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? In turn, how do these re-election incentives shape politicians' allocation of funds to public goods provision or rents? 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 investment in public goods and reduces voters' ability to discern politician type. Moreover, at low levels of bureaucratic quality, the model's implications are observationally equivalent at any level of 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 systematic evidence that citizens respond by sanctioning underperforming or rewarding high-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. This model is consistent with the implied equilibrium absent information in Ferraz and Finan (2008), Humphreys and Weinstein (2012), and Dunning et al. (2019), among others. 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

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

fortunes, so politicians maximize their 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). 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 rare in theories of electoral accountability.[2] 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 an incompetent politician, rendering the a competent type's allocation toward public goods more efficient. The voter observes the public goods output, and updates their

[2]But see Fox and Jordan (2011), Yazaki (2018) and Li, Sasso, and Turner (2019).

belief about a politician's type. The voter then decides whether or not to retain the incumbent for a second period or elect a challenger.

I characterize the perfect Bayesian equilibria as a function of voter information, specifically whether the voter observes first period public goods outputs (the signal) or not. 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 otherwise do so. However, at low levels of bureaucratic quality, public goods remain inefficient to produce, and neither type of politician funds the 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. It 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. Joining Yazaki (2018); Li, Sasso, and Turner (2019), the model posits 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 such as Fox and Jordan (2011) 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). 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). These studies do not ascribe a role to bureaucrats in the study of accountability. In one notable exception to this literature, Raffler and Martin (2019) argue the co-production of public goods by bureaucrats and politicians leads voters to update less about politicians. I show that this finding is not general across the parameter space; under some conditions, reliance on bureaucrats to produce public goods can actually *improve* voter information and thus political selection.

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 over two periods (terms). In each period, the politician and bureaucrat jointly produce public goods that are observed (or unobserved) 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.[3] Specifically, a

[3]There may be statutory regulations that constrain or empower the politician to take action. I abstract from these

competent politician monitors the bureaucrat at intensity $\overline{m}$ while an incompetent politician monitors 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 ($1 - a_t$). I assume a binary decision, i.e. $a_t \in \{0, 1\}$.[4] In the benchmark and baseline models, I treat the quality of the bureaucracy, $q > 1$ as exogenous. This quality measure captures the expertise or qualification of a representative individual working in the public sector and levels of staffing. While bureaucratic quality may an outcome of policies pursued by a politician, I assume that quality is slow-moving and requires sustained investment to realize changes (Rauch, 1995; Huber and Ting, 2015).

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

considerations at the moment, but they could be modeled as the product of m and some variable capturing the statutory environment.

[4]Given that the politician's utility is linear in a_t, if $a_t \in [0, 1]$, the results are identical because the optimal allocation decision is always at a corner. However, additional out of equilibrium beliefs are necessary if the strategy space for a_t is continuous.

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:

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

In order to understand the role of voter information in generating results, I assume that the voter observes first-term public goods with probability $p \in [0, 1]$. As such, the voter observes (resp. does not observe) first-term public goods provision and forms a posterior belief about the politician's type, $\mu(g_1)$. Setting $p = 0$ allows for characterization of equilibria "without accountability," which I interpret as broadly consistent with assertions that voters are uninformed about politician performance or public goods outputs (see anecdotes throughout Dunning et al., 2019). As such, varying p allows for examination of the effect of increasing voter information, and ostensibly accountability

[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.

pressures.

The voter values consumption of the public good (whether or not they observe it) 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:

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

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

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. With probability p, the voter observes g_1, and 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 else, the challenger 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 else, the bureaucrat exerts effort e_1 to produce the public good g_1.

I characterize the Perfect Bayesian Equilibria (PBE) 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, $g_1 : \{0, 1\} \times \mathbb{R}_+ \to \{0, q\}$, maps the budget allocation and bureaucratic effort into a public goods output observed by all players. Voters' update beliefs $\mu : \{0, 1\} \times \mathbb{R}_+ \times 0, q \to [0, 1]$ and the voter's strategy is a mapping $v : \{0, 1\} \times \mathbb{R}_+ \times \{0, q\} \times [0, 1] \to \{i, c\}$. The second period incumbent's allocation strategy is a mapping $a_2 : \{0, 1\} \times \mathbb{R}_+ \times \{0, q\} \times [0, 1] \times \{i, c\} \to \{0, 1\}$. Finally, second period bureaucratic effort and public goods production represents the mapping: $e_2 : \{0, 1\} \times \mathbb{R}_+ \times \{0, q\} \times [0, 1] \times \{i, c\} \times \{0, 1\} \to \mathbb{R}_+$ and public goods provision represents the mapping $g_2 : \{0, 1\} \times \mathbb{R}_+ \times \{0, q\} \times [0, 1] \times \{i, c\} \times \{0, 1\} \times \mathbb{R}_+ \to \{0, q\}$.

As in many signaling games, there exist multiple equilibria in some regions of the parameter space. I invoke the intuitive criterion refinement (Cho and Kreps, 1987). Under this refinement, the equilibrium characterized here is unique.

3 Results

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. The assumption counters notions that a high-quality bureaucracy insulates outputs from the follies of bad (here, incompetent) politicians. Instead, the model develops an alternate mechanism for the insulation afforded by high-quality bureaucrats focusing on a politician's allocation decisions.

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:

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

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. On the other hand, when q is sufficiently high, both types will fund public goods. The efficiency gains in the provision of public goods from a high-quality bureaucracy thus induce both types of politician to fund public goods, insulating outputs (to some extent) from incompetent politicians.

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 voting decision, recall that the voter observes g_1 with probability p. With probability $1-p$, the voter does not observe g_1. Consider the latter case first. Consistent with descriptive accounts, it may be the case that voters do not observe g_1 due to lack of attention to or access to media. In this case, $\mu = \pi$, which follows (trivially) from Bayes' rule. If voters do not update, a politician's re-election fate is not a function of her first-period allocation decision. As such, the politician maximizes her utility by adopting the same allocation strategy in both periods, always adopting the optimal allocation strategy given by Equation 7. Thus, following Equation 9, the probability of re-election is $\tau(\pi, \mathbf{a}) = \frac{1}{2}$.

In the case that voters do observe g_1, they are able to update their beliefs on the basis of

observed outputs per Bayes' rule. However, at different levels of bureaucratic quality, the signal offered by the realization of public goods differs in its informativeness. Politicians choose their first period allocation behavior on the basis of the efficiency with which a public good could be produced combined with their anticipated prospects for re-election.

Proposition 1. ***Equilibrium*** *In the unique perfect Bayesian equilibrium:*

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

(ii) If $q \in \left[\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\right)$*, 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 $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\}, \frac{1}{\underline{m}}\right)$*, a competent-type politician allocates* $a_1 = a_2 = 1$ *while an incompetent-type politician 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.*

Consider the four cases in Proposition 1. 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. If $p = 1$, 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 – even with informed voters – is $\frac{1}{2}$. As such, optimal allocation strategies, posterior beliefs, and re-election rates are identical regardless of whether the voter observes public goods. This equilibrium is supported by a voter's off-path beliefs that, upon observation of a non-zero public goods output, the voter believes the politician to be of the competent type with certainty.[6] Note that 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. This rules out any equilibrium in which the competent type invests in public goods in only the first period.

In the second case, $q \in \left[\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\right)$. In this interval, the competent type of politi-

[6]Note that these off-path beliefs eliminate equilibria in which neither politician contributes to the public good in the first period in other regions of the parameter space.

cian can provide public goods efficiently while the incompetent type cannot, as $E[g_1|\theta = \overline{\theta}] > 1$ and $E[g_1|\underline{m}|\theta = \underline{\theta}] < 1$. Consider the voter's beliefs and voting strategy. When the voter observes g_1, they learns from its realization. If they observe $g_1 = q$, the voter knows that the politician is a competent type, $\mu = 1$. In contrast, 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, when a voter observes public goods ouputs, competent type politicians are re-elected at a probability strictly greater than the incompetent type. In this interval, thus, accountability improves (from the perspective of voter welfare) the selection of politicians. Importantly, this parameter space can be empty. Many empirical studies start from an assumption of the existence of a separating equilibrium; the theoretical analysis suggests that this assumption may not obtain.

In the third case, when $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\}, \frac{1}{\underline{m}}\right)$, the incompetent type politician pools with the competent type politician in the first period, allocating her budget to the public good, but shirks in the second period allocating nothing to public goods provision. Note that this equilibrium exists only when the voter (sometimes) observes public goods outputs. If the voter were never to observe outputs ($p = 0$), it is easy to verify that this interval would be empty. When $p > 0$, accountability pressures induce an incompetent incumbent to allocate funds to public goods in the first period when she would not otherwise do so in this interval. If the voter observes that the public good has materialized, they update their belief to $\mu = \frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}} > \pi$; if the public good does not materialize, the voter updates their 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 a 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 whenever $p > 0$. However, because of fears that a second-period incompetent-type will shirk, this case generates an incumbency *dis*advantage (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, regardless of how observant the voter is (the value of p). However, it is more likely that a competent politician induces the bureaucracy to produce the public

good given her investment. If the voter observes the public good, their posterior beliefs (under each realization of g_1) are identical to the previous case (with information). 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.

As is standard in political accountability models, the inclusion of a voter that learns from observation of first-period public goods introduces two mechanism through which the equilibrium changes relative to model where the voters is uninformed (Fearon, 1999). First, the voter updates on politician type and their resultant voting strategy re-elects competent politicians at weakly higher rates than incompetent politicians. Second, these changes in the likelihood of re-election change a incompetent-type politician's first-period allocation strategy to fund public goods when they would not otherwise do so in some intervals of the parameter space. However, these manifestations of accountability do not manifest in every case of the equilibrium. Given the empirical focus on the voter's beliefs and re-election decisions later in this paper, I state the result on political selection in Proposition 2.

Proposition 2. ***Bureaucratic quality and political selection***. *At low levels of bureaucratic quality, $q < \frac{1}{m}$, the probability that the second-period incumbent is a competent type is π for any $p \in [0, 1]$. When $q \geq \frac{1}{m}$, the probability that a second-period incumbent is a competent type is strictly greater than π if $p > 0$, and increases in p.*

3.1 Observational Equivalence

Examination of how variation in p – the likelihood that voters observe public goods outputs – changes in the equilibrium characterized in Proposition 1 suggests that researchers' ability to observe behavior and beliefs consistent with the two accountability mechanisms depends on bureaucratic quality. I consider the cases in which equilibrium actions and beliefs are observationally equivalent in Proposition 3.

Proposition 3. ***Observational Equivalence*** *In the PBE characterized in Proposition 1:*

(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 for any* $p \in [0, 1]$.

(ii) If $q \notin \left[\max\{\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\}, \frac{1}{\underline{m}}\right)$*, the optimal allocation strategy for an incumbent of either type is observationally equivalent for any* $p \in [0, 1]$.

Proposition 3 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 accrues rents from office at the expense of public goods because voters are not watching. Proposition 3 suggests that politicians that value public goods may 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, if voters observe public goods performance, they 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.

3.2 Co-Production, Information, and Voter Welfare

This paper focuses on the conditions under which varying bureaucratic capacity can obscure our ability to diagnose accountability failures across contexts. Yet, it also provides implications about when the co-production of public goods by politicians and bureaucrats may hinder or facilitate selection or moral hazard of politicians. To study these effects of co-production, I compare a model in which the voter observes politician first-period allocation behavior (a_1) to the main model in which the voter observes public goods outputs (g_1). The model in which observe politician allocation behavior directly removes a source of randomness – whether or not public goods are executed by the bureaucrat. As such, in a separating equilibrium, the politician's type is fully revealed to the voter.

Proposition 4. *In the unique Perfect Bayesian Equilibrium:*

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

(ii) If $q \in \left[\frac{1}{\overline{m}}, \frac{2b}{\underline{m}(2b+p\overline{m})}\right)$, 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 $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{2b}{\underline{m}(2b+p\overline{m})}\}, \frac{1}{\underline{m}}\right)$, 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.

The equilibrium characterized in Proposition 4 is substantively quite similar to the equilibrium characterized in 1, but the direction and magnitude of (voter) welfare effects of learning about politician action versus public goods outputs depend crucially on bureaucratic quality. First, consider the effect of co-production on the moral hazard of the politician. Note that in the main model, the moral hazard of the politician can be overcome by accountability pressures at intermediate levels of bureaucratic quality, where public goods production efficient for only the competent type. Proposition 5 demonstrates that the parameter space in which the incompetent type can be induced with the competent type in period one weakly expands when voters observe allocation behavior instead of outputs. Logically, since the bureaucrat's effort adds noise to the production of the pub-

lic good, when public goods are observed, the politician's type is not fully revealed to the voter in the instance that public goods are not realized. If a politician's allocation is observed directly, the voter learns the politician's type with certainty. This increase in voter learning creates stronger incentives for this pooling.

Proposition 5. ***Co-Production and Moral Hazard of the Politician*** *Comparing the minimum threshold of q, bureaucratic quality, at which an incompent-type politician funds public goods in the first period, the threshold is weakly higher when a voter (potentially) observes public goods outputs than when a voter (potentially) observes the politician's allocation decision directly.*

I now consider the effects of bureaucratic co-production on the selection of politicians. For this analysis, I compare the difference in *ex-ante* re-election rates of each type, $\tau(\mu, \mathbf{a}|\theta = \overline{\theta}) - \tau(\mu, \mathbf{a}|\theta = \underline{\theta})$ between the two models. Given that the challenger is competent with probability π, greater differences in re-election rates imply a higher concentration of competent types in the second period.

Proposition 6. ***Co-Production and Political Selection*** *Voter observation of public goods outputs output as opposed to a politician's first-period allocation behavior:*

(i) Does not impact political selection in intervals in which $a_1 = 0$ for all θ.

(ii) Reduces the difference between the competent and incompetent type's respective probabilities of re-election in intervals where $a_1 = 1$ for $\theta = \overline{\theta}$ and $a_1 = 0$ for $\theta = \underline{\theta}$.

(iii) Increases the difference between the competent and incompetent type's respective probabilities of re-election in intervals where $a_1 = 1$ for all θ.

This analysis suggests that bureaucratic co-production of public goods can weaken or enhance the voter's ability to select competent politicians. Consistent with Raffler and Martin (2019), in a separating equilibrium, the noise in the mapping from a politician's allocation to the public goods generated by bureaucrats reduces a voter's ability to select competent types. However, in contrast to the argument in Raffler and Martin (2019), in any pooling equilibrium in which both types of politicians allocate funds to public goods in the first period, complementarities between

politician competence and bureaucratic effort imply that voters can select better politicians when they observe outputs. This occurs because, in the case of a pooling equilibrium, observation of outputs provides the voter with information about the politician's type.

4 Empirical Implications, Sketch of Research Design

The theory forwarded in this paper posits that so-called "accountability failures" often attributed to developing democracies can be rooted in challenges of implementation, rather than uninformed voters (at least in isolation). The equilibrium implications of the theory are consistent with some well-known macro empirical patterns, typically described cross-nationally. The correlation between bureaucratic quality and corruption by politicians generally strong and negative: politicians extract more when bureaucratic quality is low. Further, public goods provision is positively correlated with bureaucratic quality. Figure 1 depicts these correlations graphically.

While there exist many plausible explanations for these patterns and possible concerns about measurement, one merit of the cross-national analysis vis-a-vis a "tighter" study in a single locale is that there arguably exists wider variation in bureaucratic quality across settings. To the extent that we do not know the empirical analogue to the intervals characterized in Proposition 1, assertions of accountability failures or, conversely, falsification of the present model are hampered by the problems of observational equivalence described in Proposition 3, when tested in a single context. Given these concerns, in this research design, I propose to leverage existing studies across contexts to examine the empirical implications of the present model.

Much recent empirical literature emphasizes the study of the effects of exogenous manipulations to voters' information environment in the runup to elections. In terms of the model, these manipulations can be thought of as efforts to increase p, and are both experimental (e.g., Dunning et al., 2019) and observational (e.g., Ferraz and Finan, 2008). I identify 17 unique studies conducted in 8 countries. Such manipulations should be thought of as evaluating some partial equilibrium implications of the theory. Absent politician foresight that voter information would be manipulated when making policy decisions, such research designs effectively take equilibrium

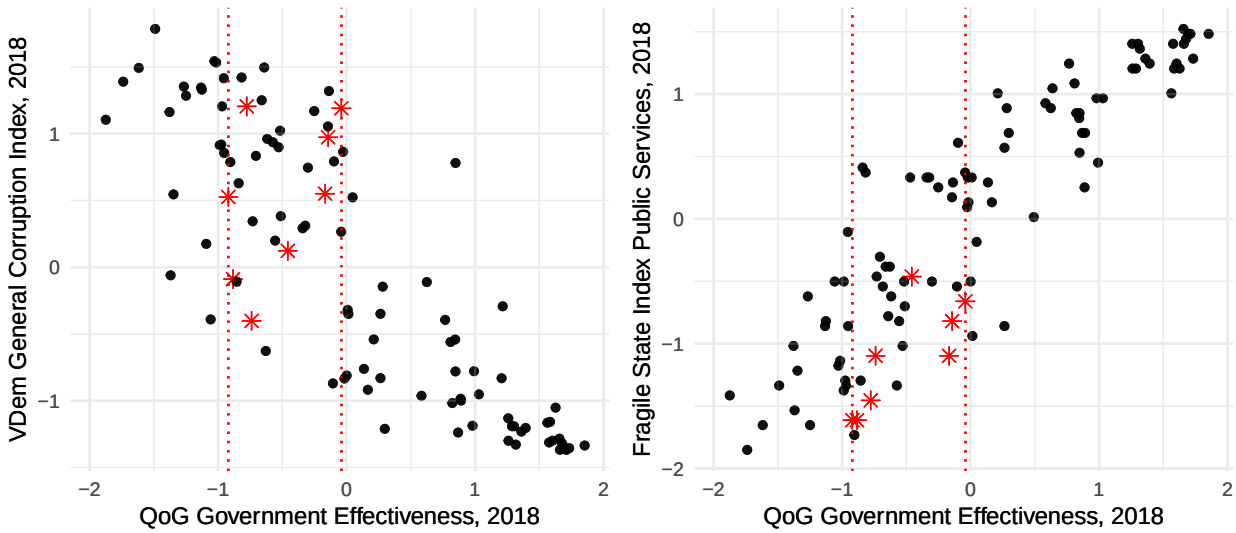

Figure 1: Correlations between bureaucratic quality (x-axes) and corruption (y-axis, left panel) and public service provision (y-axis, right panel). All measures are standardized to the set of democracies (defined by the Quality of Government dataset), such that all measures are z-scores. The red dots indicate countries in which I identify accountability experiments/natural experiments.

politician (and bureaucrat) actions as given, changing voter beliefs and voting behavior by increasing the likelihood that a voter observes politician performance in "partial equilibrium" fashion, parameterizezed as incrementing p to some $\tilde{p} \in (p, 1]$.

Table 1 organizes one set of theoretical predictions about voter beliefs in accordance with these research designs. First, the vertical panels examine predictions about voter posterior beliefs at different levels of bureaucratic quality under the baseline model.[7] The horizontal panels clarify two different types of treatments: those that reveal public goods outcomes (left main panel), and those that reveal allocation behavior of the politician, typically in the form of corruption or fund misallocation disclosure (right main panel). These research designs manipulate the *disclosure* of information, increasing the probability that the voter observes the signal p to $\tilde{p}$. However, they do not alter the quality of the signal itself. Most researchers disaggregate by the quality of the signal, into "good" or "bad" news, in line with recommendations by Izzo, Dewan, and Wolton (2019).

In recent years, some scholars have begun to aggregate the results of harmonized (Dunning et al., 2019) or similar (Incerti, 2019) studies studies in meta-analyses. In general, these studies aim

[7] I assume that the equilibrium behavior of the politician is in line with the baseline model, regardless of which signal is randomly provided to voters.

		Outputs are Revealed		Allocation is Revealed	
		"Bad news"	"Good news"	"Bad news"	"Good news"
q	Cond.	$\mu \mid g_1 = 0$	$\mu \mid g_1 = q$	$\mu \mid a_1 = 0$	$\mu \mid a_1 = 1$
Low	C	π	(Off path: $p + (1-p)\pi$)	π	(Off path: $p + (1-p)\pi$)
	T	π	(Off path: $\widetilde{p} + (1-\widetilde{p})\pi$)	π	(Off path: $\widetilde{p} + (1-\widetilde{p})\pi$)
	Δ	0	(Off path: $(\widetilde{p} - p)(1-\pi)$)	0	(Off path: $(\widetilde{p} - p)(1-\pi)$)
Med.	C	$p\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+1-\pi} + (1-p)\pi$	$p + (1-p)\pi$	$(1-p)\pi$	$p + (1-p)\pi$
	T	$\widetilde{p}\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+1-\pi} + (1-\widetilde{p})\pi$	$\widetilde{p} + (1-\widetilde{p})\pi$	$(1-\widetilde{p})\pi$	$\widetilde{p} + (1-\widetilde{p})\pi$
	Δ	$(\widetilde{p} - p)(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+1-\pi} - \pi)$	$(\widetilde{p} - p)(1-\pi)$	$-(\widetilde{p} - p)\pi$	$(\widetilde{p} - p)(1-\pi)$
High	C	$p\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})} + (1-p)\pi$	$p\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}} + (1-p)\pi$	(Off path: $(1-p)\pi$)	π
	T	$\widetilde{p}\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})} + (1-\widetilde{p})\pi$	$\widetilde{p}\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}} + (1-\widetilde{p})\pi$	(Off path: $(1-p)\tilde{\pi}$)	π
	Δ	$(\widetilde{p} - p)(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})} - \pi)$	$(\widetilde{p} - p)(\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}} - \pi)$	(Off path: $-(\tilde{p} - p)\pi$)	0

Table 1: Mapping of research designs to model predictions about beliefs. As in the model, q measures bureaucratic quality: low, medium, and high values correspond to cases (i), (ii), and (iii)-(iv) from Proposition 1, respectively. The conditions correspond to **C**ontrol (no informational treatment), **T**reatment, and the difference ($\Delta = T - C$). The panels represent distinct treatments used in the literature. "Good" and "bad" news follows definitions in (Dunning et al., 2019). Finally, $\widetilde{p}$ is the probability that the voter observes the signal when assigned to treatment.

to estimate the intent-to-treat effect (ITT) of exogenous information provision to voters on voter beliefs and voting behavior (self-reported vote choice or vote shares) across studies. Depending on the estimator – generally random effects or fixed effects meta-analysis – the estimates are (some form of) average across the component study ITT effects. In examining existing efforts to leverage information across sites, the model forwarded in this paper yields three immediate observations:

1. *Attenuation:* Meta-analytic intent-to-treat estimates represent an average of effects across studies. Inclusion of studies conducted at varying levels of bureaucratic capacity will generally attenuate the ITT of information provision toward 0, whether information is "good news" or "bad news." This can be seen by considering a weighted average of the Δ's in Table 1.

2. *Non-random sampling of sites:* Accountability experiments have been conducted in countries with low-to-moderate levels of bureaucratic quality. Figure 1 suggests that all studies have been conducted in countries that are below the average of democratic countries in terms of bureaucratic quality (between the dashed vertical lines).

3. *Heterogeneous treatments:* As is clarified in the comparison of the baseline model where informed voters observe public goods to the modified version of the model where voters

observe politician action, the two modal informational treatments in accountability experiments, output information and corruption (allocation) information, are distinct. This is also evident from comparison of the two vertical panels of Table 1.

I propose a different approach to aggregating the findings of these studies in line with the model proposed here. One immediate challenge common to this endeavor and existing endeavors is that the data collected across sites varies substantially in terms of what variables are measured. The inputs for two-stage meta-analysis estimators are simply reduced-form ITT estimates and standard errors.[8] The current project is to understand whether, assuming the common underlying theoretical model, we can go from a set of (approximately) harmonized reduced-form estimates – the "lowest common denominator" of the existing data – to estimate some structural parameters of the underlying model. Obviously any identification (in a structural sense) depends on having a sufficient number of studies (estimates) relative to the parameters being estimated. In principle, this approach to estimation, if feasible, responds to observations #1 and #3 above.

One requirement for any re-analysis of existing studies is the need for a comparative bureaucratic quality measure. The measure in Figure 1 from Quality of Governance is a relatively noisy, compound measure assessed at the national level. Many of the studies, especially those outside of Africa, examine subnational governance, where there (typically) exists high variance in quality. In some settings – Mexico and Brazil – there exist data on personnel and contracting that could be used to construct within-site measures of bureaucratic quality. More comparably, measures of educational attainment speak to characteristics of local labor markets from which local bureaucrats are selected, though these measures are may also reflect variation in politician quality and possibly baseline voter information. Any ideas are welcome here. Note that developing this measure does not address the selection into accountability study concern described above # 2 above, which remains a fundamental limitation of building from existing studies.

One alternative approach is to study a smaller subset of studies where better data is available and use the model to identify variation in response to information *within* a study. The studies

[8]For a one-stage estimator like that employed in (Dunning et al., 2019), the inputs are (minimally) an outcome vector, a treatment assignment vector, and site fixed effects.

Mexico and Brazil serve as prime candidates for two reasons. First, there exists fairly rich administrative data on bureaucratic quality and outputs, which provides variation to exploit *within* each study. Second, there is arguably relatively extreme variation in the quality of local bureaucracies across much of Latin America. Whether there exist sufficiently "high quality" bureaucracies in any locality remains an open empirical question.

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 examining 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.

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Appendices

A Proofs

(These are incomplete and unedited.)

Proof of Proposition 1

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 $g_t = 0 \forall t$; if the voter observes $g_1 = 0$, her posterior is $\mu(g_t = 0) = \pi$ whereas if they do not observe g_1, $\mu = \pi$; the voter votes to re-elect if $E[u_2^V(i)] \geq E[u_1^V(c)]$. 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 voter's posterior belief $\mu = \pi$, $\tau(\pi, \mathbf{a}) = \frac{1}{2}$. $q < \frac{1}{\overline{m}}$ implies that $E[g_1] < a_1 \forall \theta$, such that a politician of either type allocates $a_1 = 0$. The equilibrium is supported by the off-path belief that upon observation of any $g_1 > 0$, $\mu = 1$. The competent type cannot profitably deviate by allocating $a_1 = 1$ because:

$$1 + p\tau(\pi, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a}) > \overline{m}q + p\tau(1, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a})$$

Note that in this region, $\overline{m}q < 1$ and $\tau(\mu, \mathbf{a}) = \frac{1}{2} \forall \mu$ when $a_1 = a_2 = 0 \forall \theta$. As $\overline{m} > \underline{m}$, it thus holds that the incompetent type cannot profitably deviate by allocating $a_1 = 1$.

Second, suppose that $q \in \left[\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\right)$ 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 the voter's beliefs are as follows:

- If the voter does not observe g_1, $\mu = \pi$;
- Upon observation that $g_1 = q$, $\mu(q) = 1$;
- Upon observation that $g_1 = 0$, $\mu(0) = \frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+1-\pi}$.

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:

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

This condition clearly obtains for any $q \in \left[\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\right)$ since $\overline{mq} > 1$ and $\tau(1, \mathbf{a}) > \tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+1-\pi}, \mathbf{a})$. A politician of type $\theta = \underline{\theta}$ cannot profitably deviate to allocate $a_1 = 1$ to

increase her chances of re-election when:

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

Third, suppose that $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\}, \frac{1}{\underline{m}}\right)$ 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 the voter's beliefs are as follows:

- If the voter does not observe g_1, $\mu = \pi$;
- Upon observation that $g_1 = q$, $\mu(q) = \frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}}$;
- Upon observation that $g_1 = 0$, $\mu(0) = \frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}$.

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, **a**, a politician of type $\theta = \overline{\theta}$ will not deviate from $a_1 = 1$ to $a_1 = 0$ since:

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

This inequality holds for any $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\}, \frac{1}{\underline{m}}\right)$ given that $\overline{m}q > 1$ and $\tau(\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}}, \mathbf{a}) > \tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m}}, \mathbf{a})$. A politician of type $\theta = \underline{\theta}$ cannot profitably deviate by allocating $a_1 = 0$ if:

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

Solving for q [to be written out, sorry], it can be shown that this condition holds for any $q > \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}$, which is sufficient for the condition for the inequality to hold for any $q \in [\max\{\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\}, \frac{1}{\underline{m}})$

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 the voter's beliefs are as follows:

- If the voter does not observe g_1, $\mu = \pi$;
- Upon observation that $g_1 = q$, $\mu(q) = \frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}}$;
- Upon observation that $g_1 = 0$, $\mu(0) = \frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}$.

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, **a**, a politician of type $\theta = \underline{\theta}$ will not deviate from $a_1 = 1$ to $a_1 = 0$ since:

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

This inequality holds for any $q \geq \frac{1}{\underline{m}}$ because $\underline{m}q > 1$ and $\tau(\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}}, \mathbf{a}) > \tau(\frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)(1-\underline{m})}, \mathbf{a})$. This is condition, combined with the parametric assumption that $\overline{m} > \underline{m}$, is sufficient to ensure that a politician of type $\theta = \overline{\theta}$ similarly does not deviate. ■

Proof of Proposition 2

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 weakly positive given that $\overline{m} > \underline{m}$ and Equation 7. Since re-election is increasing in μ and the probability that a challenger is competent is π in all cases, if $E[\mu|\theta = \overline{\theta}] - E[\mu|\theta = \underline{\theta}]] > 0$, it must be the case that competent incumbents are re-elected at with higher probability than incompetent incumbents. I consider the four cases defined in Proposition 1:

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

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

   Thus, $E[\mu|\theta = \overline{\theta}] - E[\mu|\theta = \underline{\theta}] = 0$.

2. $q \in [\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))})$:

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

   Thus, $E[\mu|\theta = \overline{\theta}] - E[\mu|\theta = \underline{\theta}] = p\overline{m}(1 - \frac{\pi-\pi\overline{m}}{1-\pi\overline{m}}) > 0$. $\frac{\partial E[\mu|\theta=\overline{\theta}]-E[\mu|\theta=\underline{\theta}]}{\partial p} = \overline{m}(1 - \frac{\pi-\pi\overline{m}}{1-\pi\overline{m}}) > 0$.

3. $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\}, \frac{1}{\underline{m}}\right)$:

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

Thus, $E[\mu|\theta=\overline{\theta}] - E[\mu|\theta=\underline{\theta}] = p(\overline{m}-\underline{m})(\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}} - \frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)\pi(1-\underline{m})}) > 0$. $\frac{\partial E[\mu|\theta=\overline{\theta}]-E[\mu|\theta=\underline{\theta}]}{\partial p} = (\overline{m}-\underline{m})(\frac{\pi\overline{m}}{\pi\overline{m}+(1-\pi)\underline{m}} - \frac{\pi(1-\overline{m})}{\pi(1-\overline{m})+(1-\pi)\pi(1-\underline{m})}) > 0$.

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

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

This is identical to Case #3.

If $q < \frac{1}{\overline{m}}$, $E[\mu|\theta=\overline{\theta}] - E[\mu|\theta=\underline{\theta}] = 0$ and $\tau(\pi, \mathbf{a} = \frac{1}{2}$ implies that the probability that a second-period incumbent is competent is $\pi \forall p$. If $q \geq \frac{1}{\overline{m}}$, $E[\mu|\theta=\overline{\theta}] - E[\mu|\theta=\underline{\theta}] > 0$ and $\frac{\partial E[\mu|\theta=\overline{\theta}]-E[\mu|\theta=\underline{\theta}]}{\partial p} > 0$.■

Proof of Proposition 3

Follows directly from Proposition 1 and 2.

Proof of Proposition 4

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 $g_t = 0 \forall t$; if the voter observes $a_1 = 0$, her posterior is $\mu(a_1 = 0) = \pi$ whereas if they do not observe a_1, $\mu = \pi$; the voter votes to re-elect if $E[u_2^V(i)] \geq E[u_1^V(c)]$. 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 voter's posterior belief $\mu = \pi$, $\tau(\pi, \mathbf{a}) = \frac{1}{2}$. $q < \frac{1}{\overline{m}}$ implies that $E[g_1] < a_1 \forall \theta$, such that a politician of either type allocates $a_1 = 0$. The equilibrium is supported by the off-path belief that upon observation of any $a_1 = 1$, $\mu = 1$. The competent type cannot profitably deviate by allocating $a_1 = 1$ because:

$$1 + p\tau(\pi, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a}) > \overline{m}q + p\tau(1, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a})$$

In this interval, $\overline{m}q < 1$ and $\tau(\mu, \mathbf{a}) = \frac{1}{2} \forall \mu$ when $a_1 = a_2 = 0 \forall \theta$. Since $\overline{m} > \underline{m}$, it thus holds that the incompetent type cannot profitably deviate by allocating $a_1 = 1$.

Second, suppose that $q \in \left[\frac{1}{\overline{m}}, \frac{2b}{\underline{m}(2b+p\overline{m})}\right)$ 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 the voter's beliefs are as follows:

- If the voter does not observe g_1, $\mu = \pi$;
- Upon observation that $a_1 = 1$, $\mu(1) = 1$;
- Upon observation that $a_1 = 0$, $\mu(0) = 0$.

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, **a**, a politician of type $\theta = \overline{\theta}$ will not deviate from $a_1 = 1$ to $a_1 = 0$ since:

$$\overline{m}q + (p\tau(1, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a}))\,\overline{m}q > 1 + (p\tau(0, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a}))\,\overline{m}q.$$

This condition clearly obtains for any $q \in \left[\frac{1}{\overline{m}}, \frac{2b}{\underline{m}(2b+p\overline{m})}\right)$ since $\overline{mq} > 1$ and $\tau(1, \mathbf{a}) > \tau(0, \mathbf{a})$. A politician of type $\theta = \underline{\theta}$ cannot profitably deviate to allocate $a_1 = 1$ to increase her chances of re-election when:

$$\begin{aligned} 1 + p\tau(0, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a}) &> \underline{m}q + p\tau(1, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a}) \\ \Leftrightarrow q &< \frac{2b}{\underline{m}(2b + p\overline{m})} \end{aligned}$$

Third, suppose that $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{2b}{\underline{m}(2b+p\overline{m})}\}, \frac{1}{\underline{m}}\right)$ 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 the voter's beliefs are as follows:

- If the voter does not observe g_1, $\mu = \pi$;
- Upon observation that $a_1 = q$, $\mu(1) = \pi$;
- Off the equilibrium path, an observation that $a_1 = 0$, implies that $\mu = 0$.

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, **a**, a politician of type $\theta = \overline{\theta}$ will not deviate from $a_1 = 1$ to $a_1 = 0$ since:

$$\overline{m}q + (p\tau(\pi, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a}))\overline{m}q > 1 + (p\tau(0, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a}))\overline{m}q$$

This inequality holds for any $q \in \left[\max\{\frac{1}{\overline{m}}, \frac{2b}{\underline{m}(2b+p\overline{m})}\}, \frac{1}{\underline{m}}\right)$ given that $\overline{m}q > 1$ and $\tau(\pi, \mathbf{a}) > \tau(0, \mathbf{a})$. A politician of type $\theta = \underline{\theta}$ cannot profitably deviate by allocating $a_1 = 0$ if:

$$\overline{m}q + p\tau(\pi, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a})) > 1 + p\tau(0, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a})$$

Solving for q, it can be shown that this condition holds for any $q > \frac{2b}{\underline{m}2b+\overline{m}p\pi}$...

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 the voter's beliefs are as follows:

- If the voter does not observe a_1, $\mu = \pi$;
- Upon observation that $a_1 = 1$, $\mu(1) = \pi$;
- Off the equilibrium path, an observation that $a_1 = 0$, implies that $\mu = 0$.

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, **a**, a politician of type $\theta = \underline{\theta}$ will not deviate from $a_1 = 1$ to $a_1 = 0$ since:

$$\underline{m}q + (p\tau(\pi, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a}))\underline{m}q > 1 + (p\tau(0, \mathbf{a}) + (1-p)\tau(\pi, \mathbf{a}))\underline{m}q$$

This inequality holds for any $q \geq \frac{1}{\underline{m}}$ because $\underline{m}q > 1$ and $\tau(\pi, \mathbf{a}) > \tau(0, \mathbf{a})$. This is sufficient to ensure that a politician of type $\theta = \overline{\theta}$ similarly does not deviate. ■

Proof of Proposition 5

The minimum threshold of q at which a politician of type $\theta = \underline{\theta}$ can be induced to allocate $a_1 = 1$ if public goods are (possibly) observed is $\max\{\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\}$. If first-period allocations are (potentially) observed, the minimum threshold of q at which such a politician can be induced to allocate $a_1 = 1$ is $\max\{\frac{1}{\overline{m}}, \frac{2b}{\underline{m}(2b+p\overline{m})}\}$.

$$\frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))} > \frac{2b}{\underline{m}(2b+p\overline{m})}$$
$$(1-\pi\overline{m})(2b+p\overline{m}) > 2b(1-\pi\overline{m}) + p\overline{m}(1-\pi))$$
$$1-\pi\overline{m} > 1-\pi$$

First, consider the case in which $\max\{\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\} = \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}$. In this case, $\frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))} > \max\{\frac{1}{\overline{m}}, \frac{2b}{\underline{m}(2b+p\overline{m})}\}$.

Second, consider the case in which $\max\{\frac{1}{\overline{m}}, \frac{2b(1-\pi\overline{m})}{\underline{m}(2b(1-\pi\overline{m})+p\overline{m}(1-\pi))}\} = \frac{1}{\overline{m}} \Rightarrow \max\{\frac{1}{\overline{m}}, \frac{2b}{\underline{m}(2b+p\overline{m})}\} = \frac{1}{\overline{m}}$. Together, thse conditions imply that the minimum threshold of q necessary for an incompent politician will allocate $a_1 = 1$ is weakly higher if public goods are (potentially) observed than if allocation behavior is (potentially) observed. ■

Proof of Proposition 6

These results follow directly from the posterior beliefs enumerated in Propositions 1 and Proposition 4 and the proof of Proposition 2.