A Model of Electoral Accountability and Bureaucracy

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Abstract

In many theories of electoral accountability, voters learn about an incumbent's quality through the observation of public goods outcomes. Yet, politicians rely on bureaucracies to implement most policies. In comparative perspective, variation in bureaucratic quality shapes politicians' ability to provide public goods. How does variation in bureaucratic quality influence voters' ability to select politicians? Does such variation affect a politician's strategy for allocating funds to public goods provision? To answer these questions, I embed a bureaucrat that co-produces public goods in a simple model of electoral accountability. I show that low bureaucratic quality deters a politician that values public goods from making such investments. This reduces both public goods provision as well as voters' ability to discern politician type. I show that at low levels of bureaucratic quality, the model's implications are observationally equivalent to those generated by a benchmark model without electoral accountability. Manifestations of accountability emerge only when bureaucratic quality is sufficiently high. These results rationalize diverse findings about the function of accountability across the world's democracies.

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1 Introduction

Electoral accountability is a normative goal of democracy (Przeworski, Stokes, and Manin, 1999). Yet, recent empirical assessments of the health or existence of these relationships between voters and politicians present grounds for pessimism. In developing democracies, widespread malfeasance by politicians, underprovision of public goods and services, and low levels of citizen political knowledge motivate questions about whether and when voters can hold these apparently poorly performing politicians to account. Furthermore, efforts to inform citizens in settings where accountability is thought to be limited provide little evidence that citizens respond by sanctioning underperforming or rewarding well-performing politicians (Dunning et al., 2019).

In this paper, I present an alternative explanation for these empirical patterns that focuses instead on bureaucratic quality as a constraint on politicians' incentives to provide public goods even when voters are sufficiently informed and rational. The theory suggests that empirical manifestations of accountability across democracies vary with bureaucratic quality. Specifically, I argue that when bureaucratic quality is low, the presence and absence of electoral accountability are observationally equivalent with respect to corruption by politicians, underprovision of public goods, and voter beliefs and behavior. These findings provide implications for how we interpret empirical evidence and design comparative research on accountability.

To see the distinction between these accounts, consider first a model of accountability failures (or the absence of accountability). In such a model, citizens are uncertain about a politician's type and lack some informational signal upon which they can update their beliefs about the politician. (Consider the implied equilibrium absent information in, e.g., Ferraz and Finan, 2008; Humphreys and Weinstein, 2012; Dunning et al., 2019). Alternatively, citizens may receive information but fail to rationally update their beliefs (Achen and Bartels, 2016; Healy, Malhotra, and Mo, 2010).[1] In either case, failure to access or update on performance-relevant information breaks the link between a politician's actions and her subsequent electoral fortunes, so politicians maximize their

[1] But see Fowler and Montagnes (2015); Fowler and Hall (2018); Ashworth, Bueno de Mesquita, and Fridenberg (2018).

own utility, regardless of whether their actions are congruent with voters' preferences.

In contrast, I argue that low bureaucratic quality generates the same empirical patterns even with voters that hold politicians to account. Across democracies, politicians rely on bureaucrats to co-produce public goods. Yet, politicians in different settings face bureaucrats of varying quality. I define quality as a function of human capital levels of bureaucrats and staffing levels in a politician's jurisdiction. Bureaucratic quality varies substantially across democracies and correlates positively with the provision of public goods and services (Rauch, 1995; Rauch and Evans, 2000; Huber and Ting, 2015). I argue that variation in bureaucratic quality influences the efficiency of public goods investments, altering politicians' incentives to appropriate funds to public goods. Citizens learn about the politician's type on the basis of observed public goods outputs and vote on the basis of their posterior beliefs.

To understand the implications of these two accounts, I develop a simple two-period model of electoral accountability with a bureaucrat. As in standard models of accountability, voters evaluate politicians on the basis of the quality of observed policy outcomes, here levels of public goods provision (Ashworth, 2012). However, politicians jointly produce public goods with unelected bureaucrats. Bureaucrats remain absent from most theories of electoral accountability.[2] As such, the model represents a two-level (hierarchical) principal agent problem in which voters serves as the principal to the politician, who in turn serve as the principal to the bureaucrat.

In the model, a politician and a bureaucrat provide distinct inputs toward the production of public goods. In each period, the politician allocates funds (capital) to a public good, but relies on the labor of a bureaucrat to implement the good. In making an appropriations decision, the politician divides their budget between rents (private goods) and public goods. The politician is of a competent or incompetent type, which the voter does not observe. Bureaucrats exert more effort under a competent than a incompetent politician, rendering the a competent type's allocation toward public goods more efficient. The voter observes the public goods output, and updates their belief about a politician's type. The voter then decides whether or not to retain the incumbent for

[2]See Fox and Jordan (2011) for an exception.

a second period or elect a challenger.

I characterize the perfect Bayesian equilibria of otherwise identical variants of the model with and without citizen observation of the first-period public goods output. Specifically, I show that absent accountability pressures, the equilibrium allocation to public goods by the politician is driven entirely by efficiency considerations. When bureaucratic quality and politician competence are sufficient to make an allocation to public goods efficient, the politician allocates their budget to the public goods production, otherwise they allocate their budget to rents.

With the addition of accountability pressures, at sufficient levels of bureaucratic quality, voters update on the bureaucrat's type and retain competent politicians at higher rates than incompetent politicians. At moderate levels of bureaucratic quality, the anticipation of differential retention induces incompetent politicians to allocate their first-period budget to public goods when they would not do so absent accountability pressures. However, at low levels of bureaucratic quality, public goods remain inefficient to produce, and neither type of politician funds the to public good; voters observe the absence of public goods but gain no information. In this case, the equilibrium with and without accountability pressures are observationally equivalent. This model also makes predictions about the relationship between bureaucratic quality and the composition of elected politicians.

The model contributes to theoretical and empirical literatures. First, the model considers a strategic relationship between a citizen, a politician, and a bureaucrat. This configuration of actors remains rare (Fox and Jordan, 2011; Slough, 2019). The present model connects to accountability models focused on a voter and politician(s) (Fearon, 1999; Ashworth, Bueno de Mesquita, and Fridenberg, 2017) and to models of moral hazard in bureaucracies. I posit distinct but complementary roles of politicians and bureaucrats in the production of public goods as central to our understanding of accountability. This represents a departure from spatial models of delegation (see Gailmard and Patty (2007) for a review) and analyses of optimal institutional design (e.g., Maskin and Tirole, 2004; Alesina and Tabellini, 2007) in which bureaucrats and politicians (ultimately) use the same instrument to affect policy. This article emphasizes the distinct inputs politicians and

bureaucrats contribute to the production of public goods.

The results also speak to a large empirical literature on information and accountability in developing democracies (Dunning et al., 2019; Chong et al., 2015; Banerjee et al., 2011; Bhandari, Larreguy, and Marshall, 2019; Cruz, Keefer, and Labonne, 2018). With the exception of Raffler and Martin (2019), this literature does not ascribe a role to bureaucrats when examining accountability.[3] The findings of these studies are mixed with respect to the (average) effects or non-effects of information on voter beliefs and election outcomes (Enríquez et al., 2019). The theory advanced here provides predictions about the contexts in which information should change the beliefs and actions of an informed, rational (Bayesian) voter. Further, from a policy perspective, the policy implications of the two accounts are distinct. While increasing bureaucratic quality leads to higher welfare in either account, the present focus – from both academics and NGOs – on disseminating information to voters may be unwarranted (and wasteful) under the model of accountability that I advance.

2 Theory

Consider three actors: an incumbent politician, P, a bureaucrat, B, and a voter V. I study the production of public goods during two political terms. In each term, the politician and bureaucrat jointly produce public goods that are observed (and consumed) by the voter. After the first term, there is an election in which the politician contests office against a challenger.

Politicians are of an incompetent or competent type, $\theta \in \{\underline{\theta}, \overline{\theta}\}$, respectively. The politician's type is private information to the politician and the bureaucrat. The voter holds a prior belief that the politician is a competent type with probability $Pr(\theta = \bar{\theta}) = \pi \in (0, 1)$. I conceive of competence as ability to manage the bureaucracy or "get things done" via oversight.[4] Specifically, a competent politician monitors the bureaucrat at intensity $\overline{m}$ while an incompetent politician moni-

[3] Raffler and Martin (2019) study empirically whether the co-production of public goods by bureaucrats and politicians leads to less updating about the politician by voters. They do not consider how politicians act differentially when subjected to different levels of scrutiny.

[4] There may be statutory regulations that constrain or empower the politician to take action. I abstract from these considerations at the moment, but they could be modeled as the product of m and some variable capturing the statutory environment.

tors the bureaucrat at intensity $\underline{m}$, where $0 < \underline{m} < \overline{m} < 1$.

Public goods are produced as a function of the level of funding allocated by the politician in period t and the quality and effort of the bureaucracy. Specifically, politicians allocate a budget, normalized to 1 in each period, between public goods (a_t) and private rents ($1 - a_t$). In the benchmark and baseline models, I treat the quality of the bureaucracy, $q > 1$ as exogenous. Section 4 describes a possible extension on the development of bureaucratic institutions, endogenizing q. This quality measure captures the expertise or qualification of a representative individual working in the public sector and levels of staffing.

While low-powered incentives are characteristic of the public-sector setting, I assume that bureaucrat the bureaucrat exerts effort, e in response to some intensity of oversight, given by $m \in \{\underline{m}, \overline{m}\}$. As such, the utility of the bureaucrat, in period t, net of a wage satisfying his participation constraint, can be written:

$$u_t^B(e) = -m(1 - e_t) - \frac{e_t^2}{2} \tag{1}$$

Note that in the baseline model, m is given by politician's type. The bureaucrat is myopic.

Given the allocation of funds by the politician and the effort exerted by a bureaucrat, the public good, $g_t(a_t, e_t)$ is produced according to the production function in Equation 2. The production function assumes that allocation to public goods and bureaucratic quality are complements.

$$g_t(a_t, e_t) = \begin{cases} a_t q & \text{w.p. } e_t \\ 0 & \text{w.p. } 1 - e_t \end{cases} \tag{2}$$

Examination of Equation 2 clarifies the relationship between bureaucratic quality, q, and broader notions of bureaucratic capacity. As is discussed in existing work, bureaucratic capacity consists of both the skill of bureaucrats (Geddes, 1994), the allocation of bureaucrats across a jurisdiction (Acemoglu, García-Jimeno, and Robinson, 2015), and effort exerted by bureaucrats. I capture the first two features in quality (q) and the third in bureaucratic effort (e_t). Thus, in the present

framework bureaucratic capacity manifests through both the quality of outputs (Ting, 2009) and the noise with outputs are generated (Huber and McCarty, 2004).

The politician trades off private rents for public goods when allocating the budget. Both types of politicians value the provision of public goods.[5] However, variation in the two types' efficacy in inducing bureaucrats to work is captured in the realization of g_t.

$$u_t^P(a_t;\theta) = 1 - a_t + g_t \tag{3}$$

The politician receives $u_t^P(a_t;\theta)$ for each period she is in office, and utility normalized to 0 if she is not in office. As such, the politician's utility over two periods is given by:

$$u^P(\mathbf{a};\theta) = \begin{cases} 2 - a_1 - a_2 + g_1 + g_2 & \text{if re-elected} \\ 1 - a_1 + g_1 & \text{if not re-elected} \end{cases} \tag{4}$$

The voter observes first-term public goods provision and forms a posterior belief about the politician's type, $\mu(g_1)$. The voter values consumption of the public good in addition to a valence shock for the incumbent, parameterized as $\phi \sim U[-b, b]$, where $b > q$. The voter votes, $v \in \{i, c\}$, to re-elect the incumbent (i) or elect the challenger (c). If elected, a challenger acts as a first-period incumbent. (For that reason, the time subscripts in the voter's decision are relative to the politician's term in office.) As such, the voter's second period expected utility from the a vote for incumbent or a vote for a challenger (c), can be defined:

$$E[u_2^V(i)] = E[g_2|\mu] + \phi \tag{5}$$

$$E[u_2^V(c)] = E[g_1|\pi] \tag{6}$$

[5] One can generate qualitatively similar results if politicians were distinguished by their objectives, i.e. a venal type that does not value public goods and an altruistic type that does. Since the emphasis here is on settings where public goods are not produced, I opt for a setting in which politicians do not vary in their preference for producing public goods.

2.1 Sequence and Equilibrium Concept

The game proceeds according to the sequence:

1. Nature determines θ, the incumbent's competence. Only the incumbent and bureaucrat observe θ.

2. The incumbent allocates a_1 to the public good.

3. The bureaucrat exerts effort e_1 to produce the first-term public good, g_1.

4. The voter forms a posterior belief about the politician's type, μ, the valence shock ϕ is revealed, and the voter chooses whether to re-elect the incumbent or elect the challenger.

5. If the incumbent was re-elected, she allocates a_2 to the public good. If the challenger was elected, she allocates a_1 to the public good.

6. If the incumbent was re-elected, the bureaucrat exerts effort e_2 to produce the public good g_2. If the challenger was elected, the bureaucrat exerts effort e_1 to produce the public good g_1.

I characterize the unique Perfect Bayesian Equilibrium of the game. The incumbent's allocation decision is the choice $a_1 \in [0,1]$. The bureaucrat's effort allocation is $e_1 \in \mathbb{R}_+$. Public goods production, $g_1 : [0,1] \times \mathbb{R}_+ \rightarrow [0,q]$, maps the budget allocation and bureaucratic effort into a public goods output observed by all players. Voters' update beliefs $\mu : [0,1] \times \mathbb{R}_+ \times [0,q] \rightarrow [0,1]$ and the voter's strategy is a mapping $v : [0,1] \times \mathbb{R}_+ \times [0,q] \times [0,1] \rightarrow \{i,c\}$. The second period incumbent's allocation strategy is a mapping $a_2 : [0,1] \times \mathbb{R}_+ \times [0,q] \times [0,1] \times \{i,c\} \rightarrow [0,1]$. Finally, second period bureaucratic effort and public goods production represents the mapping: $e_2 : [0,1] \times \mathbb{R}_+ \times [0,q] \times [0,1] \times \{i,c\} \times a_2 \rightarrow \mathbb{R}_+$ and public goods provision represents the mapping $g_2 : [0,1] \times \mathbb{R}_+ \times [0,q] \times [0,1] \times \{i,c\} \times a_2 \times \mathbb{R}_+ \rightarrow [0,q]$.

3 Results

I proceed by backward induction. First, consider the bureaucrat's equilibrium level of effort. By straightforward inspection of the bureaucrat's objective, it is clear that optimal effort, $e_t^* = m$. Note that this effort depends only on the politician's type in either period. When combined with Equation 2, this optimal effort indicates that politician competence and bureaucratic effort are complements with respect to the production of public goods.

Turning to the politician's second-term allocation strategy, the politician considers the expectation second-term public goods provision, $E[g_2(a_2, e_2)] = mqa_2$. Where $E[g_2(a_2, e_2)] \geq 1$, a politician will invest her entire budget in public goods, $a_2 = 1$. In contrast, where $E[g_2(a_2, e_2)] < 1$, a politician will invest nothing, $a_2 = 0$. Formally, the politician's optimal second-period allocation strategy is given by:

$$a_2^* = \begin{cases} 1 & \text{if } q > \frac{1}{m} \\ 0 & \text{else} \end{cases} \tag{7}$$

Intuitively, if the bureaucracy is of sufficiently low capacity (low q), even the competent type has no incentive to fund public goods when it is inefficient to do so. This implies that even a competent politician that values public goods outputs will "take the money and run" when the state is incapable of efficiently producing public goods.

Consider the voter's voting decision. The voter votes for the incumbent if $E[u_2^V(i)] > E[u_1^V(c)]$. Given the distribution of the valence shock, the incumbent's probability of victory, $\tau(\mu,\mathbf{a})$:

$$\tau(\mu, \mathbf{a}) = \frac{1}{2} + \frac{E[g_2|\mu] - E[g_1|\pi]}{2b} \tag{8}$$

$$= \frac{1}{2} + \frac{\mu E[g(a_2|\theta = \overline{\theta})] + (1-\mu)E[g(a_2|\theta = \underline{\theta})] - \pi E[g(a_1|\theta = \overline{\theta})] - (1-\pi)E[g(a_1|\theta = \underline{\theta})]}{2b} \tag{9}$$

Turning to the voter's beliefs and decision, I characterize two variants of the model. First, I ex-

amine a model "without accountability," in which the voter never observes the public goods output. This is broadly consistent with assertions that voters are uninformed about politician performance (see anecdotes throughout Dunning et al., 2019). I use this model only as a benchmark. I then proceed to characterize the equilibrium when voters do observe and update their beliefs about the politician's type on the basis of observed public goods outputs.

3.1 Benchmark: Uninformed Voter

As a benchmark, I characterize the perfect Bayesian equilibrium in the case in which voters do not observe g_1 and as a result do not update. Consistent with descriptive accounts, it may be the case that voters do not observe g_1 for some reason (lack of attention to or access to media, etc.). In this case, $\mu = \pi$, which follows (trivially) from Bayes' rule. Following Equation 9, the probability of re-election is $\tau(\pi, \mathbf{a}) = \frac{1}{2}$ and the politician's first period actions do not influence the probability of re-election. Turning to the politician's first period allocation strategy, the politician always adopts the optimal allocation strategy from the second period (Equation 7). This occurs because first-period allocation decision cannot influence her re-election prospects with "uninformed" voters.

Proposition 1. ***Benchmark: Uninformed Voter*** *A perfect Bayesian equilibrium always exists. In equilibrium:*

(i) If $q < \frac{1}{\overline{m}}$*, both types of politicians allocate* $a_1 = a_2 = 0$ *to public goods.*

(ii) If $q \in [\frac{1}{\overline{m}}, \frac{1}{\underline{m}})$*, the competent-type politician allocates* $a_1 = a_2 = 1$ *while the incompetent type politician allocates* $a_1 = a_2 = 0$*.*

(iii) If $q \geq \frac{1}{\underline{m}}$*, both types of politicians allocate* $a_1 = a_2 = 1$ *to public goods.*

This benchmark characterizes formally settings in which voters lack access or attention to information that could inform their assessment of the incumbent politician. Voters effectively re-elect exogenously because they never update on the politician's type. Yet, as long as politicians value the provision of public goods – an assumption of the present model – there exists variation in equilibrium allocation as a function of bureaucratic quality. When public goods can be provided efficiently given sufficient politician competence and bureaucratic quality, politicians will allocate

funding to the public good.

3.2 Equilibrium

I now turn to consider the equilibrium of the baseline model with rational voters that update their beliefs about the politician on the basis of observed first-period public goods output. All other aspects of the model are identical to the benchmark case. In characterizing the equilibrium, I define $\gamma \equiv \frac{2b(1-\pi\overline{m})}{2b(1-\pi\overline{m})+\overline{m}(1-\pi)}$ for notational convenience. Note that $\gamma \in (0,1)$.

Proposition 2. *A perfect Bayesian equilibrium always exists. In equilibrium:*

(i) If $q < \frac{1}{\overline{m}}$*, both types of politicians allocate* $a_1 = a_2 = 0$ *to public goods.*

(ii) If and $q \in \left[\frac{1}{\overline{m}}, \frac{\gamma}{\underline{m}}\right)$ *and* $\frac{\gamma}{\underline{m}} > \frac{1}{\overline{m}}$*, a competent-type politician allocates* $a_1 = a_2 = 1$ *while a incompetent-type politician allocates* $a_1 = a_2 = 0$ *to public goods.*

(iii) If $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{\gamma}{\underline{m}}\}, \frac{1}{\underline{m}}\right)$*, a competent-type politician allocates* $a_1 = a_2 = 1$ *while an incomepent-type politican allocates* $a_1 = 1$ *and* $a_2 = 0$ *to public goods.*

(iv) If $q \geq \frac{1}{\underline{m}}$*, both types of politicians allocate* $a_1 = a_2 = 1$ *to public goods.*

As is standard in political accountability models, the inclusion of a rational voter that learns from observation of first-period public goods introduces two mechanism through which the equilibrium varies from the equilibrium in the benchmark model (Fearon, 1999). First, the voter updates on politician type and their resultant voting strategy re-elect competent re-elects competent politicians at weakly higher rates than incompetent politicians. Second, these changes in the likelihood of re-election may change a politician's first-period allocation strategy. However, these differences do not manifest in every case of the equilibrium.

Consider the four cases in Proposition 2. In the first case, $q < \frac{1}{\overline{m}}$, bureaucratic quality is sufficiently low that investing in the provision of public goods is inefficient for either type. As a result, no public goods are produced in the first period. The citizen observes no public goods and updates, but it must be the case that $\mu = \pi$, as an observation that $g_1 = 0$ provides no additional information about the type of politician. As such, the probability of re-election is $\frac{1}{2}$. Note that even the competent type of politician has no incentive to deviate by allocating funds to public goods in

the first period because the voter has no additional incentive to retain a competent politician that will not allocate the budget to public goods in the second period.

In the second case, $q \in \left[\frac{1}{\overline{m}}, \frac{\gamma}{\underline{m}}\right)$ and $\frac{\gamma}{\underline{m}} > \frac{1}{\overline{m}}$. Where this case exists, the competent type of politician can provide public goods efficiently while the incompetent type cannot, as $E[g_1|\theta = \overline{\theta}] > 1$ whereas $E[g_1|\underline{m}|\theta = \underline{\theta}] < 1$. When compared to the benchmark case, politicians' optimal allocation strategies are identical in this parameter space. However, the selection of politicians by voters is not identical. Upon observing $g_1 = q$, the voter knows that the politician is a competent type, $\mu = 1$. Upon observing $g_1 = 0$, the voter's posterior is $\mu = \frac{\pi - \pi\overline{m}}{1 - \pi\overline{m}}$, which implies $\mu < \pi$. Combined with Equation 9, competent type politicians are re-elected at a probability strictly greater than the incompetent type, indicating that the addition of accountability improves (from the perspective of voter welfare) the selection of candidates.

In the third case, when $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{\gamma}{\underline{m}}\}, \frac{1}{\underline{m}}\right)$, the incompetent type politician pools with the competent politician in the first period, allocating her budget to the public good, but shirks in the second period allocating nothing to public goods provision. If the public good materializes, the voter revises her belief to $\mu = \frac{\pi\overline{m}}{\pi\overline{m} + (1-\pi)\underline{m}} > \pi$; if the public good does not materialize, the voter revises her belief to $\mu = \frac{\pi(1-\overline{m})}{\pi(1-\overline{m}) + (1-\pi)(1-\underline{m})} < \pi$. Note that in this case, a voter prefers any competent politician to first-period incompetent politician to a second-period incompetent politician. This generates two implications. First, competent-type politicians are re-elected at higher rates than incompetent-type politicians. However, because of fears that a second-period incompetent-type will shirk, this case generates an incumbency *dis*advantage, when re-election probabilities are weighted by the share of each type of politician (Klašnja and Titunik, 2017).

In the final case, $q \geq \frac{1}{\underline{m}}$, both types of politicians allocate the entire budget to public goods in both periods, the same allocation observed in the analogous case absent accountability. However, it is more likely that a competent politician induces the bureaucracy to produce the public good given her investment. The voter's posterior beliefs (under each realization of g_1) are identical to the previous case. Consequently, the voter retains competent type politicians at a higher rate than incompetent type politicians. As such, the likelihood that the second-period office holder is a

competent type is higher than in the baseline case. Unlike the previous case in which a voter is concerned about second-period shirking by the politician, in this case she is indifferent between a first- and second-period politician, conditional on type.

Collectively the analysis of these cases show that when bureaucratic quality surpasses a threshold of $\frac{1}{\overline{m}}$, bureaucratic quality facilitates voters' ability to retain competent politicians at higher rates than incompetent politicians.

Proposition 3. ***Bureaucratic quality and political selection***. *At low levels of bureaucratic quality, $q < \frac{1}{\overline{m}}$, the probability that the second-period incumbent is competent is π. When $q \geq \frac{1}{\overline{m}}$, the probability that a second-period incumbent is competent is strictly greater than π.*

3.3 Observational Equivalence

The comparison of the equilibria characterized by Proposition 1 and Proposition 2 suggest that researchers' ability to observe behavior and beliefs consistent with mechanisms of accountability depends on bureaucratic quality. I consider the cases in which equilibrium actions and beliefs are observationally equivalent in Proposition 4.

Proposition 4. ***Observational Equivalence*** *Comparing the perfect Bayesian equilibrium characterized in Proposition 1 to the perfect Bayesian equilibrium characterized in Proposition 2:*

(i) If $q < \frac{1}{\overline{m}}$, the voter's posterior belief and therefore the probability of re-election of the incumbent are observationally equivalent.

(ii) If $q \notin \left[\frac{\gamma}{\underline{m}}, \frac{1}{\underline{m}}\right]$, the optimal allocation strategy for an incumbent of either type is observationally equivalent.

Proposition 4 posits that accountability only manifests in different voter beliefs, voter actions, and politician actions when bureaucratic quality is sufficiently high. In a large body on literature on information and accountability, a politician accrue rents from office at the expense of public goods because voters are not watching. In this model, politicians that value public goods accrue rents from office while voters watch because low bureaucratic quality makes investments in public goods inefficient. Voters cannot update on the basis of observing a lack of public goods outputs

and are consequently indifferent between re-electing the incumbent or electing a challenger from the same pool of candidates.

In contrast, when bureaucratic quality and politician competence are high enough to render investment in public goods (by at least one type of politician) efficient, voters observe public goods performance and update their beliefs about the politician, leading to a higher likelihood of retention of competent versus incompetent types. For some parts of the parameter space, re-election concerns induce incompetent-type politicians to make costly first-period allocations to the public good that does would not occur in equilibrium absent accountability pressures.

Collectively, this observational equivalence suggests that the empirical diagnostics used to assert an absence of electoral accountability in developing countries – corruption by politicians, underprovision of public goods, coexisting with "uninformed" voters – may not imply a lack of accountability. Moreover, by choosing different diagnostics of electoral accountability failures for places with different levels of bureaucratic capacity, we are unable to distinguish between these explanations.

3.4 Observable Allocation Behavior

As in the baseline model, it is common to assume that voters do not observe politicians' actions directly and make inferences about an incumbent based on some form of policy output or outcome. In general, it seems reasonable to assume that outputs are more visible to voters than, for example, politician's allocation decisions. However, a number of recent empirical studies on information provision to voters seek to understand the effect of providing information on actions, as opposed to outcomes, to voters to measure subsequent updating and voting behavior (Ferraz and Finan, 2008; Chong et al., 2015; Arias et al., 2019). These studies are concentrated in Latin American countries where national anti-corruption agencies investigate local polticians' (usually mayors') (mis)use of public funds. The treatments in such studies map quite naturally into the present framework if voters were to observe and update on the basis of politicians' allocation decisions (a_1) instead of public goods outputs (g_1).

This question is somewhat less interesting in the present modelling framework because it re-

moves a source of randomness – whether public goods are actually produced by the bureaucrat. As such, in a separating equilibrium, either politician's type is fully revealed to the voter. Nevertheless, given its importance to the empirical study of accountability, it is useful to spell out the implications of observable allocation versus output. One caveat to the characterization of the equilibrium of this game is that in this framework, politicians anticipate that their allocations will be revealed to the voter.[6]

I characterize the equilibrium in Proposition 5. For notational convenience, define $\kappa \equiv \frac{b(3+\underline{m})}{2b\underline{m}+\overline{m}(\underline{m}+\pi-\underline{m}\pi)}$.

Proposition 5. *A perfect Bayesian equilibrium always exists. In equilibrium:*

(i) If $q < \frac{1}{\overline{m}}$*, both types of politicians allocate* $a_1 = a_2 = 0$ *to public goods.*

(ii) If $q \in \left[\frac{1}{\overline{m}}, \kappa\right)$ *and* $\kappa < \frac{1}{\underline{m}}$ *or* $q \in \left[\frac{1}{\overline{m}}, \frac{1}{\underline{m}}\right)$ *and* $\kappa \geq \frac{1}{\underline{m}}$*, a competent-type politician allocates* $a_1 = a_2 = 1$ *while a incompetent-type politician allocates* $a_1 = a_2 = 0$ *to public goods.*

(iii) If $q \in \left[\max\{\frac{1}{\overline{m}}, \kappa\}, \frac{1}{\underline{m}}\right)$ *and* $\kappa < \frac{1}{\underline{m}}$ *a competent-type politician allocates* $a_1 = a_2 = 1$ *while an incomepent-type politican allocates* $a_1 = 1$ *and* $a_2 = 0$ *to public goods.*

(iv) If $q > \frac{1}{\underline{m}}$*, both types of politicians allocate* $a_1 = a_2 = 1$ *to public goods.*

Several features are of note. For any $q < \frac{1}{\overline{m}}$, the equilibrium is observationally equivalent to the benchmark and baseline cases described in Proposition 4, further supporting the argument that sufficient bureaucratic quality is necessary to observe empirical patterns consistent with mechanisms of accountability. Further, in any equilibrium in which both types of politicians pool in the first period to allocate a_1 (Cases (iii) and (iv)), the voter cannot update, i.e. $\mu = \pi$. In these cases, when a voter observes g_1, she gains information about the politician's type via differences in the likelihood that the bureaucrat can be induced to provide the public good. Thus, unlike in Proposition 3, the voter cannot increase the probability that the second-period incumbent is competent above the prior probability, π in Cases (iii) and (iv). In contrast, in an equilibrium in which competent and incompetent separate in the first period, the voter gains more information from an allocation

[6]The experimental and quasi-experimental studies of accountability described above generally focus on the "partial equilibrium" effects of informing voters about politicians' actions. They do not describe an equilibrium in which politicians necessarily anticipate this revelation and act accordingly. See Avis, Ferraz, and Finan (2018) for an empirical description of a setting closest to that which is analyzed here.

disclosure than observation of public goods. However, note that in the region $q \in [\frac{1}{\overline{m}}, \frac{1}{\underline{m}})$, such comparisons across models can be misleading when $\frac{\gamma}{\underline{m}} \neq \kappa$.

4 Discussion: Possible Next Steps

In this section, I outline three possibilities for further development of this paper for feedback. Both relate to the treatment of bureaucrats in the model. First, while the addition of the bureaucrat is relatively rare in a model of electoral accountability, the bureaucrat is effectively mechanical in the models presented here. One possible extension is to consider how some alignment (or lack thereof) between the politician and bureaucrat impacts the voter's ability to discern politician competence and the politician's allocation decision. Alignment can be interpreted as a characteristic of bureaucrats that changes how politician competence maps into bureaucratic effort, thus execution of the public good. Fox and Jordan (2011) provide one approach to the problem, by specifying bureaucratic type (aligned or unaligned) as private information to the politician and bureaucrat. Perhaps a preferable approach to the problem in the present modeling framework is to make the bureaucrat forward-looking with preferences over the identity of the second-period incumbent, such that the bureaucrat would exert more (resp. less) effort in the first period to advantage (resp. disadvantage) the incumbent.

Alternatively, having demonstrated the role of bureaucratic capacity as fundamental to the characterization of accountability relationships, where does bureaucratic capacity come from? In principle, politicians are also tasked with hiring or at least passing laws to regulate bureaucratic selection (Geddes, 1994; Huber and Ting, 2015). As such, q could, in principle, be endogenized. Much depends on the timing of an investment/disinvestment in bureaucratic quality and the timing of the realization of these reforms to q. My primary idea here is that such investments occur before the first period but are only realized in the second period. This most closely resembles the theoretical description in Rauch (1995).

A third option is to use the theory motivated here to organize empirical findings from across contexts. Given the proliferation of accountability experiments and natural experiments in the last

10 years, one option is to "test" the theory advanced here through some type of meta-analysis of existing empirical results. One limitation is that most of these experiments and natural experiments are hyper-localized and we lack comparable measures of bureaucratic quality at the subnational level in many contexts that would be useful for analysis both within and between studies.

5 Conclusion: On "Bad Politics"

In the contemporary study of Comparative Politics, scholars gravitate toward "bad politics" explanations for normatively bad outcomes. Because bad outcomes cluster in developing contexts, work in Comparative Politics tends to emphasize the malevolence or incompetence of political actors at much higher rates than in theories of politics rooted in developed contexts. For example, voters have taken a beating in the literature on accountability failures, which frequently implies that voters are too ill-informed and/or irrational to sanction corrupt incumbents or select better politicians.

The theory advanced in this paper takes a different approach to explaining similar patterns of outcomes. Indeed, the model of electoral accountability advanced in this paper assumes that politicians (uniformly) value the provision of public goods. Voters are informed and rational (Bayesian). Bureaucrats shirk, but are responsive to oversight and are not otherwise corrupt. Yet, the theory predicts the confluence of corruption, underprovision of public goods, and voter behavior often taken to motivate claims of circumscribed electoral accountability can emerge in the context of electoral accountability in which bureaucratic capacity is low. It also offers predictions for how accountability pressures should manifest in behavior and outcomes at different levels of bureaucratic quality, providing new testable implications for empirical research on accountability.

It may be the case that "bad politics" dominate in developing democracies, but this claim is impossible to assess without assessing other processes through which bad outcomes can be generated. This paper represents part of a broader appeal for theories that treat political actors more equally (symmetrically) across contexts in order to generate comparative insight. To extent that the policy implications of empirical findings depend on the underlying causal process generating outcomes, a bias toward "bad politics" may limit the insight that we can contribute in our efforts

to inform policies to advance welfare.

References

Acemoglu, Daron, Camilo García-Jimeno, and James A. Robinson. 2015. "State Capacity and Economic Development: A Network Approach." *American Economic Review* 105 (8): 2364–2409.

Achen, Christopher H., and Larry M. Bartels. 2016. *Democracy for Realists: Why Elections Do Not Produce Responsive Government*. Princeton, NJ: Princeton University Press.

Alesina, Alberto, and Guido Tabellini. 2007. "Bureaucrats or Politicians? Part I: A Single Policy Task." *American Economic Review* 97 (1): 169–179.

Arias, Eric, Horacio Larreguy, John Marshall, and Pablo Querubin. 2019. "Priors Rule: When do Malfeasance Revelations Help or Hurt Incumbent Parties?" Available at `https://scholar.harvard.edu/files/jmarshall/files/mexico_accountability_experiment_v13.pdf`.

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

Ashworth, Scott, Ethan Bueno de Mesquita, and Amanda Fridenberg. 2017. "Accountability and Information in Elections." *American Economic Journal: Microeconomics* 9 (2): 95–128.

Ashworth, Scott, Ethan Bueno de Mesquita, and Amanda Fridenberg. 2018. "Learning about Voter Rationality." *American Journal of Political Science* 62 (1): 37–54.

Avis, Eric, Claudio Ferraz, and Frederico Finan. 2018. "Do Government Audits Reduce Corruption? Estimating the Impacts of Exposing Corrupt Politicians." *Journal of Political Economy* 126 (5): 1912–1964.

Banerjee, Abhijit, Selvan Kumar, Rohini Pande, and Felix Su. 2011. "Do Informed Voters Make Better Choices? Experimental Evidence From India." Available at `https://scholar.harvard.edu/files/rpande/files/do_informed_voters_make_better_choices.pdf`.

Bhandari, Abhit, Horacio Larreguy, and John Marshall. 2019. "Able and Mostly Willing: An Empirical Anatomy of Information's Effect on Voter-Driven Accountability in Senegal." Available at `https://scholar.harvard.edu/files/jmarshall/files/accountability_senegal_paper_v5.pdf`.

Chong, Alberto, Ana de la O, Dean Karlan, and Leonard Wantchekon. 2015. "Does Corruption Information Inspire the Fight or Quash the Hope? A Field Experiment in Mexico on Voter Turnout, Choice, and Party Identification." *Journal of Politics* 77 (1): 51–77.

Cruz, Cesi, Philip Keefer, and Julien Labonne. 2018. "Buying Informed Voters: New Effects of Information on Voters and Candidates." Available at `https://static1.squarespace.com/static/58c979fad1758e09d030809c/t/5c048e82898583120b1f73cc/1543802523246/buying_informed_voters_web.pdf`.

Dunning, Thad, Guy Grossman, Macartan Humphreys, Susan D. Hyde, Craig McIntosh, and Gareth Nellis, eds. 2019. *Information, Accountability, and Cumulative Learning: Lessons from Metaketa I*. New York: Cambridge University Press.

Enríquez, José Ramón, Horacio Larreguy, John Marshall, and Alberto Simpser. 2019. "Information saturation and electoral accountability: Experimental evidence from Facebook in Mexico." Working paper.

Fearon, James. 1999. *Democracy, Accountability, and Representation*. Cambridge University Press chapter Electoral Accountability and the Control of Politicians: Selecting Good Types versus Sanctioning Poor Performance.

Ferraz, Claudio, and Frederico Finan. 2008. "Exposing Corrupt Politicians: The Effects of Brazil's Publicly Released Audits on Electoral Outcomes." *Quarterly Journal of Economics* 123 (2): 703–745.

Fowler, Anthony, and Andrew B. Hall. 2018. "Do Shark Attacks Influence Presidential Elections? Reassessing a Prominent Finding on Voter Competence." *Journal of Politics* 80 (4): 1423–1437.

Fowler, Anthony, and B. Pablo Montagnes. 2015. "College Football, Elections, and False-Positive Results in Observational Research." *Proceedings of the National Academy of Sciences (PNAS)* 112 (45): 13800–13804.

Fox, Justin, and Stuart V. Jordan. 2011. "Delegation and Accountability." *Journal of Politics* 73 (3): 831–844.

Gailmard, Sean, and John W. Patty. 2007. "Slackers and Zealots: Civil Service, Policy Discretion, and Bureaucratic Expertise." *American Journal of Political Science* 51 (4): 873–889.

Geddes, Barbara. 1994. *Politician's Dilemma: Building State Capacity in Latin America*. Berkeley, CA: University of California Press.

Healy, Andrew J., Neil Malhotra, and Cecilia Hyunjung Mo. 2010. "Irrelevant Events Affect Voters' Evaluations of Government Performance." *Proceedings of the National Academy of Sciences (PNAS)* 107 (29): 12804–12809.

Huber, John D., and Michael M. Ting. 2015. "Civil Service and Patronage in Bureaucracies." Working Paper.

Huber, John D., and Nolan McCarty. 2004. "Bureaucratic Capacity, Delegation, and Political Reform." *American Political Science Review* 98 (3): 481–494.

Humphreys, Macartan, and Jeremy M. Weinstein. 2012. "Policing Politicians: Citizen Empowerment and Political Accountability in Uganda - Preliminary Analysis." IGC Working Paper S-5021-UGA-1.

Klašnja, Marko, and Rocío Titunik. 2017. "The Incumbency Curse: Weak Parties, Term Limits, and Unfulfilled Accountability." *American Political Science Review* 111 (1): 129–148.

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

Przeworski, Adam, Susan Stokes, and Bernard Manin. 1999. *Democracy, Accountability, and Representation*. Cambridge University Press chapter Introductoin, pp. 1–26.

Raffler, Pia, and Lucy Martin. 2019. "Fault Lines: The Effects of Bureaucratic Power on Electoral Accountability." *American Journal of Political Science* Forthcoming.

Rauch, James E. 1995. "Bureaucracy, Infrastructure, and Economic Growth: Evidence from U.S. Cities During the Progressive Era." *American Economic Review* 85 (4): 968–979.

Rauch, James E., and Peter B. Evans. 2000. "Bureaucratic Structure and Bureaucratic Performance in Less Developed Countries." *Journal of Public Economics* 75: 49–71.

Slough, Tara. 2019. "Bureaucrats Driving Inequality in Access: Experimental Evidence from Colombia." Working paper.

Ting, Michael M. 2009. "Organizational Capacity." *Journal of Law, Economics, and Organization* 27 (2): 245–271.

Appendices

A Proofs

Proof of Proposition 1

By assumption of the benchmark model, voters observe no information and the prior is equivalent to the posterior, $\pi = \mu$. The voter re-elects the politician if $E[u_2^V(i)] \geq E[u_1^V(c)]$. Given that $\mu = \pi$ and the distribution of ϕ, this yields $\tau(\pi, \mathbf{a}) = \frac{1}{2}$, the probability of re-election. This implies that an incumbent's re-election probability is independent of the her first-period allocation strategy, a_1. Thus, the politician maximizes first-period expected utility to determine a_1 in all cases. I now consider the three relevant cases.

First, suppose that $q < \frac{1}{\overline{m}}$. The bureaucrat's optimal strategy in either period, $e^* = m$, follows from inspection of Equation 1. If re-elected in $t = 2$, a politician of either type allocates $a_2 = 0$ which follows from inspection of Equation 3. These allocations yield no public goods in t_2, i.e., $g_2 = 0$. By inspection of Equation 3, a politician of either type allocates $a_1 = 0$, which yields $g_1 = 0$.

Second, suppose that $q \in [\frac{1}{\overline{m}}, \frac{1}{\underline{m}})$. The bureaucrat's optimal strategy in either period, $e^* = m$ follows from inspection of Equation 1. If re-elected in $t = 2$, a politician of type $\theta = \overline{\theta}$ allocates $a_2 = 1$ while a politician of type $\theta = \underline{\theta}$ allocates $a_2 = 0$, which follows from inspection of Equation3 and the fact that $E[g_2] = a_2 mq$ and $q \in [\frac{1}{\overline{m}}, \frac{1}{\underline{m}})$. Consequently, $E[g_2|\theta = \overline{\theta}] = \overline{m}q$ while $E[g_2|\theta = \underline{\theta}] = 0$. By inspection of Equation 3, a politician of type $\theta = \overline{\theta}$ allocates $a_1 = 1$ while a politician of type $\theta = \underline{\theta}$ allocates $a_1 = 0$.

Finally, suppose that $q \geq \frac{1}{\underline{m}}$. The bureaucrat's optimal strategy in either period, $e^* = m$ follows from inspection of Equation 1. If re-elected in $t = 2$, a politician of either type allocates $a_2 = 1$, which follows from inspection of Equation 3 and the fact that $E[g_2] = a_2 mq$ and $q \geq \frac{1}{\underline{m}}$. Consequently, $E[g_2|\theta = \overline{\theta}] = \overline{m}q$ and $E[g_2|\theta = \underline{\theta}] = \underline{m}q$. By inspection of Equation 3, a politician of either type allocates $a_1 = 1$. ■

Proof of Proposition 2

First, suppose that $q < \frac{1}{\overline{m}}$ and consider the following strategy and belief profile: politicians of both types allocate $a_1 = 0$ and $a_2 = 0$; the bureaucrat exerts effort proportional to m in each period; this yields no public goods $g_t = 0 \forall t$; the voter votes to re-elect if $E[u_2^V(i)] \geq E[u_1^V(c)]$; and $\mu(g_t = 0) = \pi$. By inspection, μ is derived via Bayes' rule. The bureaucrat's equilibrium effort follows from inspection of Equation 1. The voter's choice is optimal given her posterior belief and Equation 9. Given the posterior belief $\mu = \pi$, $\tau(\pi, \mathbf{a}) = \frac{1}{2}$. Thus, it is sufficient to compare first-period expected utilities to determine the incumbent's optimal first-period allocation. $q < \frac{1}{\overline{m}}$ implies that $E[g_1] < a_1$, such that a politician of either type allocates $a_1 = 0$.

Second, suppose that $q \in [\frac{1}{\overline{m}}, \frac{\gamma}{\underline{m}})$ and consider the following strategy and belief profile: a politician of type $\theta = \overline{\theta}$ allocates $a_1 = a_2 = 1$ while a politician of type $\theta = \underline{\theta}$ allocates $a_1 = a_2 = 0$; the bureaucrat exerts effort proportional to m in each period; the voter votes to re-elect if $E[u_2^V(i)] \geq E[u_1^V(c)]$; and $\mu(q) = \frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)0} = 1$ while $\mu(0) = \frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+1-\pi}$, both of which follow from Bayes' rule. For any $g_t \in (0, q)$ (off path), the voter believes the politician to be an incompetent type, i.e. $\mu = 0$. The bureaucrat's equilibrium effort follows from inspection

of Equation 1. The voter's choice is optimal given her posterior belief and Equation 9. The equilibrium second-period allocation strategies follow from inspection of Equation 7. Denoting equilibrium allocation strategy, $\mathbf{a}$, a politician of type $\theta = \overline{\theta}$ will not deviate from $a_1 = 1$ to $a_1 = 0$ since $\overline{m}q + (\overline{m}\tau(1, \mathbf{a}) + (1 - \overline{m})\tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+1-\pi}, \mathbf{a}))\overline{m}q > 1 + \tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+1-\pi}, \mathbf{a})\overline{m}q$. A politician of type $\theta = \underline{\theta}$ will not deviate to allocate $a_1 = 1$ to increase her chances of re-election under the following condition:

$$1 + \tau\left(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+1-\pi}, \mathbf{a}\right) > \underline{m}q + \underline{m}\tau(1, \mathbf{a}) + (1-\underline{m})\tau\left(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+1-\pi}, \mathbf{a}\right)$$
$$\Rightarrow q < \frac{2b(1-\overline{m}\pi)}{\underline{m}(2b(1-\overline{m}\pi) + \overline{m}(1-\phi)} = \frac{\gamma}{\underline{m}}$$

Third, suppose that $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{\gamma}{\underline{m}}\}, \frac{1}{\underline{m}}\right)$ and consider the following and consider the following strategy and belief profile: a politician of type $\theta = \overline{\theta}$ allocates $a_1 = a_2 = 1$ while a politician of type $\theta = \underline{\theta}$ allocates $a_1 = 1$ and $a_2 = 0$; the bureaucrat exerts effort proportional to m in each period; the voter votes to re-elect if $E[u_2^V(i)] \geq E[u_1^V(c)]$; and $\mu(q) = \frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}}$ while $\mu(0) = \frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}$, both of which follow from Bayes' rule. For any $g_t \in (0, q)$ (off path), the voter believes the politician to be an incompetent type, i.e. $\mu = 0$. The bureaucrat's equilibrium effort follows from inspection of Equation 1. The voter's choice is optimal given her posterior belief and Equation 9. The equilibrium second-period allocation strategies follow from inspection of Equation 7. Denoting equilibrium allocation strategy, $\mathbf{a}$, a politician of type $\theta = \overline{\theta}$ will not deviate from $a_1 = 1$ to $a_1 = 0$ since $\overline{m}q + (\overline{m}\tau(\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}}, \mathbf{a}) + (1-\overline{m})\tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}, \mathbf{a}))\overline{m}q > 1 + \tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}, \mathbf{a})\overline{m}q$. A politician of type $\theta = \underline{\theta}$ will not deviate to allocate $a_1 = 0$ to increase her first-period utility under the condition:

$$\underline{m}q + \underline{m}\tau\left(\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}}, \mathbf{a}\right) + (1-\underline{m})\tau\left(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}, \mathbf{a}\right) > 1 + \tau\left(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}, \mathbf{a}\right)$$

Solving for q [to be written out, sorry], it can be shown that $q < \frac{\gamma}{\underline{m}}$ which is sufficient for the condition to hold for any $q \in [\max\{\frac{1}{\overline{m}}, \frac{\gamma}{\underline{m}}\}, \frac{1}{\underline{m}})$.

Finally, suppose that $q \geq \frac{1}{\underline{m}}$ and consider the following strategy and belief profile: politicians of both types allocate $a_1 = a_2 = 1$; the bureaucrat exerts effort proportional to m in each period; this yields no public goods $g_t = 0 \forall t$; the voter votes to re-elect if $E[u_2^V(i)] > E[u_1^V(c)]$; and $\mu(q) = \frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}}$ while $\mu(0) = \frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}$, both of which follow from Bayes' rule. For any $g_t \in (0, q)$ (off path), the voter believes the politician to be an incompetent type, i.e. $\mu = 0$. The bureaucrat's equilibrium effort follows from inspection of Equation 1. The voter's choice is optimal given her posterior belief and Equation 9. The equilibrium second-period allocation strategies follow from inspection of Equation 7. Denoting equilibrium allocation strategy, $\mathbf{a}$, a politician of type $\theta = \overline{\theta}$ will not deviate from $a_1 = 1$ to $a_1 = 0$ since $\overline{m}q + (\overline{m}\tau(\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}}, \mathbf{a}) + (1-\overline{m})\tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}, \mathbf{a}))\overline{m}q > 1 + \tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}, \mathbf{a})\overline{m}q$. Similarly, a politician of type $\theta = \underline{\theta}$ will not deviate to $a_1 = 0$ since $\underline{m}q + (\underline{m}\tau(\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}}, \mathbf{a}) + (1-\underline{m})\tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}, \mathbf{a}))\underline{m}q > 1 + \tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}, \mathbf{a})\underline{m}q$. ■

Proof of Proposition 3

Differentiate $\tau(\mu, \mathbf{a})$, the probability of re-election by μ:

$$\frac{d\tau(\mu, \mathbf{a})}{d\mu} = \frac{E[g(a_2|\theta = \overline{\theta})] - E[g(a_2|\theta = \underline{\theta})]}{2b} > 0$$

This expression is strictly positive given that $\overline{m} > \underline{m}$ and the optimal second-period allocations in Equation 7. Since re-election is increasing in μ and the probability that a challenger is competent is π in all cases, if $E[\mu|\theta = \overline{\theta}] > E[\mu|\theta = \underline{\theta}]]$, it must be the case that competent incumbents are re-elected at with higher probability than incompetent incumbents. I show the four cases defined in Proposition 2:

1. $q < \frac{1}{\overline{m}}$:

$$E[\mu|\theta = \overline{\theta}] = \pi$$
$$E[\mu|\theta = \underline{\theta}] = \pi$$

   Thus, $E[\mu|\theta = \overline{\theta}] = E[\mu|\theta = \underline{\theta}]$.

2. $q \in [\frac{1}{\overline{m}}, \frac{\gamma}{\underline{m}})$ and $\frac{1}{\overline{m}} < \frac{\gamma}{\underline{m}}$:

$$E[\mu|\theta = \overline{\theta}] = \overline{m} + (1 - \overline{m})\frac{\pi - \pi\overline{m}}{1 - \pi\overline{m}}$$
$$E[\mu|\theta = \underline{\theta}] = \frac{\pi - \pi\overline{m}}{1 - \pi\overline{m}}$$

   Thus, $E[\mu|\theta = \overline{\theta}] > E[\mu|\theta = \underline{\theta}]$.

3. $q \in [\max\{\frac{1}{\overline{m}}, \frac{\gamma}{\underline{m}}\}]$:

$$E[\mu|\theta = \overline{\theta}] = \overline{m}\frac{\pi\overline{m}}{\pi\overline{m} + (1 - \pi)\underline{m}} + (1 - \overline{m})\frac{\pi(1 - \overline{m})}{\pi(1 - \overline{m}) + (1 - \pi)\pi(1 - \underline{m})}$$
$$E[\mu|\theta = \underline{\theta}] = \underline{m}\frac{\pi\overline{m}}{\pi\overline{m} + (1 - \pi)\underline{m}} + (1 - \underline{m})\frac{\pi(1 - \overline{m})}{\pi(1 - \overline{m}) + (1 - \pi)\pi(1 - \underline{m})}$$

   Because $\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}} > \frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)\pi(1-\underline{m})}$, $E[\mu|\theta = \overline{\theta}] > E[\mu|\theta = \underline{\theta}]$.

4. $q > \frac{1}{\underline{m}}$:

$$E[\mu|\theta = \overline{\theta}] = \overline{m}\frac{\pi\overline{m}}{\pi\overline{m} + (1 - \pi)\underline{m}} + (1 - \overline{m})\frac{\pi(1 - \overline{m})}{\pi(1 - \overline{m}) + (1 - \pi)\pi(1 - \underline{m})}$$
$$E[\mu|\theta = \underline{\theta}] = \underline{m}\frac{\pi\overline{m}}{\pi\overline{m} + (1 - \pi)\underline{m}} + (1 - \underline{m})\frac{\pi(1 - \overline{m})}{\pi(1 - \overline{m}) + (1 - \pi)\pi(1 - \underline{m})}$$

   As in Case #3, $E[\mu|\theta = \overline{\theta}] > E[\mu|\theta = \underline{\theta}]$.

When $q < \frac{1}{m}$, $E[\mu|\theta = \overline{\theta}] = E[\mu|\theta = \underline{\theta}]]$ so that competent and incompetent types are re-elected at an equal rate, which implies that the probability that a second-period incumbent is competent is π. When $q \geq \frac{1}{m}$, $E[\mu|\theta = \overline{\theta}] \geq E[\mu|\theta = \underline{\theta}]]$ implies that competent types are re-elected at higher rates than incompetent types which is sufficient to ensure that the second-period incumbent is competent with some probability greater than π. ■

Proof of Proposition 4

Follows directly from Proposition 1 and 2.

Proof of Proposition 5

(To be completed.)