Bureaucratic Quality and Electoral Accountability
Dataverse Appendix

Tara Slough*

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Contents

*Assistant Professor, New York University

D1 Proofs and Formal Analysis

D1.1 Proposition D1 and Proof

Consider a variant of the model in which the voter observes the bureaucrat's effort, e_1, with probability p. The voter does not observe public goods or politician allocation behavior. As such, the realized signal is $z \in \{\emptyset\} \cup [0,1]$. All other aspects of the model are identical to the model presented in the main text.

Proposition D1 *In the unique Perfect Bayesian Equilibrium:*

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

(ii) If $q \in \left[\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}}\right)$, 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 $q \geq \frac{1}{\underline{\theta}}$, both types of politicians allocate $a_1 = a_2 = 1$ to public goods.

This proof proceeds in two sections. I first prove the existence of the equilibria characterized in Proposition A1, then I prove uniqueness. To reduce redundancy, note that in every case, the bureaucrat's equilibrium effort follows from inspection of (1) and the politician's second-period allocation strategy follows from (7).

Existence: First, suppose that $q < \frac{1}{\overline{\theta}}$ and consider the following strategy and belief profile: politicians of both types allocate $a_1 = a_2 = 0$ and the bureaucrat exerts effort proportional to θ in each period; the voter re-elects the incumbent if $E[u_2^V(i)] \geq E[u_2^V(c)]$, and the voters' poster beliefs are as follows:

$$\mu = \begin{cases} \pi & \text{if } z = \emptyset \\ 0 & \text{if } z < \overline{\theta} \\ 1 & \text{if } z \geq \overline{\theta}. \end{cases} \tag{D1}$$

By inspection, μ is derived by Bayes' rule. Denoting posterior beliefs in (D1) as μ and equilibrium allocation strategies as $\boldsymbol{a}$, the competent type cannot profitably deviate by allocating $a_1 = 1$ because:

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

In this interval, $\overline{\theta}q < 1$ and $\tau(\mu, \boldsymbol{a}) = \frac{1}{2}\forall\mu$ because $a_1 = a_2 = 0\forall\theta$. This ensures that the inequality is always satisfied and the competent type cannot provitably deviate. Since $\underline{\theta} < \overline{\theta}$, the incompetent type similarly cannot profitably deviate by allocating a_1 = 1.

Second, suppose that $q \in \left[\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}}\right)$ 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 θ in each period; the voter votes to re-elect if $E[u_2^V(i)] \geq E[U_2^V(c)]$; and the voter's beliefs are given by (D1).

By inspection, μ is derived via Bayes' rule. Substituting the voter's posterior beliefs from (D1) and denoting equilibrium strategies by $\boldsymbol{a}$, a politician of type $\theta = \overline{\theta}$ will not deviate from $a_1 = 1$ to $a_1 = 0$ if:

$$\overline{\theta}q + (p\tau(1, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a}))\,\overline{\theta}q \geq 1 + (p\tau(1, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a}))\,\overline{\theta}q$$
$$\Leftrightarrow q \geq \frac{1}{\overline{\theta}}$$

A politician of type $\theta = \underline{\theta}$ cannot profitably deviate to allocate $a_1 = 1$ to increase her chances of re-election when:

$$1 + p\tau(0, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a}) > \underline{\theta}q + p\tau(0, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a})$$
$$\Leftrightarrow q < \frac{1}{\underline{\theta}}$$

Finally, suppose that $q \geq \frac{1}{\underline{\theta}}$ and consider the following strategy and belief profile: politicians of both types allocate $a_1 = a_2 = 1$; the bureaucrat exerts effort proportional to θ in each period; the voter votes to re-elect if $E[u_2^V(i)] > E[u_2^V(c)]$; and the voter's beliefs are given by (D1).
By inspection, μ is derived via Bayes' rule. Substituting the voter's posterior beliefs in (D1) and denoting equilibrium allocation strategies by $\boldsymbol{a}$, a politician of type $\theta = \underline{\theta}$ will not deviate from $a_1 = 1$ to $a_1 = 0$ if:

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

This inequality holds for any $q \geq \frac{1}{\underline{\theta}}$ because $\underline{\theta}q > 1$. This is sufficient to ensure that a politician of type $\theta = \overline{\theta}$ similarly does not deviate.

Uniqueness: I consider all candidate pooling equilibria and then examine the candidate separating and semi-separating equilibria. In any pooling equilibrium in which both types allocate $a_1 = 0$, I impose the off-path belief that $\mu = 0$ upon observation of $e_1 < \overline{\theta}$, per the intuitive criterion refinement. There exist three candidate equilibria in which both types allocate $a_1 = 0$. The first is an equilibrum (the first case in the proof of existence), the others are not:

- First, suppose that $q \in \left[\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}}\right)$. Consider the following strategy and belief profile: politicians of both types allocate $a_1 = 0$ and a politician of type $\theta = \overline{\theta}$ allocates $a_2 = 1$ while a politician of type $\theta = \underline{\theta}$ allocates $a_2 = 0$; the bureaucrat exerts effort proportional to θ in each period; the voter votes to re-elect if $E[u_2^V(i)] \geq E[u_2^V(c)]$; and the voter's beliefs are given by (D1).

  These posterior beliefs follow from Bayes' rule. Substituting the posterior beliefs in (D1) and denoting equilibrium allocation strategies as $\boldsymbol{a}$. A politician of type $\theta = \overline{\theta}$ will not deviate if:

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

  This inequality is never satisfied since $\overline{\theta}q \geq 1$ when $q \in q \in \left[\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}}\right)$. Thus, this strategy and belief profile is not an equilibrium.

- Second, suppose that $q \geq \frac{1}{\underline{\theta}}$. Consider the following strategy and belief profile: politicians of both types allocate $a_1 = 0$ and a politician of both types allocate $a_2 = 1$. All other beliefs and strategies are equivalent to the previous case.

  Note that the politician of type $\theta = \overline{\theta}$ faces identical incentives to the previous case. As above, such a politician will deviate because $\overline{\theta}q > 1$. Thus, this strategy and belief profile is not an equilibrium.

In a pooling equilibrium in which both types allocate $a_1 = 1$, I impose the off-path beliefs that $\mu = 0$ upon observation of $e_1 < \overline{\theta}$ and $\mu = 1$ upon observation that $e_1 > \overline{\theta}$, per the intuitive criterion refinement. There exist three candidate equilibria in which both types allocate $a_1 = 0$. The last (when $q \geq \frac{1}{\underline{\theta}}$) is an equilibrum (the third case in the proof of existence), the others are not, as shown below:

- First, suppose $q < \frac{1}{\overline{\theta}}$. Consider the following strategy and belief profile: politicians of both types allocate $a_1 = 1$ and a politician of either type allocates $a_2 = 0$; the bureaucrat exerts effort proportional to θ in each period; the voter votes to re-elect if $E[u_2^V(i)] \geq E[u_2^V(c)]$; and the voter's beliefs are given by (D1).

  By inspection, these beliefs follow from Bayes' rule. Substituting posterior beliefs in (D1) and denoting equilibrium allocation strategies as $\boldsymbol{a}$. A politician of type $\theta = \underline{\theta}$ will not deviate if:

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

  Because $\underline{\theta}q < 1$ in this region, the inequality is never satisfied. Thus, this strategy and belief profile is not an equilibrium.

- Second, suppose $q \in \left[\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}}\right)$. Consider the following strategy and belief profile: politicians of both types allocate $a_1 = 1$ and a politician of type $\overline{\theta}$ allocates $a_2 = 1$ while a politician of type $\underline{\theta}$ allocates $a_2 = 0$. All other beliefs and strategies are equivalent to the previous case.

  Note that the politician of type $\theta = \underline{\theta}$ faces identical incentives to the previous case. As above, such a politician will deviate because $\underline{\theta}q < 1$. Thus, this strategy and belief profile is not an equilibrium.

Now, consider the candidate separating equilibria.

- First, suppose that $q < \frac{1}{\overline{\theta}}$. Consider the following strategy and belief profile: a politician of type $\theta = \overline{\theta}$ allocates $a_1 = 1$ and $a_2 = 0$ while a politician of type $\theta = \underline{\theta}$ allocates $a_1 = a_2 = 0$; the bureaucrat exerts effort proportional to θ in each period; the voter votes to re-elect if $E[u_2^V(i)] \geq E[u_2^V(c)]$; and the voter's beliefs are given by (D1).

  These beliefs follow from Bayes' rule by inspection. Substituting the posteriors in (D1) and denoting equilibrium allocation strategies as $\boldsymbol{a}$, a politician of type $\theta = \overline{\theta}$ will not deviate if:

  $$\overline{\theta}q + p\tau(1, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a}) \geq 1 + p\tau(1, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a})$$

  In this region, $\overline{\pi}q < 1$, so the inequality is never satisfied. Thus, this profile of strategies and beliefs cannot be sustained as an equilibrium.

- Second, suppose $q \geq \frac{1}{\underline{\theta}}$ 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 $a_1 = 0$ and $a_2 = 1$; the bureaucrat exerts effort proportional to θ in each period; the voter votes to re-elect if $E[u_2^V(i)] \geq E[u_2^V(c)]$; and the voter's beliefs are identical to the previous case.

  Substituting the posterior beliefs in (D1) and denoting equilibrium allocation strategies, $\boldsymbol{a}$, a politician of type $\theta = \underline{\theta}$ will not deviate if:

  $$1 + p\tau(0, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a}) \geq \underline{\theta}q + p\tau(0, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a}).$$

  Since $\underline{\theta}q > 1$ in this region, this cannot be sustained as an equilibrium.

Finally consider two candidate semi-separating equilibria.

- First, suppose that $q \leq \frac{1}{\overline{\theta}}$: a politician of type $\theta = \overline{\theta}$ allocates $a_1 = 1$ with probability $k \in (0, 1)$ and $a_1 = 0$ with probability $1 - k$ and $a_2 = 0$; politician of type $\theta = \underline{\theta}$ allocates $a_1 = a_2 = 0$; the bureaucrat exerts effort proportional to θ in each period; the voter re-elects the incumbent if $E[u_2^V(i)] \geq E[u_2^V(c)]$; and the voter's beliefs are given by (D1).

  Substituting posterior beliefs in (D1) and denoting equilibrium allocation strategies as **a**, a politician of type $\overline{\theta}$ chooses k such that they are indifferent between allocating resources to the public good and not allocating resources to the public good.

  $$\overline{\theta}q + p\tau(1, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a}) = 1 + p\tau(1, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a})$$

  Note that this expression does not depend on k because the posterior beliefs in (D1) do not include k. Further, we know that $\overline{\theta}q < 1$ in this region so this equality is never satisfied. This cannot be an equilibrium.

- Second, suppose that $q \in \left[\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}}\right)$: a politician of type $\theta = \underline{\theta}$ allocates $a_1 = 1$ with probability $k \in (0, 1)$ and $a_1 = 0$ with probability $1 - k$ and $a_2 = 0$; politician of type $\theta = \underline{\theta}$ allocates $a_1 = a_2 = 1$; the bureaucrat exerts effort proportional to θ in each period; the voter re-elects the incumbent if $E[u_2^V(i)] \geq E[u_2^V(c)]$; and the voter's beliefs are given by (D1).

Substituting posterior beliefs in (D1) and denoting equilibrium allocation strategies as $\boldsymbol{a}$, a politician of type $\underline{\theta}$ chooses k such that they are indifferent between allocating resources to the public good and not allocating resources to the public good.

$$\underline{\theta}q + p\tau(0, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a}) = 1 + p\tau(0, \boldsymbol{a}) + (1-p)\tau(\pi, \boldsymbol{a})$$

Note that this expression does not depend on k because the posterior beliefs in (D1) do not include k. Further, we know that $\underline{\theta}q < 1$ in this region so this equality is never satisfied. This cannot be an equilibrium. ■

D1.2 Bureaucratic quality and/or politician competence?

The empirical tests above are motivated as comparative static predictions with respect to bureaucratic quality, q. However, the model provides empirical implications with regard to politician competence, which is given by π (the share of competent types), $\overline{\theta}$ (the monitoring rate of competent types), and $\underline{\theta}$ (the monitoring rate of incompetent types). One may worry that bureaucratic quality and politician competence covary. This section addresses this possible threat to identification theoretically by evaluating comparative statics in D1.2.1 and D1.2.2. Section A2.4 provides an alternative approach to this problem by providing an empirical assessment of the likely extent of covariance of bureaucratic quality in Brazil during the elections included in the four empirical tests.

D1.2.1 Comparison of comparative statics

In this section, I characterize copmarative static predictions for each of the empirical implications (#1-4) with respect to the share of competetnt politicians (π), the monitoring rate of the competent type ($\overline{\theta}$), and the monitoring rate of the incompetent type ($\underline{\theta}$). It is first useful to note that these results draw on Corollary A1.

Corollary A1 *If $q < \frac{1}{\overline{\theta}}$, then politician allocations to rents, term effects in politician allocations to rents, voter updating, and the incidence of incumbency disadvantage do not vary in π or $\underline{\theta}$. If $q \geq \frac{1}{\underline{\theta}}$, then politician allocations to rents, term effects in politician allocations to rents, voter updating, and the incidence of incumbency disadvantage do not vary in π or $\overline{\theta}$.*

Proof: Follows directly from Propositions 1 and A1.

Empirical Implication #1: Following Remark A1, expected politician allocations to rents, $E[1-a]$ vary in each of the parameters characterizing the distribution of politician competence as depicted in Figure D1. It is important to note that the emergence of non-zero comparative statics depend on the level of bureaucratic quality q (on the y-axis), as is indicated Corollary A1.

- If $q \in \left[\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}}\right)$ and $\pi < \frac{2b(1-\underline{\theta}q)-\overline{\theta}\underline{\theta}pq}{\overline{\theta}(2b(1-\underline{\theta}q)-\underline{\theta}pq)}$, allocations to rents decrease in π, as $\frac{\partial E[1-a]}{\partial \pi} = -1+\frac{\overline{\theta}^2 pq(\pi-1)(1-3\pi+2\overline{\theta}\pi^2)}{2b(\overline{\theta}\pi-1)^2} < 0$. If $\pi \geq \frac{2b(1-\underline{\theta}q)-\overline{\theta}\underline{\theta}pq}{\overline{\theta}(2b(1-\underline{\theta}q)-\underline{\theta}pq)}$, allocations to rents can increase or decrease in π, as demonstrated by the following two parametric examples:
  - $\overline{\theta} = \frac{7}{8}, \underline{\theta} = \frac{3}{4}, p = \frac{1}{2}, q = \frac{679}{512}, b = \frac{3}{2}, \pi = \frac{13}{224}$. In this case, $\frac{\partial E[1-a]}{\partial \pi} \approx 0.123 > 0$. Note further that $q \in [q_3, q_4)$.
  - $\overline{\theta} = \frac{5}{8}, \underline{\theta} = \frac{1}{2}, p = \frac{1}{2}, q = \frac{511}{256}, b = 2, \pi = \frac{1}{10}$. In this case, $\frac{\partial E[1-a]}{\partial \pi} \approx -0.052 < 0$. Note further that $q \in [q_3, q_4)$.

  If else, allocations to rents do not vary in π.
- If $q < \frac{1}{\underline{\theta}}$ and $\overline{\theta} > \frac{1}{q}$, allocations to rents are piecewise (weakly) decreasing in $\overline{\theta}$. First, note that $\frac{\partial q_2}{\partial \overline{\theta}} < 0$, meaning that as $\overline{\theta}$ increases, the incompetent type begins to (partially) pool by allocating funds to public goods in the first term. Second, note that $\frac{\partial q_3}{\partial \overline{\theta}} < 0$, meaning as $\overline{\theta}$ increases further, the incompetent type begins to pool

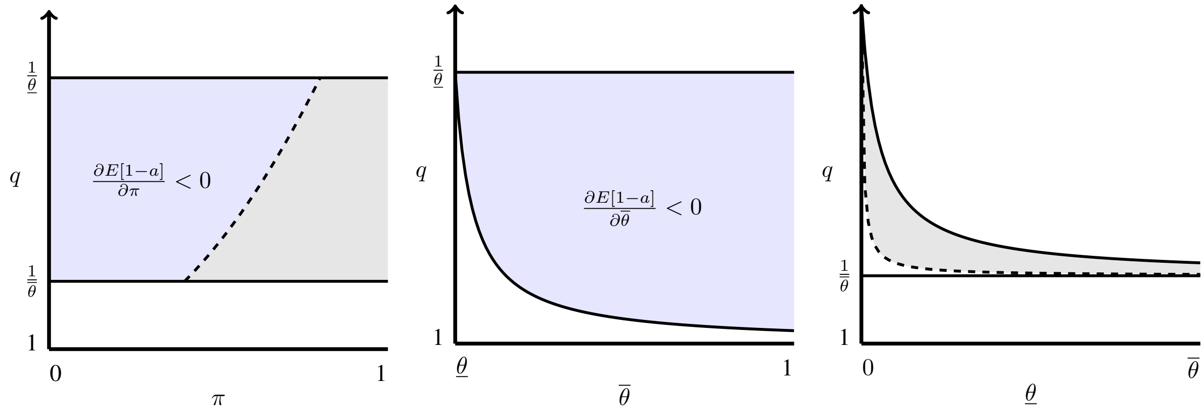

Figure D1: Comparative statics on expected allocation to rents with respect to politician competence. In blue shaded (and marked) regions, rents are decreasing (or piecewise decreasing) in the relevant parameter on the x-axis. In gray shaded regions, rents can increase or decrease in the relevant parameter. In unshaded regions, rents do not vary in the relevant parameter. The specific functional form of each of the dashed lines depends on the values of other parameters.

by funding public goods in the first term with probability 1. Now, consider how rents vary in $\overline{\theta}$ in the separating equlibrium. A sufficient condition for $\frac{\partial[1-a]}{\partial\overline{\theta}} < 0$ is $\frac{\partial R(q|\theta=\underline{\theta})}{\partial\overline{\theta}} = -\frac{\overline{\theta}pq(-\pi)\pi(2-\overline{\theta}\pi)}{2b(-1+\overline{\theta}\pi)^2} < 0$. Now, consider the partially-pooling equilibrium. In this equilibrium, the first-order condition:

$$\frac{\partial E[1-a]}{\partial\overline{\theta}} = \frac{(\overline{\theta}-k\underline{\theta})pq(\pi-1)^2\pi^2(3\overline{\theta}\underline{\theta}k(1+k\underline{\theta}(\pi-1))(\pi-1)-k^2\underline{\theta}^2(1+k\underline{\theta}(\pi-1))(\pi-1)+\overline{\theta}^2(-2+k\underline{\theta}(4-3\pi))\pi+\overline{\theta}^3\pi^2))}{2b(k\underline{\theta}(\pi-1)-\overline{\theta}\pi)^2(1+k\underline{\theta}(\pi-1)-\overline{\theta}\pi)^2} < 0$$

for any $k \in (0,1)$ (and any $\overline{\theta} \in (0,1)$). Finally, consider the pooling equilibrium. In this equilibrium the first-order condition:

$$\frac{\partial E[1-a]}{\partial\overline{\theta}} = \frac{(\overline{\theta}-\underline{\theta})pq(\pi-1)^2\pi^2(3\overline{\theta}\underline{\theta}(1+\underline{\theta}(\pi-1))(\pi-1)-\underline{\theta}^2(1+\underline{\theta}(\pi-1))(\pi-1)+\overline{\theta}^2(-2+\underline{\theta}(4-3\pi))\pi+\overline{\theta}^3\pi^2))}{2b(\underline{\theta}(\pi-1)-\overline{\theta}\pi)^2(1+\underline{\theta}(\pi-1)-\overline{\theta}\pi)^2} < 0.$$

If else, allocations to rents do not vary in $\overline{\theta}$.

- If $q > \frac{1}{\overline{\theta}}$ and $\underline{\theta} \in \left[\frac{2b(1-\pi\overline{\theta})}{q(2b(1-\pi\overline{\theta})+\overline{\theta}p(1-\pi))}, \frac{1}{q}\right)$, politician allocations to rents can increase or decrease in $\underline{\theta}$, as demonstrated by the following two parametric examples:
  - $\overline{\theta} = \frac{3}{4}, \underline{\theta} = \frac{1}{8}, p = \frac{1}{2}, q = \frac{1019}{128}, b = 9, \pi = \frac{1}{2}$. In this case, $\frac{\partial E[1-a]}{\partial\pi} \approx 0.001 > 0$. Note further that $q \in [q_3, q_4)$.
  - $\overline{\theta} = \frac{3}{8}, \underline{\theta} = \frac{1}{4}, p = \frac{1}{2}, q = \frac{511}{128}, b = 5, \pi = \frac{1}{2}$. In this case, $\frac{\partial E[1-a]}{\partial\pi} \approx -0.094 < 0$. Note further that $q \in [q_3, q_4)$.

  If else, allocations to rents do not vary in $\underline{\theta}$.

Empirical Implication #2: Following Proposition 1 and Remark A2, term effects on politician allocation to rents are attenuated to zero when $q < q_1 = \frac{1}{\overline{\theta}}$ or $q \geq q_4 = \frac{1}{\underline{\theta}}$. Thus:

- If $q < \frac{1}{\underline{\theta}}$, non-zero term effects on politician allocations to rents emerge for sufficiently high $\overline{\theta}$, as $\frac{dq_1}{d\overline{\theta}} = -\frac{1}{\overline{\theta}^2} < 0$. If else, term effects do not emerge for any $\overline{\theta}$ and thus do not vary in $\overline{\theta}$.
- If $q \geq \frac{1}{\overline{\theta}}$, non-zero term effects on politician allocations to rents emerge for sufficiently low $\underline{\theta}$, as $\frac{dq_4}{d\underline{\theta}} = -\frac{1}{\underline{\theta}^2} < 0$. If else, term effects do not emerge for any $\underline{\theta}$ and thus do not vary in $\underline{\theta}$.

- If $q \in \left[\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}}\right)$, non-zero term effects can emerge for any $\pi \in (0, 1)$ and the (qualitative) presence of term effects does not depend on π. If else, term effects do not emerge for any π and thus do not vary in π.

Empirical Implication #3: Following Proposition A1, voter learning from a clean signal of first-period incumbent allocation behavior is attenuated to zero ($\mu - \pi = 0$) if $q \geq \frac{2b}{\underline{\theta}2b+p\overline{\theta}\pi}$. Thus, for any $q \geq \frac{1}{\overline{\theta}}$:

- Voter learning is attenuated to zero if $\pi \geq \frac{2b(1-\underline{\theta}q)}{\overline{\theta}qp}$.
- Voter learning is attenuated to zero if $\overline{\theta} \geq \frac{2b(1-\underline{\theta}q)}{\pi qp}$.
- Voter learning is attenuated to zero if $\underline{\theta} \geq \frac{1}{q} - \frac{p\overline{\theta}\pi}{2b}$.

If $q < \frac{1}{\overline{\theta}}$, voter learning from a clean signal is attenuated to zero by assumption (under the intuitive criterion) for any $\pi, \overline{\theta}$, or $\underline{\theta}$.

Empirical Implication #4: Following Corollary 2, incumbency disadvantage emerges when:

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

There are two relevant cases to consider.

- *Case #1*: Suppose that $\frac{1}{\overline{\theta}} \geq \frac{2b(1-\pi\overline{\theta})}{\underline{\theta}(2b(1-\pi\overline{\theta})+\overline{\theta}p(1-\pi))}$. Incumbency disadvantage emerges for sufficiently large $\overline{\theta}$ (when $\overline{\theta} \geq \frac{1}{q}$) if $\underline{\theta} < \frac{1}{q}$; incumbency disadvantage does not vary in $\overline{\theta}$ if $\underline{\theta} \geq \frac{1}{q}$. Incumbency disadvantage emerges for sufficiently small $\underline{\theta}$ (when $\underline{\theta} < \frac{1}{q}$) if $\overline{\theta} < \frac{1}{q}$; if $\overline{\theta} < \frac{1}{q}$ incumbency disadvantage does not vary in $\underline{\theta}$. The emergence of incumbency disadvantage does not vary in π.

- *Case #2*: Suppose that $\frac{1}{\overline{\theta}} < \frac{2b(1-\pi\overline{\theta})}{\underline{\theta}(2b(1-\pi\overline{\theta})+\overline{\theta}p(1-\pi))}$:
  - If $\underline{\theta} < \frac{1}{q}$, incumbency disadvantage emerges for sufficiently high vaues of $\overline{\theta}$, when $\overline{\theta} \geq \frac{2bp(1-\underline{\theta}q)}{2bp(1-\underline{\theta}q)+\underline{\theta}qp(1-\pi)}$. Else, incumbency disadvantage does not vary in $\overline{\theta}$.
  - If $\overline{\theta} \geq \frac{1}{q}$, incumbency disadvantage emerges for intermediate values of $\underline{\theta}$, when $\underline{\theta} \in \left[\frac{2b(1-\pi\overline{\theta})}{q(2b(1-\pi\overline{\theta})+\overline{\theta}p(1-\pi))}, \frac{1}{q}\right)$. If $\overline{\theta} < \frac{1}{q}$, incumbency disadvantage does not vary in $\underline{\theta}$.
  - If $\overline{\theta} \geq \frac{1}{q}$ and $\underline{\theta} < \frac{1}{q}$, incumbency disadvantage emerges for sufficiently low values of π, when $\pi < \frac{\overline{\theta}\underline{\theta}pq+2b(\underline{\theta}q-1)}{\overline{\theta}(\underline{\theta}pq+2b(\underline{\theta}q-1))}$. Else, incumbency disadvantage does not vary in π.

Summary of comparative statics: I summarize the above discussion in Table D1. It is clear that none of the parameters produces the same set of comparative statics as q. Moreover, to the extent that these parameters produce similar patterns to q, they only do so for certain values of q, following Corollary A1.

D1.2.2 Implications of covariance of bureaucratic quality and politician competence

Now consider a second variant of the above identification problem in which bureaucratic quality covaries with politician competence. In this section, consider a the empirical implications of a simultaneous increase in bureaucratic quality (q) and one of the three parameters characterizing the pool of politicians (π, $\overline{\theta}$, or $\underline{\theta}$). For empirical implications #2-#4 will consider the implications of an arbitrary increase in each measure of politician competence, as follows:

Increase π_0 to π_1 where:	$0 < \pi_0 < \pi_1 < 1.$
Increase $\overline{\theta}_0$ to $\overline{\theta}_1$ where:	$\underline{\theta} < \overline{\theta}_0 < \overline{\theta}_1 < 1.$
Increase $\underline{\theta}_0$ to $\underline{\theta}_1$ where:	$0 < \underline{\theta}_0 < \underline{\theta}_1 < \overline{\theta}.$

Empirical implication #1: Increases in bureaucratic quality, q reduce allocation to rents $(1 - a)$ in two ways:

	Comparative static predictions with respect to:		
	π	$\overline{\theta}$	$\underline{\theta}$
Empirical implication #1	Ambiguous	Same as q (if $q < \frac{1}{\underline{\theta}}$)	Ambiguous
Empirical implication #2	Different from q (none)	Different from q	Same as q (if $q \geq \frac{1}{\theta}$)
Empirical implication #3	Same as q (if $q \geq \frac{1}{\theta}$)	Same as q (if $q \geq \frac{1}{\theta}$)	Same as q (if $q \geq \frac{1}{\theta}$)
Empirical implication #4	Same as q (if $q \in [\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}})$)	Different from q	Different from q

Table D1: Comparison of the comparative statics with respect to q (the empirical implications in the main text) and comparative statics with regard to the parameters characterizing the distribution of politician competence. No single parameter produces the same set of comparative static predictions.

1. They determine which equilibrium presents, per Proposition 1.
2. They affect the re-election rates of candidates (for $q \in [q_2, q_4)$) and the rate at which incompetent politicians pool in the partially-pooling equilibrium when $q \in [q_2, q_3)$, per Proposition 1 and Remark A1.

In the interest of tractability, I consider both effects in turn. First, consider the determination of which equilibrium presents. To do so, I consider comparative statics on each of the thresholds q_1, q_2, q_3, and q_4. For any negative first-order-condition, a simultaneous increase in q and the parameter of interest make it more likely that the subsequent equilibrium (in terms of ranking by increasing bureaucratic quality) is reached, which results in a reduction in politician allocations to rents.

- First order conditions with respect to π: $\frac{\partial q_1}{\partial \pi} = 0$, $\frac{\partial q_2}{\partial \pi} = \frac{2b(1-\pi)\overline{\theta}p}{\underline{\theta}(\overline{\theta}p(\pi-1)+2b(\overline{\theta}\pi-1))^2} > 0$, $\frac{\partial q_3}{\partial \pi}$ is ambiguous in sign,[1] and $\frac{\partial q_4}{\partial \pi} = 0$.
- First order conditions with respect to $\overline{\theta}$: $\frac{\partial q_1}{\partial \overline{\theta}} = -\frac{1}{\overline{\theta}^2} < 0$, $\frac{\partial q_2}{\partial \overline{\theta}} = \frac{2bp(\pi-1)}{\underline{\theta}(\overline{\theta}p(\pi-1)+2b(\overline{\theta}\pi-1))^2} < 0$, $\frac{\partial q_3}{\partial \overline{\theta}} = \frac{2bp(\pi-1)\pi(-2\overline{\theta}\underline{\theta}(1+\underline{\theta}(\pi-1))(\pi-1)+}{\underline{\theta}(\overline{\theta}(\overline{\theta}-\underline{\theta})p(\pi-1)\pi+2b(\underline{\theta}^2(\pi-1)}$ 0, and $\frac{\partial q_4}{\partial \overline{\theta}} = 0$.
- First order conditions with respect to $\underline{\theta}$: $\frac{\partial q_1}{\partial \underline{\theta}} = 0$, $\frac{\partial q_2}{\partial \underline{\theta}} = \frac{2b(1-\overline{\theta}\pi)}{\underline{\theta}^2(\overline{\theta}p(\pi-1)+2b(1-\overline{\theta}\pi))} < 0$, $\frac{\partial q_3}{\partial \underline{\theta}}$ is ambiguous in sign,[2] and $\frac{\partial q_4}{\partial \underline{\theta}} = -\frac{1}{\underline{\theta}^2} < 0$.

Second, consider how rents in each equilibrium vary in q and the parameter of interest. Because equilibrium politician allocation strategies only vary by type and/or term for $q \in [q_2, q_4)$, I examine only these equilbria.

- Variation in q and π: In the separating equilibrium $q \in [q_1, q_2)$, $\frac{\partial^2 E[1-a]}{\partial q \partial \pi} = \frac{\overline{\theta}^2 p(\pi-1)(1-3\pi+2\overline{\theta}\pi^2)}{2b(\overline{\theta}\pi-1)^2}$, which is ambiguous in sign. In the partial-pooling and pooling equilibria that emerge at $q \in [q_2, q_4)$, the sign of $\frac{\partial^2 E[1-a]}{\partial q \partial \pi} < 0$ is ambiguous.
- Variation in q and $\overline{\theta}$: In each equilibrium region, $\frac{\partial^2 E[1-a]}{\partial q \partial \overline{\theta}} < 0$. In the separating equilibrium ($q \in [q_1, q_2)$, $\frac{\partial^2 E[1-a]}{\partial q \partial \overline{\theta}} = \frac{\overline{\theta}p(\pi-1)^2\pi(\overline{\theta}\pi-2)}{2b(\overline{\theta}\pi-1)^2} < 0$. In the partial pooling equilibrium ($q \in [q_2, q_3)$):

$$\frac{\partial^2 E[1-a]}{\partial \overline{\theta} \partial q} = \frac{(\overline{\theta} - k\underline{\theta})p(\pi-1)^2\pi^2(3\overline{\theta}\underline{\theta}k(1+k\underline{\theta}(\pi-1))(\pi-1) - k^2\underline{\theta}^2(1+k\underline{\theta}(\pi-1))(\pi-1) + \overline{\theta}^2(-2+k\underline{\theta}(4-3\pi))\pi + \overline{\theta}^3\pi^2))}{2b(k\underline{\theta}(\pi-1) - \overline{\theta}\pi)^2(1+k\underline{\theta}(\pi-1) - \overline{\theta}\pi)^2} < 0$$

[1] For example, when $\overline{\theta} = \frac{3}{4}, \underline{\theta} = \frac{1}{4}, \pi = \frac{3}{4}, p = \frac{1}{2}, q = \frac{7}{2}$, and $b = 5$, $\frac{\partial q_3}{\partial \pi} \approx 0.124 > 0$. When $\overline{\theta} = \frac{3}{4}, \underline{\theta} = \frac{1}{4}, \pi = \frac{1}{4}, p = \frac{1}{2}, q = \frac{7}{2}$, and $b = 5$, $\frac{\partial q_3}{\partial \pi} \approx -0.124 < 0$.

[2] For example, when $\overline{\theta} = \frac{31}{32}, \underline{\theta} = \frac{485}{512}, p = \frac{1}{2}, \pi = \frac{1}{2}, q = \frac{265}{256}$, and $b = \frac{133}{128}$, $\frac{\partial q_3}{\partial \underline{\theta}} \approx 0.006 > 0$. When $\overline{\theta} = \frac{1}{2}, \underline{\theta} = \frac{1}{8}, p = \frac{1}{2}, \pi = \frac{1}{2}, q = \frac{9}{4}$, and $b = 3$, $\frac{\partial q_3}{\partial \underline{\theta}} \approx -62.361$.

for any $k \in (0,1)$ (and any $\overline{\theta} \in (0,1)$). Finally, consider the pooling equilibrium. In this equilibrium the first-order condition:

$$\frac{\partial^2 E[1-a]}{\partial q \partial \overline{\theta}} = \frac{(\overline{\theta} - \underline{\theta})p(\pi-1)^2\pi^2(3\overline{\theta}\underline{\theta}(1+\underline{\theta}(\pi-1))(\pi-1) - \underline{\theta}^2(1+\underline{\theta}(\pi-1))(\pi-1) + \overline{\theta}^2(-2+\underline{\theta}(4-3\pi))\pi + \overline{\theta}^3\pi^2))}{2b(\underline{\theta}(\pi-1) - \overline{\theta}\pi)^2(1+\underline{\theta}(\pi-1) - \overline{\theta}\pi)^2} < 0.$$

- Variation in q and $\underline{\theta}$: In the separating equilibrium ($q \in [q_1, q_2)$), $\frac{\partial^2 E[1-a]}{\partial q \partial \underline{\theta}} = 0$. In the partial-pooling and pooling equilibria the sign of $\frac{\partial^2 E[1-a]}{\partial q \partial \underline{\theta}} < 0$ is ambiguous.

Empirical implication #2: Per Proposition 1 and Remark A2, term effects are attenuated to zero when $q < \frac{1}{\overline{\theta}}$ or $q \geq \frac{1}{\underline{\theta}}$. We will thus consider $\boldsymbol{q}_0 \in \{q_{0l}, q_{0h}\}$, where $q_{0l} < \frac{1}{\overline{\theta}_0}$ and $q_{0h} \in (\frac{1}{\overline{\theta}_0}, \frac{1}{\underline{\theta}_0})$, and $\boldsymbol{q}_1 \in \{q_{1l}, q_{1h}\}$, where $q_{1l} > q_{0l}$ and $q_{1h} > q_{0h}$.

- *Increasing q and $\overline{\theta}$*: First, consider the case when $q_0 = q_{0l}$. Increasing q_{0l} to q_{1l} in isolation introduces term effects if $q_{1l} \in [\frac{1}{\overline{\theta}_0}, \frac{1}{\underline{\theta}})$. Increasing $\overline{\theta}_0$ to $\overline{\theta}_1$ in isolation introduces term effects if $q_{0l} \in [\frac{1}{\overline{\theta}_1}, \frac{1}{\underline{\theta}})$. Note that $\frac{1}{\overline{\theta}_1} < \frac{1}{\overline{\theta}_0}$ since $\overline{\theta}_1 > \overline{\theta}_0$. Simultaneously increasing q_{0l} to q_{1l} and $\overline{\theta}_0$ to $\overline{\theta}_1$ introduces term effects if $q_{1l} \in [\frac{1}{\overline{\theta}_1}, \frac{1}{\underline{\theta}})$.
  Now, consider the case when $q_0 = q_{0h}$. Increasing q_{0h} to q_{1h} in isolation eliminates term effects if $q_{1h} \geq \frac{1}{\underline{\theta}}$. Increasing $\overline{\theta}_0$ to $\overline{\theta}_1$ in isolation has no effect on term effects. Simultaneously increasing q_{0h} to q_{1h} and $\overline{\theta}_0$ to $\overline{\theta}_1$ eliminates term effects if $q_{1h} \geq \frac{1}{\underline{\theta}}$.
- *Increasing q and $\underline{\theta}$*: First, consider the case when $q_0 = q_{0l}$. Increasing q_{0l} to q_{1l} in isolation introduces term effects if $q_{1l} \in [\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}_0})$. Increasing $\underline{\theta}_0$ to $\underline{\theta}_1$ in isolation has no effect on the emergence of term effects. Simultaneously increasing q_{0l} to q_{1l} and $\underline{\theta}_0$ to $\underline{\theta}_1$ introduces term effects if $q_{1l} \in [\frac{1}{\overline{\theta}}, \frac{1}{\underline{\theta}_1})$.
  Now, consider the case when $q_0 = q_{0h}$. Increasing q_{0h} to q_{1h} in isolation eliminates term effects if $q_{1h} \geq \frac{1}{\underline{\theta}_0}$. Increasing $\underline{\theta}_0$ to $\underline{\theta}_1$ in isolation eliminates term effects if $q_{0h} \geq \frac{1}{\underline{\theta}_1}$. Simultaneously increasing q_{0h} to q_{1h} and $\underline{\theta}_0$ to $\underline{\theta}_1$ eliminates term effects if $q_{1h} \geq \frac{1}{\underline{\theta}_1}$.
- *Increasing q and π*. Increasing π from π_0 to π_1 does not affect the emergence of term effects. This is evident from inspection of Proposition 1 and Remark A2. Term effects vary in q following Remark A2.

Empirical implication #3: Per Proposition A1 and Remark A3, voter learning from a clean signal is attenuated to zero when $q \geq \frac{2b}{\underline{\theta}2b+p\overline{\theta}\pi}$ We will thus consider an arbitrary $q_0 \in \left[\frac{1}{\overline{\theta}_0}, \frac{2b}{\underline{\theta}2b+p\overline{\theta}\pi}\right)$ and $q_1 > q_0$.

- *Increasing q and $\overline{\theta}$*. Increasing q_0 to q_1 in isolation attenuates voter learning to zero when $q_1 \geq \frac{2b}{\underline{\theta}2b+p\overline{\theta}_0\pi}$. Increasing $\overline{\theta}_0$ to $\overline{\theta}_1$ in isolation attenuates voter learning to zero when $q_0 \geq \frac{2b}{\underline{\theta}2b+p\overline{\theta}_1\pi}$. Note that $\frac{2b}{\underline{\theta}2b+p\overline{\theta}_1\pi} \leq \frac{2b}{\underline{\theta}2b+p\overline{\theta}_0\pi}$. Simultaneously increasing q_0 to q_1 and $\overline{\theta}_0$ to $\overline{\theta}_1$ attenuates voter learning to zero when $q_1 \geq \frac{2b}{\underline{\theta}2b+p\overline{\theta}_1\pi}$.
- *Increasing q and $\underline{\theta}$*. Increasing q_0 to q_1 in isolation attenuates voter learning to zero when $q_1 \geq \frac{2b}{\underline{\theta}_0 2b+p\overline{\theta}\pi}$. Increasing $\underline{\theta}_0$ to $\underline{\theta}_1$ in isolation attenuates voter learning to zero when $q_0 \geq \frac{2b}{\underline{\theta}_1 2b+p\overline{\theta}\pi}$. Note that $\frac{2b}{\underline{\theta}_1 2b+p\overline{\theta}\pi} < \frac{2b}{\underline{\theta}_0 2b+p\overline{\theta}\pi}$. Simultaneously increasing q_0 to q_1 and $\underline{\theta}_0$ to $\underline{\theta}_1$ attenuates voter learning to zero when $q_1 \geq \frac{2b}{\underline{\theta}_1 2b+p\overline{\theta}\pi}$.
- *Increasing q and π*. Increasing q_0 to q_1 in isolation attenuates voter learning to zero when $q_1 \geq \frac{2b}{\underline{\theta}2b+p\overline{\theta}\pi_0}$. Increasing π_0 to π_1 in isolation attenuates voter learning to zero when $q_0 \geq \frac{2b}{\underline{\theta}2b+p\overline{\theta}\pi_1}$. Note that $\frac{2b}{\underline{\theta}2b+p\overline{\theta}\pi_1} \leq \frac{2b}{\underline{\theta}_0 2b+p\overline{\theta}\pi_0}$. Simultaneously increasing q_0 to q_1 and π_0 to π_1 attenuates voter learning to zero when $q_1 \geq \frac{2b}{\underline{\theta}2b+p\overline{\theta}\pi_1}$.

If $q_0 < \frac{1}{\underline{\theta}_0}$, voter learning from a clean signal is attenuated to zero (by assumption of the intuitive criterion) at baseline. An increase from q_0 to q_1 generates positive updating on a clean signal if $q_1 \in [\frac{1}{\overline{\theta}_0}, \frac{1}{\underline{\theta}})$. An increase from $\overline{\theta}_0$ to $\overline{\theta}_1$ generates positive updating on a clean signal if $q_0 \geq \frac{1}{\overline{\theta}_1}$. A simultaneous increase from q_0 to q_1 and $\overline{\theta}_0$ to $\overline{\theta}_1$ if $q_1 \in [\frac{1}{\overline{\theta}_1}, \frac{1}{\underline{\theta}})$. In this region, simultaneous increases in q and π or q and $\underline{\theta}$ have the same effect as an increase in q alone.

Empirical implication #4: Per Proposition 1 and Remark A4, incumbency disadvantage emerges when:

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

We will thus consider an arbitrary $q_0 < \max\left\{\frac{1}{\overline{\theta}}, \frac{2b(1-\pi\overline{\theta})}{\underline{\theta}(2b(1-\pi\overline{\theta})+\overline{\theta}p(1-\pi))}\right\}$ and $q_1 > q_0$.

- *Increasing q and $\overline{\theta}$*. Increasing q_0 to q_1 in isolation generates incumbency disadvantage when $q_1 \in \Big[\max\Big\{\frac{1}{\overline{\theta}_0}, \frac{2b(1-\pi\overline{\theta}_0)}{\underline{\theta}(2b(1-\pi\overline{\theta}_0)+\overline{\theta}_0p(1-\pi}$ Increasing $\overline{\theta}_0$ to $\overline{\theta}_1$ in isolation generates incumbency disadvantage when $q_0 \in \left[\max\left\{\frac{1}{\overline{\theta}_1}, \frac{2b(1-\pi\overline{\theta}_1)}{\underline{\theta}(2b(1-\pi\overline{\theta}_1)+\overline{\theta}_1p(1-\pi))}\right\}, \frac{1}{\underline{\theta}}\right)$. Note that $\frac{1}{\overline{\theta}_1} < \frac{1}{\overline{\theta}_0}$ and $\frac{2b(1-\pi\overline{\theta}_1)}{\underline{\theta}(2b(1-\pi\overline{\theta}_1)+\overline{\theta}_1p(1-\pi))} < \frac{2b(1-\pi\overline{\theta}_0)}{\underline{\theta}(2b(1-\pi\overline{\theta}_0)+\overline{\theta}_0p(1-\pi))}$. Simultaneously increasing q_0 to q_1 and $\overline{\theta}_0$ to $\overline{\theta}_1$ generates incumbency disadvantage when $q_1 \in \left[\max\left\{\frac{1}{\overline{\theta}_1}, \frac{2b(1-\pi\overline{\theta}_1)}{\underline{\theta}(2b(1-\pi\overline{\theta}_1)+\overline{\theta}_1p(1-\pi))}\right\}, \frac{1}{\underline{\theta}}\right)$.

- *Increasing q and $\underline{\theta}$*. Increasing q_0 to q_1 in isolation generates incumbency disadvantage when $q_1 \in \Big[\max\Big\{\frac{1}{\overline{\theta}}, \frac{2b(1-\pi\overline{\theta})}{\underline{\theta}_0(2b(1-\pi\overline{\theta})+\overline{\theta}p(1-\pi))}$ Increasing $\underline{\theta}_0$ to $\underline{\theta}_1$ in isolation generates incumbency disadvantage when $q_0 \in \left[\max\left\{\frac{1}{\overline{\theta}_1}, \frac{2b(1-\pi\overline{\theta})}{\underline{\theta}_1(2b(1-\pi\overline{\theta})+\overline{\theta}p(1-\pi))}\right\}, \frac{1}{\underline{\theta}_1}\right)$. Note that $\frac{1}{\underline{\theta}_1} < \frac{1}{\underline{\theta}_0}$ and $\frac{2b(1-\pi\overline{\theta})}{\underline{\theta}_1(2b(1-\pi\overline{\theta})+\overline{\theta}p(1-\pi))} < \frac{2b(1-\pi\overline{\theta})}{\underline{\theta}_0(2b(1-\pi\overline{\theta})+\overline{\theta}p(1-\pi))}$. Simultaneously increasing q_0 to q_1 and $\overline{\theta}_0$ to $\overline{\theta}_1$ generates incumbency disadvantage when $q_1 \in \left[\max\left\{\frac{1}{\overline{\theta}}, \frac{2b(1-\pi\overline{\theta})}{\underline{\theta}_1(2b(1-\pi\overline{\theta})+\overline{\theta}p(1-\pi))}\right\}, \frac{1}{\underline{\theta}_1}\right)$.

- *Increasing q and π*: Increasing q_0 to q_1 in isolation generates incumbency disadvantage when $q_1 \in \Big[\max\Big\{\frac{1}{\overline{\theta}}, \frac{2b(1-\pi_0\overline{\theta})}{\underline{\theta}(2b(1-\pi_0\overline{\theta})+\overline{\theta}p(1-\pi_0)}$ Increasing π_0 to π_1 in isolation generates incumbency disadvantage when $q_0 \in \left[\max\left\{\frac{1}{\overline{\theta}}, \frac{2b(1-\pi_1\overline{\theta})}{\underline{\theta}(2b(1-\pi_1\overline{\theta})+\overline{\theta}p(1-\pi_1))}\right\}, \frac{1}{\underline{\theta}}\right)$. Note that $\frac{2b(1-\pi_1\overline{\theta})}{\underline{\theta}(2b(1-\pi_1\overline{\theta})+\overline{\theta}p(1-\pi_1))} > \frac{2b(1-\pi_0\overline{\theta})}{\underline{\theta}(2b(1-\pi_0\overline{\theta})+\overline{\theta}p(1-\pi_0))}$. Simultaneously increasing q_0 to q_1 and π_0 to π_1 generates incumbency disadvantage when $q_1 \in \left[\max\left\{\frac{1}{\overline{\theta}}, \frac{2b(1-\pi_1\overline{\theta})}{\underline{\theta}(2b(1-\pi_1\overline{\theta})+\overline{\theta}p(1-\pi_1))}\right\}, \frac{1}{\underline{\theta}}\right)$.

Summary of analysis: At some level of bureaucratic quality, increasing q and $\overline{\theta}$ simultanteously magnifies (strengthens) the effect of an all-else-equal increase in q for each of the four empirical implications. However, the relevant thresholds in bureaucratic quality that characterize the emergence of these complementarities vary across implications. The effects of simultaneous increases of q and π or $\underline{\theta}$ are mixed. For empirical implication #3, for example, for sufficient bureaucratic quality, $q_0 \geq \frac{1}{\underline{\theta}_0}$, there are qualitatively similar complementarities in each pair of parameters. In contrast, with empirical implication #4, when $q < q_2$, simultaneous increases in q and π weakens the effect of an increase of q in isolation on the emergence of incumbency disadvantage and on allocations to rents. Finally, when $q < q_2$, small simultaneous increases in q and $\underline{\theta}$ make incumbency disadvantage more likely (relative to increases in q alone), but sufficiently large increases in either parameter can yield the pooling equilibrium where incumbency disadvantage does not obtain.

D2 Bureaucratic Quality and Allocation to Rents: Visualization and Extensions

D2.1 Full Regression Table for Table 2

Table D2 reproduces the estimates from Table 2 while reporting estiates for the coefficient on the radio indicator. The other covariates are fixed effects and are supressed in the regression table in line with *APSR* guidelines.

	Share of corrupt spending			Log(Share of corrupt spending + 1)		
	(1)	(2)	(3)	(4)	(5)	(6)
A. LINEAR BUREAUCRATIC QUALITY MEASURE (Z-SCORE)						
Bureaucratic quality	-0.014^{**}	-0.014^{**}	-0.017^{**}	-0.012^{**}	-0.012^{**}	-0.014^{**}
	(0.006)	(0.006)	(0.007)	(0.005)	(0.005)	(0.006)
Radio indicator			0.009			0.008
			(0.016)			(0.013)
B. BUREAUCRATIC QUALITY MEASURE TERCILES (RELATIVE TO FIRST TERCILE)						
Bureaucratic quality, Tercile 2	-0.009	-0.009	-0.009	-0.007	-0.007	-0.007
	(0.012)	(0.012)	(0.012)	(0.010)	(0.010)	(0.010)
Bureaucratic quality, Tercile 3	-0.027^{**}	-0.026^{*}	-0.036^{**}	-0.023^{**}	-0.022^{*}	-0.029^{**}
	(0.012)	(0.014)	(0.018)	(0.010)	(0.011)	(0.014)
Radio indicator			0.010			0.009
			(0.016)			(0.013)
C. BUREAUCRATIC QUALITY MEASURE QUARTILE (RELATIVE TO FIRST QUARTILE)						
Bureaucratic Quality, Quartile 2	-0.009	-0.003	-0.002	-0.006	-0.001	0.000
	(0.015)	(0.015)	(0.015)	(0.012)	(0.013)	(0.012)
Bureaucratic Quality, Quartile 3	-0.019	-0.021	-0.029^{*}	-0.015	-0.018	-0.024^{*}
	(0.015)	(0.014)	(0.015)	(0.012)	(0.012)	(0.013)
Bureaucratic Quality, Quartile 4	-0.029^{**}	-0.030^{*}	-0.042^{**}	-0.025^{**}	-0.025^{*}	-0.034^{**}
	(0.014)	(0.016)	(0.021)	(0.012)	(0.013)	(0.017)
Radio indicator			0.012			0.011
			(0.016)			(0.013)
State FE		✓	✓		✓	✓
Lottery FE		✓	✓		✓	✓
Demographic controls (decile bins)			✓			✓
Outcome Range	[0,0.794]	[0,0.794]	[0,0.794]	[0,0.584]	[0,0.584]	[0,0.584]
Outcome Mean	0.062	0.062	0.062	0.056	0.056	0.056
Outcome Std. Dev.	0.10	0.10	0.10	0.085	0.085	0.085
Num. obs.	448	448	448	448	448	448

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table D2: Association between bureaucratic quality, q, and allocations to public goods, a. Funds diverted from public goods are measured as the share of corrupt spending. Note that the fixed effects (and thus the intercept) are omitted from this table. Heteroskedasticity-robust standard errors in parentheses.

D2.2 Plots of Raw Data

The bivariate relationship between bureaucratic quality (Z-score) and share of funds spent in a corrupt manner are graphed in Figure D2.

	Share of spending								
	Granted to corrupt bids			Misallocated			Spent on overbudget projects		
Bureaucratic quality (Z-score)	-0.008	-0.007	-0.011^{*}	-0.007^{**}	-0.007^{**}	-0.008^{*}	0.001	0.001	0.001
	(0.005)	(0.005)	(0.006)	(0.003)	(0.003)	(0.004)	(0.001)	(0.001)	(0.001)
State FE		✓	✓		✓	✓		✓	✓
Lottery FE		✓	✓		✓	✓		✓	✓
Demographic controls (decile bins)			✓			✓			✓
Community radio indicator			✓			✓			
DV Mean	0.040	0.040	0.040	0.021	0.021	0.021	0.001	0.001	0.001
DV Std. Dev.	0.079	0.079	0.079	0.054	0.054	0.054	0.01	0.01	0.01
Range, DV	[0,0.672]	[0,0.672]	[0,0.672]	[0,0.584]	[0,0.584]	[0,0.584]	[0,0.143]	[0,0.143]	[0,0.143]
Adj. R^2	0.010	0.061	0.074	0.013	0.056	0.059	0.002	0.001	0.009
Num. obs.	448	448	448	448	448	448	448	448	448

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table D3: Decomposition of sources of corrupt spending in Table 2. Heteroskedasticity-robust standard errors in parentheses. All fixed effects and covariates are binary indicators. Covariate adjustment is implemented by demeaning, which produces no estimates of these parameters.

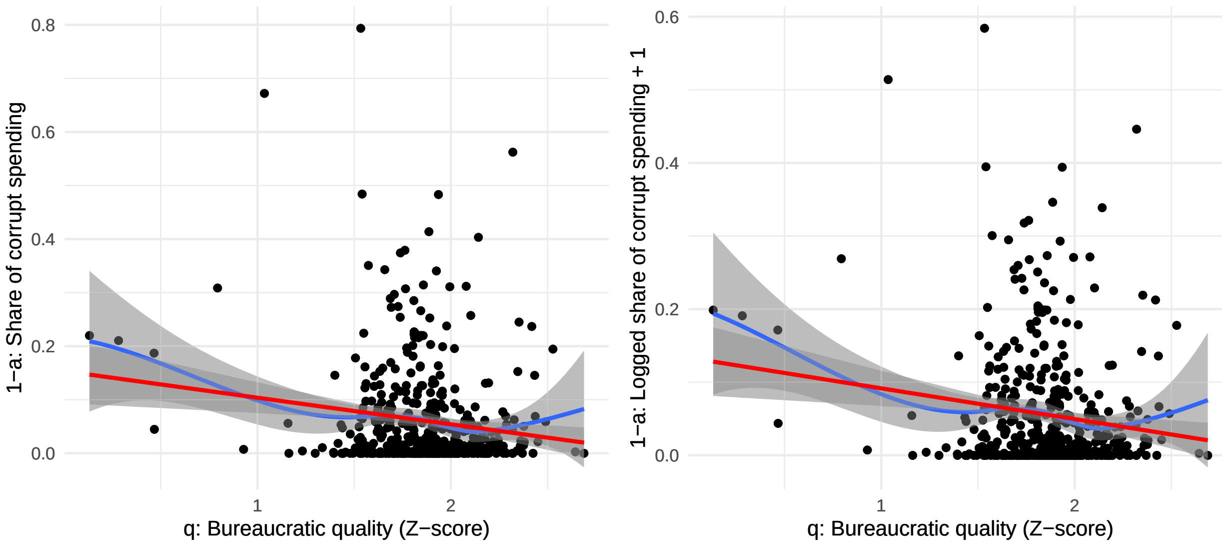

Figure D2: Scatter plot depicting bureaucratic quality and the share of audited funds spent in a corrupt manner. These graphs plot the raw data from Table 2.

D2.3 Extensions

Decomposition of corrupt spending: One potential concern with the results in Table 2 is that low bureaucratic quality corresponds to worse record-keeping that would manifest in audits as corrupt spending. If this were the case, we may expect similar effects across types of malfeasant spending, as defined by Avis, Ferraz, and Finan (2018).[3] This is not the case when we decompose the sources of rents in Table D3. Increases in bureaucratic quality correlate most strongly with reductions in misallocated spending.

No heterogeneity by community radio presence: Diffusion of pre-2004 audit reports was believed to be facilitated by the presence of a municipal radio station in Brazilian municipalities. Note that Ferraz and Finan (2008) show that community radio magnified the electoral effects of revelation of audit information. They do not find that radio stations

[3] Avis, Ferraz, and Finan (2018) refer to misallocation as "embezzlement", corrupt bids as "procurement contracts," and overbudget as "over invoicing."

	Share of corrupt spending			Log(Share of corrupt spending + 1)		
	(1)	(2)	(3)	(4)	(5)	(6)
Bureaucratic Quality (Z-score)	-0.015^{**}	-0.015^{**}	-0.017^{**}	-0.013^{**}	-0.013^{**}	-0.014^{**}
	(0.006)	(0.006)	(0.008)	(0.005)	(0.006)	(0.007)
Radio	-0.005	0.007	0.009	-0.005	0.006	0.008
	(0.011)	(0.012)	(0.016)	(0.009)	(0.010)	(0.013)
Bureaucratic Quality×Radio	0.002	0.001	-0.002	0.002	0.001	-0.002
	(0.013)	(0.012)	(0.012)	(0.011)	(0.010)	(0.010)
State FE		✓	✓		✓	✓
Lottery FE		✓	✓		✓	✓
Demographic controls (decile bins)			✓			✓
Outcome Range	[0,0.794]	[0,0.794]	[0,0.794]	[0,0.584]	[0,0.584]	[0,0.584]
Outcome Mean	0.062	0.062	0.062	0.056	0.056	0.056
Outcome Std. Dev.	0.10	0.10	0.10	0.085	0.085	0.085
Adj. R^2	0.014	0.081	0.097	0.015	0.092	0.108
Num. obs.	448	448	448	448	448	448

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table D4: Heterogeneity in the association of bureaucratic quality and corruption as a function of community radio presence. 177 of the sampled communities registered community radios in December 2003 2. Heteroskedasticity-robust standard errors in parentheses. All fixed effects and covariates are binary indicators. Covariate adjustment is implemented by demeaning, which produces no estimates of these parameters.

alone make voters more likely to sanction politicians. This section evaluates whether the presence of a local radio station influences the a politician's allocation behavior when audits were not yet anticipated. If radios do not alone increase p (absent audits) as in Ferraz and Finan (2008), then there should be no difference in allocation behavior as a function of the presence of a community radio station.

I collect historic FM radio station registrations from ANATEL and create an indicator measuring whether each municipality had an FM radio station registered in 2003. Table D4 finds no heterogeneity by radio presence. I interpret this as evidence that incumbents did not differentially anticipate revelation of performance information as a function of radio presence/absence when making allocations.

D3 First-term vs. Second-term Allocation to Rents: Visualization

The regression estimmated by (10) compares differences in second- versus first-term allocation to rents. Figure D3 provides an alternative depiction of this result by ploting average allocation to rents by quantile of bureaucratic quality (on the x-axis) and by term (by color and shape). It shows that second-term shirking is apparent in the lowest tercile/quantile. Note that these conditional means do not account for differential rates of re-election across quantiles. Consistent with the analysis of incumbency disadvantage, re-election rates are 6 to 10 percentage points lower in municipalities in the lowest bin of bureaucratic quality.

D4 Survey Experimental Test of Voter Updating: Survey Material and Extensions

D4.1 Design of survey and experiment

This paper uses a subset of treatment conditions from Weitz-Shapiro and Winters (2016*a*) and Winters and Weitz-Shapiro (2016). The full seven-arm design is enumerated in Table D5. Because "clean" and "corrupt" are both exper-

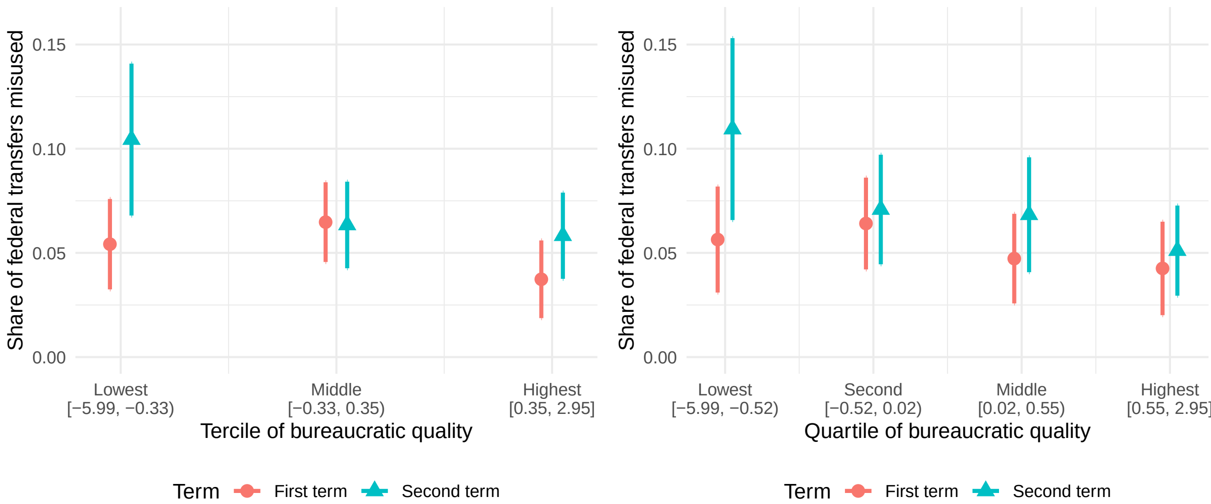

Figure D3: Conditional means (with 95% confidence intervals) by quantile of bureaucratic quality and politician term. We detect second-period shirking only in the lowest tercile/quantile. In all other subgroups, allocations to rents are indistinguishable.

imental manipulations of interest, I omit treatment conditions that are not fully crossed for both types of information. I use the control (no information) condition as a measure of priors.

Arm							
Corruption Information	None	Clean	Corrupt				
Source of Information	None	Unspecified	Unspecifed	Opposition Party		Federal Audit	
Implicated Official	–	Mayor	Mayor	Mayor	Municipal official	Mayor	Municipal official
Analyzed in extension	✓	✓	✓				
N per arm:	286	286	286				

Table D5: Design and specification of treatment conditions utilized in extension of the survey experiment.

The vignette used as the material for the three treatments of interest is quoted in Table D6.

Arm	Vignette Text
Control	"Imagine that you live in a neighborhood similar to your own but in a different city in Brazil. Let's call the mayor of that hypothetical city in which you live Carlos. Imagine that Mayor Carlos is running for reelection. During the four years that he has been mayor, the municipality has experienced a number of improvements, including good economic growth and better health services and transportation." (Weitz-Shapiro and Winters, 2016*a*, p.66)
Clean	Control text + "Also, it is well known in the city that Mayor Carlos has not accepted any bribes when awarding city contracts." (Weitz-Shapiro and Winters, 2016*a*, p.66, emphasis added).
Corrupt	Control text + "Also, it is well known in the city that Mayor Carlos has accepted bribes when awarding city contracts." (Weitz-Shapiro and Winters, 2016*a*, p.66, emphasis added).

Table D6: Vignette text for each treatment condition.

Per Weitz-Shapiro and Winters (2016*b*), the sampling procedure for cities and individuals was as follows:

> "140 cities were sampled using a probability-proportional-to-size (PPS) method within 25 strata that are defined by 25 of Brazil's 27 states. (The survey rotates on a monthly basis among three small states in the northern region of the country.) Census tracts were selected using PPS with stratification across zones of major metropolitan areas. Enumerators recruited individual respondents in public or semi-public places according to a quota scheme designed to produce a representative sample of the national population in terms of age, gender, and employment characteristics (sector of the economy and employment status)." (Weitz-Shapiro and Winters, 2016*b*, p. 4)

Because larger cities are more likely to be chosen when municipal sampling is proportional to population and larger cities have higher average bureaucratic quality (see Figure A2), sampled municipalities have a slightly higher level of bureaucratic quality, as depicted in Figure D4. Importantly, however, there is support across most of the distribution of bureaucratic quality.
Table D7 confirms that adjusting for municipal population eliminates this imbalance, consistent with the account of municipal sampling. Note that 129/140 municipalities in the survey experimental sample recorded bureaucratic education in 2011. I also constructed an predicted measure from an additional 10 municipalities that recorded bureaucratic education in 2008.

The survey experiment blocks assignment to the experimental manipulations on municipality and maintains equal probabilities of assignment in each municipality.

D4.2 Robustness and Extensions

This section provides several extensions of the analysis reported in the paper. First, note that per Tables D5 and D6, the survey experiment included both clean and corrupt treament conditions. In Figure 5, I analyze a new empirical implication for voter learning from a clean signal. However, it is also possible to examine how voters respond to the corrupt signal, a focus of both Weitz-Shapiro and Winters (2016*a*) and Winters and Weitz-Shapiro (2016). Per Proposition A1, for any $q \geq \widetilde{q}_3$, a corrupt signal is off the equilibrium path because all first-term politicians pool by allocating the budget to public good (approximating no corruption). The intuitive criterion invokes an assumption that a corrupt signal reveals the politician to be an incompetent type. As such, the analysis of CATEs of the corrupt signal test a mix of empirical implications (at low levels of bureaucratic quality in sample) and off-path assumptions (at moderate and high levels of bureaucratic quality).

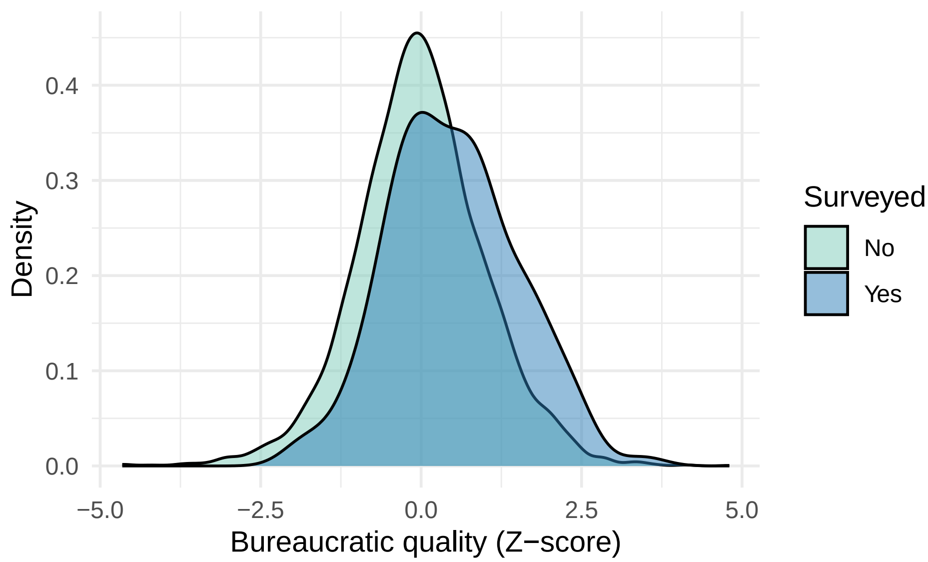

Figure D4: Distribution of bureaucratic quality in sampled and unsampled municipalities.

	Municipality in survey sample			
	(1)	(2)	(3)	(4)
Bureaucratic quality (z-score)	0.012^{***}	0.001		
	(0.002)	(0.002)		
Bureaucratic quality w/ imputation (z-score)			0.012^{***}	0.001
			(0.002)	(0.002)
Population percentile bins		✓		✓
Adj. R^2	0.006	0.223	0.006	0.213
Num. obs.	5230	5230	5507	5507

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table D7: Municipal sampling in survey experiment. Adjustment for municipal population accounts for differences in bureaucratic quality in sampled and non-sampled municipalities. Note that population percentile bins are binary indicators. Note that these fixed effects are implemented by demeaning, which produces no estimates of these parameters.

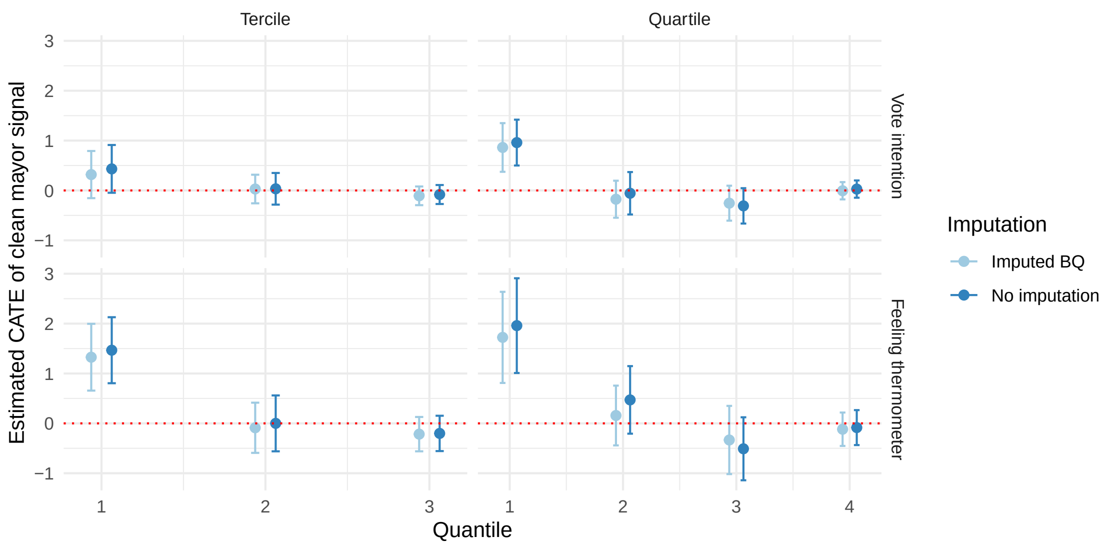

Figure D5: Estimated CATEsfrom Panels B and C of Table A10, columns (3), (6), (9), and (12). 95% confidence intervals are constructed from standard errors clustered at the municpal level.

Figure D6 disaggregates the result in Figure 5 by respondent education/political knowledge, as defined by Weitz-Shapiro and Winters (2016*a*). While the subgroups reduce sample sizes and add noise, we do not see substantial differences in updating behavior across the two subgroups. Table D4.2 provides the regression results from which Figure D6 is constructed.

D5 Incumbency Disadvantage: Design Validation and Commensurability Analysis

D5.1 Design validation

In Table D9, I test for differential sorting (or differential density) around the electoral cutoff within each of the bins of bureaucratic quality using the test proposed by McCrary (2008). I find no evidence of differential sorting. In Tables A11-**??**, I report several estimates of each LATE (or post-treatment estimand) including the bias-corrected estimates depicted in Figure 6.

D5.2 Commensurability Analysis

Eggers (2017) and Ashworth, Berry, and Bueno de Mesquita (2021) raise important concerns about the ability of close-election regression discontinuity designs to isolate the source of incumbency advantage or disadvantage. In the present model, candidates can differ on three dimensions: (1) their competence (type); (2) their valence, and (3) the presence of re-election incentives. This application of a close-elections RD design seeks to isolate voter anticipation of second-period shirking when the politician no longer faces the prospect of re-election as the source of incumbency disadvantage. To evaluate the commensurability of the LATE and this source of incumbency disadvantage, consider the two types of races that we see in the data:

- *Case #1: First-term incumbent contests re-election*: This case is characterized by the equilibrium described in Propsition 1. Here, a first-term incumbent contests re-election against a challenger. Because the voter does not observe any signal of the challenger's competence before the election, the voter believes that the challenger to be competent with probability π (her unbiased prior). If elected, the challenger is elected, she will therefore be

	(1)	(2)	(3)	(4)
	Vote intent		Feeling thermometer	
PANEL A: TERCILE BINS OF BUREAUCRATIC QUALITY				
BQ tercile 2	0.540	0.169	0.571	0.947^{**}
	(0.553)	(0.271)	(0.933)	(0.474)
BQ tercile 3	−0.018	0.013	0.361	0.746
	(0.551)	(0.301)	(0.715)	(0.527)
Clean mayor signal	0.600	0.314	1.778^{**}	1.527^{***}
	(0.638)	(0.285)	(0.772)	(0.461)
Corrupt mayor signal	-1.133^{*}	-0.996^{**}	−1.161	-1.298^{***}
	(0.625)	(0.389)	(1.229)	(0.464)
Tercile 2 × clean signal	−0.728	−0.295	−2.062	-1.482^{**}
	(0.759)	(0.344)	(1.329)	(0.579)
Tercile 3 × clean signal	−0.538	−0.436	-2.000^{**}	-1.686^{***}
	(0.689)	(0.319)	(0.854)	(0.516)
Tercile 2 × corrupt signal	−0.282	−0.335	−1.056	−0.726
	(0.798)	(0.459)	(1.651)	(0.628)
Tercile 3 × corrupt signal	−0.337	−0.169	−1.391	−0.578
	(0.665)	(0.423)	(1.285)	(0.521)
PANEL B: QUARTILE BINS OF BUREAUCRATIC QUALITY				
BQ quartile 2	1.727^{*}	0.689^{*}	3.433^{*}	1.733^{***}
	(0.992)	(0.388)	(1.770)	(0.606)
BQ quartile 3	1.441^{*}	0.945^{***}	2.278	2.402^{***}
	(0.865)	(0.350)	(1.395)	(0.589)
BQ quartile 4	0.982	0.488	2.851^{**}	1.736^{***}
	(0.946)	(0.362)	(1.422)	(0.602)
Clean mayor signal	1.000	0.850^{***}	0.475	2.156^{***}
	(0.876)	(0.275)	(0.872)	(0.635)
Corrupt mayor signal	−0.477	−0.694	−0.635	−0.825
	(0.481)	(0.545)	(1.399)	(0.593)
Quartile 2 × clean signal	−1.442	-0.937^{**}	−0.418	-1.636^{**}
	(1.095)	(0.373)	(1.835)	(0.736)
Quartile 3× clean signal	−0.983	-1.202^{***}	−0.086	-2.747^{***}
	(0.995)	(0.333)	(1.102)	(0.741)
Quartile 4 × clean signal	−0.911	-0.856^{***}	−0.718	-2.175^{***}
	(0.920)	(0.313)	(0.972)	(0.675)
Quartile 2 × corrupt signal	−0.432	−0.611	−0.592	−1.021
	(0.682)	(0.608)	(1.772)	(0.747)
Quartile 3 × corrupt signal	-1.420^{**}	−0.733	−1.334	-1.418^{**}
	(0.706)	(0.589)	(1.576)	(0.719)
Quartile 4 × corrupt signal	-0.947^{*}	−0.411	−2.012	−0.986
	(0.553)	(0.575)	(1.472)	(0.642)
Num. obs.	197	562	203	574
Respondent education/knowledge	High	Low	High	Low
State FE	✓	✓	✓	✓
Demographic covariates (decile bins)	✓	✓	✓	✓

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table D8: Regression estimates from which Figure D6 is calculated. Note that the state fixed effects and decile bins of the demographic covariates are all binary indicators. As such, the fixed effects/covariate adjustment is implemented by demeaning, which produces no estimates of these parameters.

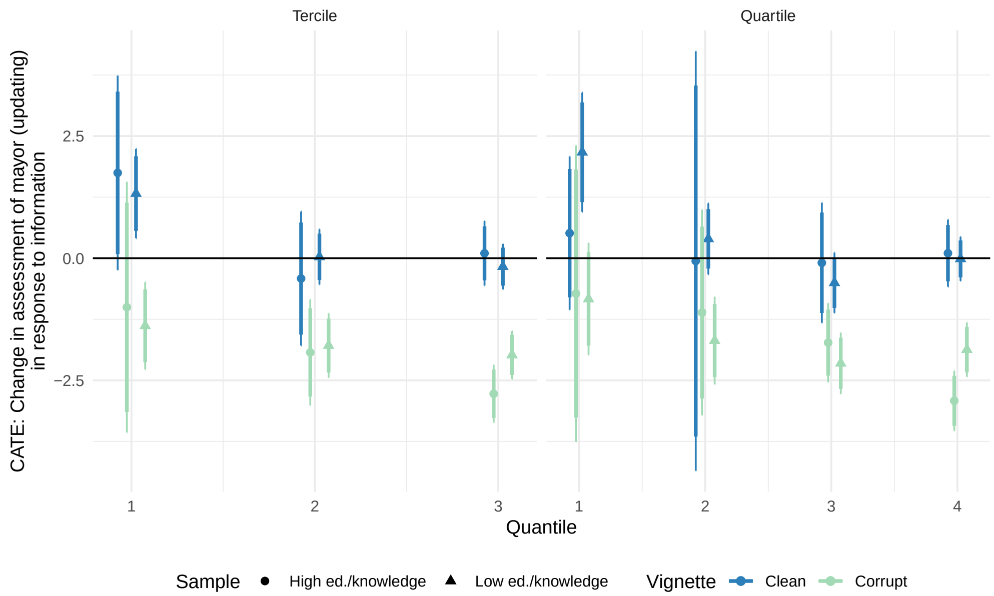

Figure D6: Disaggregating results by subjects with high education or high political knowledge ($n = 203$) versus not ($n = 574$) reveals little heterogeneity in updating by respondent characteristics. Standard errors are clustered at the municipality level. Note that the state fixed effects and decile bins of the demographic covariates are all binary indicators. As such, the fixed effects/covariate adjustment is implemented by demeaning, which produces no estimates of these parameters.

competent with probability π. But this means that the share of competent types among first-term politicians is also π. As such, there is no difference in average competence between first-term incumbents and challengers. Moreover, by assumption, the valence shock for the incumbent is symmetric about zero ($\phi \sim [-b, b]$). Thus, in expectation, incumbents and challengers are equal in quality and in valence, since $E[\phi] = 0$. The two pools of candidates vary only in their re-election incentives. If re-elected, the incumbent no longer faces re-election incentives. In contrast, if elected, the challenger must look forward to contesting re-election in the next election under the assumptions of the model. As such, comparison of (unconditional) re-election rates between incumbents and challengers isolates voter anticipation of future politician behavior. Incumbency disadvantage therefore isolates voter anticipation of shirking in the second term if it is predicted to occur.

- *Case #2: Open seat races*: This case is "outside the model" but is straightforward to characterize using the parameters of the model. In open-seat elections, voters choose between two untested candidates. This could occur because the first-term incumbent does not run for re-election or because a second-term incumbent has reached her term limit. Because the voter does not observe any signal of either candidate's competence before the election, the voter assumes that each is competent with probability π. There is no incumbent, and thus no valence shock.[4] In this case, both challengers will have identical re-election incentives. As such, the voter randomly chooses one of the challengers since they are identical in expectation. Here, there should be no incumbency advantage or disadvantage.

In the data, we see a mix of these two cases. The presence of open seat races in the data should simply dilute or attenuate observed incumbency disadvantage. Given the sparsity of the model, the above implies that a naive comparison of re-election rates of incumbents should also measure incumbency disadvantage. However, there are unmodeled

[4] Alternatively, one could allow for a random valence shock for one of the candidates to break the voter's indifference. So long as the valence shock is independent across elections (within individual candidate/politicians), valence differentials akin to the candidate quality differentials raised by Eggers (2017) and Ashworth, Berry, and Bueno de Mesquita (2021) will not emerge.

Quantile	Bin	Z-score	p-value
Tercile	1	0.657	0.511
Tercile	2	-0.736	0.462
Tercile	3	1.270	0.204
Quartile	1	0.512	0.609
Quartile	2	0.066	0.947
Quartile	3	0.616	0.538
Quartile	4	0.491	0.623

Table D9: McCrary (2008) tests for sorting in the running variable for each subgroup in the analysis. The Z-statistic is the test statistic. The p-value tests the null hypothesis of no sorting at the threshold.

features the external world which may hinder our ability to observe this all-else-equal comparison. The close-elections sample, and specifically the case in which the margin of victory at election t is equivalent to 0, maintains the same properties as the the naïve comparison.[5] It has the (empirical) benefit of holding other features continuous about this threshold (Klašnja and Titunik, 2017).

The consequential difference between my model and the models in both Eggers (2017) and Ashworth, Berry, and Bueno de Mesquita (2021) is the alternate assumption about *whether candidate quality information is revealed to voters before a candidate takes office*. Eggers (2017, p. 1317) and Ashworth, Berry, and Bueno de Mesquita (2021, p. 218) assume that voters observe candidate quality (or noisy private signals thereof) in advance of the close election used in the RD design. The present model does not assume this. Ultimately, it is impossible to fully adjudicate between my model and alternative models in which challenger quality is observed before the election using the observed data. However, Eggers (2017, p. 1324) explicitly provides one alternative explanation for the Klašnja and Titunik (2017) finding of incumbency disadvantage in Brazil, writing "candidates who replace term-limited incumbents are weaker than their opponents." The logic is elegant, but relies on the assumption that voters observe challenger quality before casting their ballots. If this alternative explanation was operative, we should see incumbency disadvantage emerge in open-seat races, not (necessarily) races in which a first-term incumbent contests re-election. Figure D7 suggests that all measures of incumbency disadvantage are driven by contests in which the incumbent runs. This is inconsistent with the alternative explanation by Eggers (2017). Note however, that this (or any known) empirical analysis cannot rule out all candidate-quality driven explanations for incumbency disadvantage.

[5]This follows because the valence shock is assumed to be iid across municipalities, and over time within municipality.

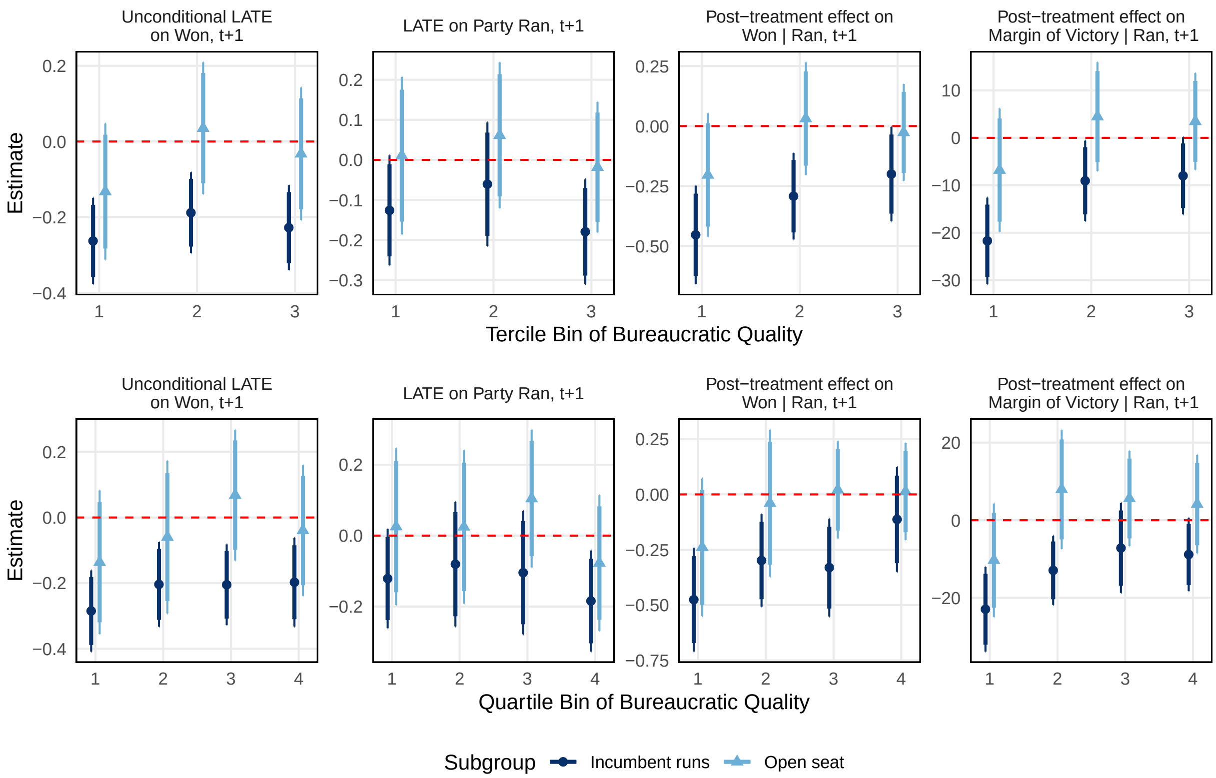

Figure D7: Disaggregating treatment effects in Figure 6 into races in which (1) an incumbent candidate contests re-election and (2) open seat races. Across all outcomes and different quantile binning approaches, incumbency disadvantage is driven by contests in which an incumbent is running, consistent with the analysis above and inconsistent with the alternative explanation posited by Eggers (2017).

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