then, l_{σ^2} implements the mean of their posterior as long as

$$-\frac{\sigma^2}{2\sigma^2+1} - c > -\left(\frac{s_l}{2\sigma^2+1}\right)^2 - \frac{\sigma^2}{2\sigma^2+1}$$
$$\Leftrightarrow |s_l| > (2\sigma^a + 1)\sqrt{c},$$

and retains otherwise.

Now suppose that l_{σ^2} observes a signal that is sufficiently moderate that when they implement the mean of their posterior distribution and they lose reelection. Then l will retain the initial policy, change to the mean of their posterior distribution, or change to y_l equal to the closest cutoff that obtains reelection. Any other policy will lead to a lower policy payoff than changing to the mean of the posterior or m. Comparing each of these strategies, l_{σ^2} will change the policy the mean of their posterior when

$$|s_l| \in ((2\sigma^2+1)\sqrt{c}, (2\sigma^2+1)(t-\sqrt{r})),$$

will retain the initial policy when

$$|s_l| < \min\left\{(2\sigma^2+1)\frac{m^2+c-R}{2m}, (2\sigma^2+1)\sqrt{c}\right\},$$

and will change the policy to $y_l = m$ (or $y_l = -m$ when their posterior mean is negative) when

$$|s_l| > \max\left\{(2\sigma^2+1)(t-\sqrt{r}), (2\sigma^2+1)\frac{m^2+c-R}{2m}\right\}.$$

Hence, for any m and any s_l, l_{σ^2} either retains, bunches at the cutoff, or implements the mean of their posterior.

■

9.6 Proof of Proposition 3

Proof. Fix $m \in (0, \sqrt{c-b}]$. Note, this requires $c > b$. l will utilize the simple revision strategy when $|s_l| \geq (2\sigma^2+1)\sqrt{c-R}$, and will retain y_l otherwise.

Fix l's strategy as described above. m is a best response if

$$\mathbb{E}[\sigma^2|y_l = 0] > 1$$
$$\mathbb{E}[\sigma^2||y_l| \in [\sqrt{c-R}, \infty)] \leq 1.$$

The first condition is ensured by Lemma 2, and the second condition is satisfied if $\hat{y} \leq \sqrt{c-R}$.

To confirm existence, consider the following example. Suppose $\sigma^2 \in \{\frac{3}{4}, 2\}$ and $c = \frac{5-2\ln(\frac{1}{2\sqrt{2}})}{5}$. If $R = 1$, $\hat{y} = \sqrt{c-R}$. Hence, this type of equilibrium exists. ■

9.7 Proof of Proposition 4

Proof. Consider the following cases:

(a) Fix $m \in (\sqrt{\max\{c-b, b-c\}}, \sqrt{c}+\sqrt{b})$. l will implement the mean of their posterior when $s_l \geq (2\sigma^2+1)m$, will bunch at the cutoff when $s_l \in ((2\sigma^2+1)\frac{m^2+c-b}{2m}, (2\sigma^2+1)m)$ because

$$m > \max\left\{\frac{m^2+c-b}{2m}, m - \sqrt{r}\right\}$$

and will retain y_l when $|s_l| < (2\sigma^2+1)\sqrt{c}$ because

$$m > \min\left\{\sqrt{c}, \frac{m^2+c-b}{2m}\right\}.$$

Fix l's strategy as described above. m is a best response if

$$\mathbb{E}[\sigma^2|y_l = 0] > 1$$
$$\mathbb{E}[\sigma^2||y_l| \in (m, \infty)] \leq 1$$
$$\mathbb{E}[\sigma^2||y_l = m] \leq 1$$

The first condition is satisfied by Lemma 2 and the second is satisfied if $\hat{y} \leq m^*$. The third requires

$$\frac{\int_{(2\overline{\sigma}^2+1)\frac{m^2+c-b}{2m}}^{(2\overline{\sigma}^2+1)m} e^{-\frac{t^2}{2(\frac{1}{2}+\overline{\sigma}^2)}}dt}{\int_{(2\underline{\sigma}^2+1)\frac{m^2+c-b}{2m}}^{(2\underline{\sigma}^2+1)m} e^{-\frac{t^2}{2(\frac{1}{2}+\underline{\sigma}^2)}}dt} \leq \Sigma,$$

which requires $\hat{y}$ be sufficiently smaller than m.

It remains to show existence. First, suppose $\sigma^2 \in \{\frac{3}{4}, 2\}$ and $c = \frac{5-2\ln(\frac{1}{2\sqrt{2}})}{5}$. If $b = 1$, $\hat{y} = \sqrt{c-b}$. If $m^* \gtrapprox 0.947$ and $m^* \leq \sqrt{c}+\sqrt{b} \gtrapprox 0.947133$, this equilibrium exists.

This shows that multiple types of equilibria may exist simultaneously since for these parameters a continuum of equilibria exist of the form described in Proposition 3.

Now, suppose $\sigma^2 \in \{\frac{3}{4}, 2\}$, $c = \frac{1}{2}$, and $R = b$. $\hat{y} = \sqrt{c - R}$. If $m^* \gtrapprox 1.26$ and $m^* \leq \sqrt{c} + \sqrt{r} \gtrapprox 1.26$ this equilibrium exists. Moreover, this is an equilibrium that exists when $c < b$, which means the equilibrium described in Proposition 3 does not exist.

(b) Fix $m > \sqrt{c} + \sqrt{b}$. l will implement the mean of their posterior when $|s_l| \geq (2\sigma^2 + 1)m$, will implement $y_l = m$ when $|s_l| \in ((2\sigma^2 + 1)m, (2\sigma^2 + 1)(m - \sqrt{b}))$ because

$$m > \max\left\{\frac{m^2 + c - b}{2m}, m - \sqrt{b}\right\},$$

will implement the mean of their posterior when $|s_l| \in ((2\sigma^2 + 1)\sqrt{c}, (2\sigma^2 + 1)(m - \sqrt{b}))$ because

$$\sqrt{c} < m - \sqrt{b},$$

and will retain y_l when $|s_l| < (2\sigma^2 + 1)\sqrt{c}$ because

$$\sqrt{c} < \frac{m^2 + c - b}{2m}.$$

Fix l's strategy as described above. m is a best response if

$$\begin{aligned} \mathbb{E}[\sigma^2 | y_l = 0] &> 1, \\ \mathbb{E}[\sigma^2 | |y_l| \in (\sqrt{c}, m - \sqrt{b})] &> 1, \\ \mathbb{E}[\sigma^2 | |y_l| \in (m, \infty)] &\leq 1 \\ \mathbb{E}[\sigma^2 | |y_l| = m] &\leq 1 \end{aligned}$$

The first condition is satisfied by Lemma 2, the second condition is satisfied as long as $\hat{y} > m - \sqrt{r}$, the third condition is satisfied as long as $\hat{y} \leq m$, and the fourth condition is satisfied as long as,

$$\frac{\int_{(2\overline{\sigma}^2+1)(m-\sqrt{r})}^{(2\overline{\sigma}^2+1)m} e^{-\frac{t^2}{2}} dt}{\int_{(2\underline{\sigma}^2+1)(m-\sqrt{r})}^{(2\underline{\sigma}^2+1)m} e^{-\frac{t^2}{2}} dt} \leq \Sigma$$

which requires $\hat{y} < m$.

Prior to showing existence, note that this type of equilibrium cannot exist simultaneously with the equilibrium in Proposition 3. For the second type of equilibrium described in this proposition to exist, it must be that $m^* < \hat{y} + \sqrt{b}$ and $m^* \geq \sqrt{c} + \sqrt{b} \Leftrightarrow \hat{y} > \sqrt{c}$. But, recall that for the equilibrium described in Proposition 3 to exist, $\hat{y} \leq \sqrt{c - b}$. This is a contradiction.

It remains to show existence. Suppose $\sigma^2 \in \{\frac{3}{4}, 2\}$, $c = \frac{1}{2}$, and $b = 1$. Furthermore, suppose $m^* = 1.8$. Then this is an example of this equilibrium.

■

9.8 Proof of Proposition 5

Proof. Consider the remaining cases:

(a) Fix $m = 0$. Then l engages in informed repeal as long as $|s_l| \geq (2\sigma^2 + 1)\sqrt{c}$, and retains y_l otherwise. But Lemma 2 shows that the voter will never elect l when l retains the initial policy. This is a contradiciton.

(b) Fix $m \in (0, \sqrt{R - c})$. Note, this requires $b - c > 0$. Then l will engage replace the initial policy with the mean of their posterior when $|s_l| \geq (2\sigma^2 + 1)m$, and will bunch when $|s_l| < (2\sigma^2 + 1)m$ since

$$\min\left\{\frac{m^2 + c - R}{2m}, \sqrt{c}\right\} < 0,$$
$$\sqrt{c} > (m - \sqrt{b}).$$

Fix l's strategy as above. $m \in (0, \sqrt{R - c})$ is a best response if

$$\mathbb{E}[\sigma^2 | y_l = 0] \leq 1,$$
$$\mathbb{E}[\sigma^2 || y_l| \in [m, \infty)] \leq 1$$

That is, if $\hat{y} \leq m$ and

$$\frac{\frac{1}{\sqrt{2\pi}} \int_0^{(2\overline{\sigma}^2+1)m} e^{-\frac{t^2}{2(\frac{1}{2}+\overline{\sigma}^2)}} dt}{\frac{1}{\sqrt{2\pi}} \int_0^{(2\underline{\sigma}^2+1)m} e^{-\frac{t^2}{2(\frac{1}{2}+\underline{\sigma}^2)}} dt} \leq \Sigma. \tag{6}$$

By a similar argument to that used in Lemma 2, the LHS of 6 is larger than one for any m. Moreover, the RHS of 6 is less than one by Assumption 2. This is a contradiction.

■

9.9 Proof Proposition 6

Suppose that $R = 0$, and consider a strategy profile where l and the voter use their equilibrium strategies described in Proposition 1 and r's strategy is to choose $y_l = \frac{s_l}{2}$. Of course, since y_l is now endogenously chosen, I no longer assume $y_l = 0$.

Given this strategy profile and y_l,

$$\theta|y_l \sim \mathcal{N}\left(y_l, \frac{1}{2}\right),$$
$$s_l|y_l \sim \mathcal{N}(y_l, \frac{1}{2} + \sigma^2)$$

and given s_l,

$$\theta|s_l, y_l \sim \mathcal{N}\left(\frac{2y_l\sigma^2 + s_l}{2\sigma^2+1}, \frac{\sigma^2}{2\sigma^2+1}\right).$$

Therefore, l_{σ^2} changes the policy when

$$s_l \notin (y_l - (2\sigma^2+1)\sqrt{c}, y_l + (2\sigma^2+1)\sqrt{c}).$$

Given the strategy profile described above, and assuming that $\mathbb{E}[\theta|s_R] = 0$, as a function of y_l, A has the following expected utility

$$\begin{aligned}
&-q\left(\Phi\left(\frac{y_l + (2\overline{\sigma}^2+1)\sqrt{c}}{\sqrt{\frac{1}{2}+\overline{\sigma}^2}}\right) + \Phi\left(\frac{y_l - (2\overline{\sigma}^2+1)\sqrt{c}}{\sqrt{\frac{1}{2}+\overline{\sigma}^2}}\right)\right)\left(\frac{1}{2} + (y_l - 0)^2\right)\\
&-(1-q)\left(\Phi\left(\frac{y_l + (2\underline{\sigma}^2+1)\sqrt{c}}{\sqrt{\frac{1}{2}+\underline{\sigma}^2}}\right) + \Phi\left(\frac{y_l - (2\underline{\sigma}^2+1)\sqrt{c}}{\sqrt{\frac{1}{2}+\underline{\sigma}^2}}\right)\right)\left(\frac{1}{2} + (y_l - 0)^2\right)\\
&-q\int_{-\infty}^{y_l-(2\overline{\sigma}^2+1)\sqrt{c}}\left(\frac{\overline{\sigma}^2}{2\overline{\sigma}^2+1} + \left(\frac{2\overline{\sigma}^2 y_l + s_l}{2\overline{\sigma}^2+1} - \frac{s_l}{2\overline{\sigma}^2+1}\right)^2\right) f_{s_l}^{\overline{\sigma}^2} ds_l\\
&-(1-q)\int_{-\infty}^{y_l-(2\underline{\sigma}^2+1)\sqrt{c}}\left(\frac{\underline{\sigma}^2}{2\underline{\sigma}^2+1} + \left(\frac{2\underline{\sigma}^2 y_l + s_l}{2\underline{\sigma}^2+1} - \frac{s_l}{2\underline{\sigma}^2+1}\right)^2\right) f_{s_l}^{\underline{\sigma}^2} ds_l\\
&-q\int_{y_l+(2\overline{\sigma}^2+1)\sqrt{c}}^{\infty}\left(\frac{\overline{\sigma}^2}{2\overline{\sigma}^2+1} + \left(\frac{2\overline{\sigma}^2 y_l + s_l}{2\overline{\sigma}^2+1} - \frac{s_l}{2\overline{\sigma}^2+1}\right)^2\right) f_{s_l}^{\overline{\sigma}^2} ds_l\\
&-(1-q)\int_{y_l+(2\underline{\sigma}^2+1)\sqrt{c}}^{\infty}\left(\frac{\underline{\sigma}^2}{2\underline{\sigma}^2+1} + \left(\frac{2\underline{\sigma}^2 y_l + s_l}{2\underline{\sigma}^2+1} - \frac{s_l}{2\underline{\sigma}^2+1}\right)^2\right) f_{s_l}^{\underline{\sigma}^2} ds_l
\end{aligned}$$

The remainder of this proof can be shown graphically. I am in the process of showing it formally.

9.10 Proof of Lemma 4

Consider a subgame where the state is $\omega \sim \mathcal{N}(0,1)$. The voter first elects r or l. Then the incumbent $i \in \{l, r\}$ receives a noisy signal s_i with the same form as the baseline game. The incumbent then chooses $y_i \in \mathbb{R}$. Both parties and the voter have utility functions of the form $-(\omega - y_i)^2$.

Clearly, the incumbent chooses $y_i = \mathbb{E}[\omega|s_i]$. Therefore, the expected utility of the voter electing $i \in \{A, B\}$

$$-(\theta - \mathbb{E}[\omega|s_i])^2, \tag{7}$$

which equivalent to the variance of the posterior distribution of the state. Therefore, the voter will elect l if

$$\frac{\hat{\sigma}^2}{1+\hat{\sigma}^2} \leq \frac{1}{2}$$
$$\Leftrightarrow \hat{\sigma}^2 \leq 1,$$

where $\hat{\sigma}^2$ is the (expected given the previous game play) variance of the error term in l's signal.

9.11 Proof of Proposition 7

Proof. If the voter elects Party r, r will implement the mean if their posterior for both policies. As a result, the voter's expected utility is -1. Now suppose the equilibrium in the subgame where Party l is elected in the first policymaking period is the equilibrium where $m^* \leq \sqrt{c-b}$. Then the voter's expected utility from electing l is

$$\begin{aligned}
&- q \Pr(y_l = y_r|\sigma^2 = \overline{\sigma}^2)\left(\int_{-(2\overline{\sigma}^2+1)\sqrt{c}}^{(2\overline{\sigma}^2+1)\sqrt{c}} \int_{-\infty}^{\infty} (\theta-0)^2 f_{\theta|s_l}^{\overline{\sigma}^2}(\theta|s_l) f^{\overline{\sigma}^2}(s_l) d\theta ds_l + \frac{1}{2}\right) \\
&\quad - (1-q)\Pr(y_l = y_r|\sigma^2 = \underline{\sigma}^2)\left(\int_{-(2\underline{\sigma}^2+1)\sqrt{c}}^{(2\underline{\sigma}^2+1)\sqrt{c}} \int_{-\infty}^{\infty} (\theta-0)^2 f_{\theta|s_l}^{\underline{\sigma}^2}(\theta|s_l) f^{\underline{\sigma}^2}(s_l) d\theta ds_l + \frac{1}{2}\right) \\
&\qquad - q4\int_{\sqrt{c}}^{\infty}\left(\frac{\mathbb{E}[\sigma^2|y_b]}{2\mathbb{E}[\sigma^2|y_b]+1}\right) f^{\overline{\sigma}^2}(y_b) dy_b - q4\int_{\sqrt{c}}^{\infty}\left(\frac{\mathbb{E}[\sigma^2|y_b]}{2\mathbb{E}[\sigma^2|y_b]+1}\right) f^{\underline{\sigma}^2}(y_b) dy_b.
\end{aligned}$$

$-\frac{\mathbb{E}[\sigma^2|y_b]}{2\mathbb{E}[\sigma^2|y_b]+1} > -\frac{1}{2}$ for any $\mathbb{E}[\sigma^2|y_b] < \infty$. Moreover,

$$\frac{\partial}{\partial\sigma^2} - \int_{-(2\sigma^2+1)\sqrt{c}}^{(2\sigma^2+1)\sqrt{c}} \int_{-\infty}^{\infty} (\theta-0)^2 f_{\theta|s_l}^{\sigma^2}(\theta|s_l) f^{\sigma^2}(s_l) d\theta ds_l = -\frac{2e^{-1-2\sigma^2}(2+3\sigma^2)}{\sqrt{\pi}\sqrt{2+\frac{1}{\sigma^2}\sqrt{\sigma^2}(1+2\sigma)}} < 0,$$

$$\lim_{\sigma^2\to\infty} - \int_{-(2\sigma^2+1)\sqrt{c}}^{(2\sigma^2+1)\sqrt{c}} \int_{-\infty}^{\infty} (\theta-0)^2 f_{\theta|s_l}^{\sigma^2}(\theta|s_l) f^{\sigma^2}(s_l) d\theta ds_l = -\frac{1}{2}.$$

Hence,

$$- \int_{-(2\sigma^2+1)\sqrt{c}}^{(2\sigma^2+1)\sqrt{c}} \int_{-\infty}^{\infty} (\theta-0)^2 f_{\theta|s_l}^{\sigma^2}(\theta|s_l) f^{\sigma^2}(s_l) d\theta ds_l > -\frac{1}{2}.$$

By choosing $e = l$, the voter chooses a lottery over payoffs that are higher than the payoff from choosing $e = r$. Hence, the voter will elect $e = l$. ■