Oversight, Capacity, and Inequality

Tara Slough*

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Abstract

Oversight of bureaucratic service providers frequently relies upon information provided by citizens complaints. I argue that the use of complaints to direct oversight generates variation in a state's capacity to implement public policies and shapes who accesses state services. I develop a model of service provision to understand the distributive implications of a politician's choice to use information generated by complaints when monitoring a bureaucrat. Complaints generate information that direct a politician's remediation of bureaucratic decisions and may increase bureaucratic effort. However, when citizen vary in their propensity to complain, reliance on complaints generates inequality in citizen access to services, improving access of citizens that can complain while reducing access of citizens that cannot. Reliance on complaints can build or erode a state's capacity for accurate policy implementation depending on the share of citizens who complain. I show that bureaucratic oversight institutions shape implementation capacity and inequality in comparative perspective.

*Assistant Professor, New York University, tara.slough@nyu.edu. I thank Charles Angelucci, John Huber, Macartan Humphreys, John Marshall, John Patty, Mike Ting, Tinghua Yu, and Congyi Zhou for helpful comments. This project is supported in part by an NSF Graduate Research Fellowship, DGE-11-44155; NSF Doctoral Dissertation Research Improvement Grant 1729334; and grants from J-PAL, Evidence in Governance and Politics (EGAP), the Center for the Study of Developement Strategies, and the Columbia Department of Political Science.

Citizen complaint systems represent one of the most regular forms of citizen engagement with governments in democratic and autocratic regimes alike. These systems, broadly defined, provide a means for citizens to convey information to the government in response to a (perceived) failing of a bureaucrat or bureaucratic agency. Across contexts, citizens communicate information about the location of potholes, missing social benefits, corruption by state agents, and violations of social or human rights, among many others.

Despite their ubiquity, the design of citizen complaint systems as a bureaucratic oversight institution varies across contexts and policy areas. These systems differ in how principals (politicians or higher-level bureaucrats) respond to complaints, both in terms of granting redress an in punishing the offending agents. The anticipation of these responses should in turn shape citizens' complaint-making behavior and bureaucrats' effort in providing services. In this paper, I ask how the design of oversight institutions influences "who gets what" services from the state.

A growing literature uses citizen complaints to study government responsiveness (Chen, Pan, and Xu, 2015; Christensen and Ejdemyr, 2020; Sjoberg, Mellon, and Peixoto, 2017; Dipoppa and Grossman, 2020; Hamel and Holliday, 2019) and the organization of autocratic regimes (Pan and Chen, 2018; Dimitrov, 2013). This paper complements and extends this literature by considering when and how politicians (principals) design complaint systems and how these institutions shape the population that complains. In turn, this characterization of selection into complaint-making generates new implications for understanding the distributional consequences of oversight.

Consider a politician's choice to use (or ignore) information generated by citizen complaints as part of a bureaucratic oversight strategy. In terms of classic oversight parlance, when do politicians commit to monitor bureaucrats via "fire alarms" versus "police patrols"? How does the choice of such monitoring propensities constrain the politician's ability to incentivize bureaucratic effort? I contend that the answer to this puzzle lies in *who* complains. The model emphasizes that citizens in a population vary in their ability/willingness to complain or "pull" a fire alarm. The observation that costs of complaint are often non-trivial and can vary substantially across a population echoes early warnings of McCubbins and Schwartz (1984).

I answer these questions by developing a model of service provision built upon a framework developed by Prendergast (2003). In the model, a bureaucrat chooses whether or not to exert effort to determine a citizen's state (i.e., eligible or ineligible) with respect to the service. The bureaucrat then makes a binary allocation of the service to the citizen. The citizen, who knows her state, observes the allocation, and decides whether or not to complain to the politician. Importantly, the cost of complaint varies across the population of citizens, such that citizens vary in their willingness to provide information about their personal state (Slough, 2019). The politician monitors the bureaucrat's action based on the allocation and the presence of a complaint. If such auditing reveals misallocation (i.e., a service denial to an eligible citizen), the citizen recovers the service and the bureaucrat is punished.

The politician designs oversight by committing to a contract *ex-ante* that specifies effort incentives for bureaucrats (the magnitude of punishment for errors) and monitoring rates as a function of observed allocation by the bureaucrat and the presence of a citizen complaint. I characterize four qualitatively distinct contracts that emerge in equilibrium depending on: (i) the politician's targeting of services and (ii) the level of bureaucratic insulation, conceived as a limit on the size of effort incentives (punishments for wrong decisions by bureaucrats). The contracts vary in their provision of effort incentives and whether the politician's monitoring responds to information provided by citizens in the form of complaints. These monitoring propensities, in turn, determine which citizens have an incentive to complain.

I use these oversight contracts to derive implications for the state's capacity to implement policies as well as for inequality in access to services. The measure of implementation capacity developed in this paper arguably formalizes Mann's (1984) concept of state capacity as "infrustructural power," or the "ability to . . . penetrate civil society, and to implement political decisions throughout the realm" (189).[1] By focusing on an informational problem underlying service provision, namely the need for a government to learn about its citizens' states, this paper draw parallels to discussion of the "legibility" of citizens to a government as a determinant of implementation capacity (Scott,

[1]There are many definitions of state capacity in the literature. I refer to "implementation capacity" to refer to the concept used in this paper.

1998; Lee and Zhang, 2016).

I find that contracts that condition monitoring on information provided by citizens have an ambiguous effect on a state's capacity to match policies to intended recipients. This type of monitoring improves the accuracy of targeting among "legible" citizens – those that choose to provide information when wrongly denied. However, it also promotes a form of capture by simultaneously reducing the state's accuracy in providing service to "illegible" citizens who would never complain. Which effect dominates depends on the share of legible citizens in a population.

In contrast to its ambiguous effect on implementation capacity, conditioning monitoring on citizen information transmission always increases inequality in the delivery of state services when citizens vary in their propensity to complain. When monitoring relies on citizen complaints, citizens who complain receive more accurate – and simply more – services, both from bureaucrats' initial allocations and through redress of their complaints. Further, the capture mechanism implies that those who cannot complain are worse off (in absolute terms) than they are in the absence of information transmission from agrieved citizens to politicians. The magnitude of this increase in inequality depends on the distribution of costs of complaint in the population. The use of citizen information in bureaucratic oversight thus suggests a possible tradeoff between expanding the state's capacity to accurately serve its citizens and entrenching inequality in access to state resources. The tradeoff emerges when oversight institutions induce a sufficiently small proportion of the population to provide information to the state.

This paper analyzes a comparatively neglected tool used by politicians to influence the state's capacity to implement policies: the use of information from citizens in bureaucratic oversight (Berwick and Christia, 2018). Existing work linking bureaucratic institutions to state outputs has focused on the adoption of personnel policy like civil service reforms (Geddes, 1991, 1994; Grindle, 2012; Huber and Ting, 2015). The present model captures public sector personnel systems with two exogenous parameters: bureaucratic quality and insulation. In so doing, it allows for consideration of how these oft-studied features of public sector personnel systems affect the oversight schemes adopted by politicians and their consequences. Whereas civil service reforms are often viewed as major, costly reforms across large portions of the bureaucracy (Rauch, 1995; Folke, Hirano, and Snyder, 2011; Ujhelyi, 2014), oversight practices can, in principle, be deployed or manipulated more flexibly by politicians. Variation in oversight practices across policies or jurisdictions therefore may better explain variation in apparent implementation capacity across space, time, and policy design, in line with a growing literature on sub-national variation in capacity (Weber, 1976; Enriquez and Centeno, 2012; Soifer, 2015).

The model in this paper builds upon an emerging theoretical literature on state capacity (Besley and Persson, 2010; Acemoglu, García-Jimeno, and Robinson, 2015; Gennaioli and Voth, 2015; Snowberg and Ting, 2019). As in the empirical literature, there is no apparent consensus on what state capacity means. I focus on one manifestation of state capacity distinct from the aforementioned literature: the congruence between policies and their realization. I refer to this as implementation capacity. Further, this paper clarifies and formalizes the distinction between bureaucratic capacity and state implementation capacity, by emphasizing the incorporation of bureaucrats into the state as an organization consisting of a government *and* citizens.

This primary contribution of this paper is its suggestion of a link between organization of bureaucratic oversight and the study of distributive politics. The study of "who gets what" from the state generally focuses on the allocation and policy decisions made by politicians by examining which individuals or groups are targeted as beneficiaries (Golden and Min, 2013). One interpretation of existing arguments of capacity and economic growth is that capacity scales the "size of the pie" that politicians have to distribute. My theory, instead, contends that building the capacity to implement policies redistributes the pie across different segments of a population. Such distributional consequences of implementation can occur independently from the content of the policy. To the extent that politicians design influence bureaucratic oversight institutions, I identify a novel strategy via which politicians influence "who gets what" beyond the policymaking process, complementing an emerging literature on policy implementation (Williams, 2017).

Many recent and ongoing studies on state capacity are motivated by an impulse to learn "how to strengthen [state capacity]" (Berwick and Christia, 2018: p. 71). The bureaucratic oversight institutions I study provide a new framework through which to answer the "how." However, the main findings on capacity and distribution suggest that viewing capacity as an aggregate concept or measure can disguise stark distributional outcomes of efforts to strengthen states' implementation capacity. In so doing, I provide one possible reconciliation of a much longer-standing disagreement about the welfare effects of state capacity (e.g., Scott, 1998; Acemoglu, García-Jimeno, and Robinson, 2015; Johnson and Koyama, 2017).

1 Empirical Motivation

1.1 Describing Observed Complaints

The most frequently documented citizen complaints come from 311-type hotlines or online platforms that allow for reporting about a variety of service provision issues (Chen, Pan, and Xu, 2015; Pan and Chen, 2018; Sjoberg, Mellon, and Peixoto, 2017; Christensen and Ejdemyr, 2020; Dipoppa and Grossman, 2020; Hamel and Holliday, 2019). In Figure 1, I examine per-capita utilization of complaint hotlines in New York City, United States and Bogotá, Colombia. Similar to many other cities and countries with 311-type systems, both cities release anonymized complaint-level records. The left panel of Figure 1 suggests a consistent stream of complaints in both cities between January 2017 and June 2018. Rates of complaint are substantially higher in New York, averaging 616 per million residents per day versus 15 in Bogotá.[2] Variation in the services covered by complaint systems, modes of complaint, and potentially responsiveness render the comparison of complaints in both cities a challenging endeavor. Nevertheless, the non-trivial rates of complaint in both cities suggest that responding to and remedying complaints occupies one source of oversight effort.

The right panel of Figure 1 examines rates of complaint across smaller geographic units. The data is shared at different levels of spatial aggregation. In Bogotá, I examine the city's 20 localities; in New York, I examine 2164 census tracts. In both cities, there exists substantial variation in the per-capita rates of complaint across these areas. The variation across geographic units is substan-

[2] I exclude non-emergency complaints to the police, fire department, and Taxi and Limousine Commission in New York given to increase comparability. Non-emergency police calls are directed elsewhere in Colombia.

tial: in Bogotá, moving from the first to the third quartile locality represents a 232% increase in the per-capita rate of complaint; in New York, the analogous shift represents a 47% increase in the per-capita rate of complaint. Existing studies that seek to identify differential *responses* to complaints as a function of election timing (Dipoppa and Grossman, 2020), politician re-election incentives (Christensen and Ejdemyr, 2020), or neighborhood characteristics (Hamel and Holliday, 2019) find measurable differences in the speed with which complaints are remedied, but effect sizes are quite small, ranging from a few hours to 2 days. Combined, substantial differences in the rate of complaint and small (if precise) differences in response to complaints suggest that selection into complaining may be particularly important for understanding the distributive consequences of these types of complaint systems.

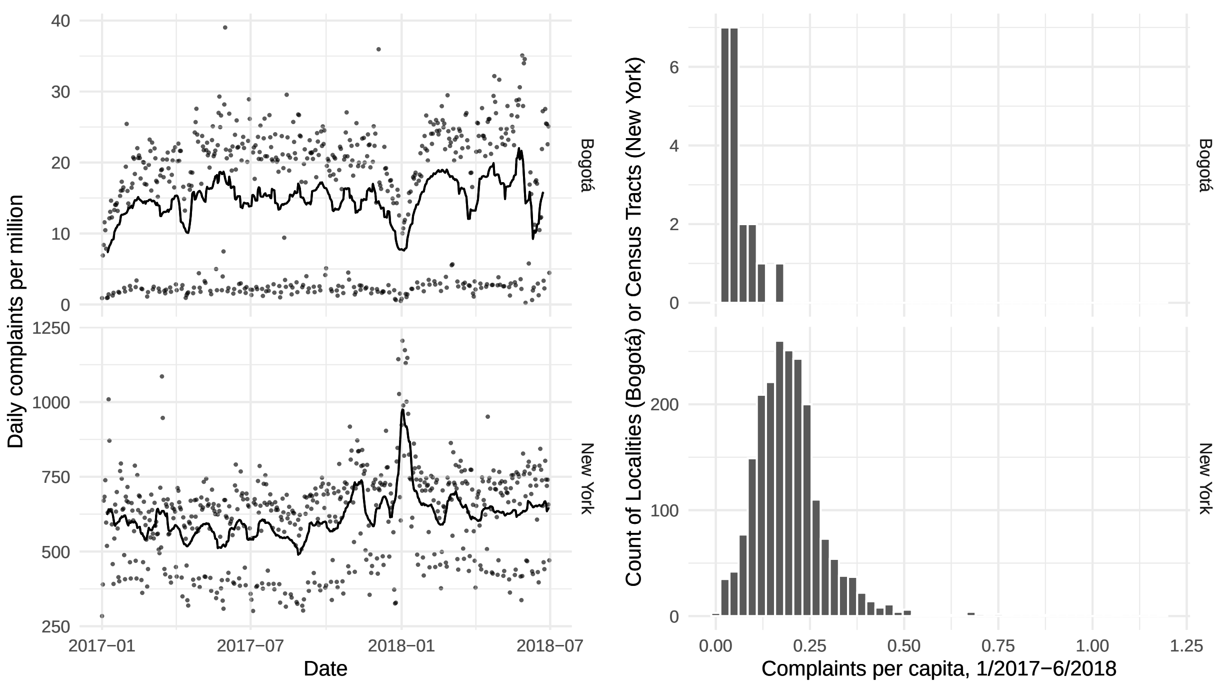

Figure 1: Description of anonymized 311 complaint data in Bogotá and New York. The left panel depicts the number of daily complaints per million over an 18-month period. The large differences in daily complaint rates in both cities generally map to weekdays vs. weekends/holidays. As such, the line represents a 7-day moving average. The right panel shows the distribution of per-capita complaints over the 18-month period by locality (Bogotá) and census tract (New York).

Certainly, rates of complaint may differ across a population for multiple reasons. If different subpopulations rely more or less on specific public services, their need for recourse via complaint may vary. With high levels of residential segregation, these differences may manifest across jurisdictions. Further, even among widely-used services, if the quality or level of service provision is uneven across jurisdictions, worse service provision may yield more complaints. On the other hand, if some citizens may face fewer costs or barriers to complaint they may be more likely to communicate grievances that do occur (Ba, 2018; Rizzo, 2019). In the model, I consider a population that is differentially willing (or able) to engage the state via complaint. In light of the complaint data, I provide suggestive evidence in favor of the plausibility of this argument in Appendix B.

1.2 The Design of Oversight

The design of bureaucratic oversight institutions varies substantially across contexts and policy areas. I consider two sources of this variation. First, I consider the extent to which bureaucrats are punished if complaints are filed and errors are detected. In most contexts, complaints about a pothole may help to redress the issue but are unlikely to result in a substantial penalty to a bureaucrat with responsibility for roads. In contrast, bureaucrats' efforts to hide corruption complaints in China suggest a widespread perception that these complaints are detrimental to the career advancement of implicated officials (Pan and Chen, 2018). We can conceptualize the distinction between these cases in terms of the sanctions applied to bureaucrats when errors are detected by principals.

Of course, politicians (principals) operate within the constraints of public sector personnel regulations when determining what bureaucratic sanctions are legal or feasible to implement. In some civil service systems, bureaucrats are highly insulated from politicians. This insulation can be captured as a *maximum* magnitude of sanctions for bureaucratic errors. The possibility of costly sanctions is important for understanding bureaucratic effort and service provision behaviors more generally.

Second, bureaucratic oversight institutions vary in how politicians opt to use information generated by citizen complaints when monitoring bureaucrats. Following a classic analogy by McCubbins and Schwartz (1984), politicians can monitor bureaucrats through "police patrols" or "fire alarms." A "police patrol" strategy involves auditing a subset of all bureaucratic decisions in search of mistakes by the bureaucrat. A "fire alarm" strategy uses complaints or requests for redress to target likely mistakes. In service provision settings, complaint systems – from 311 systems, complaint boxes, to more formal forms of legal recourse – serve as one common source of "fire alarms." In practice, oversight caninclude some combination of both oversight strategies.

Whether and how politicians use information from complaints should influence citizens' selection into complaint-making. Given some initial service allocation/provision, citizens make claims to redress mistakes by the bureaucrat. In principle, citizens' complaint-making should increase in the perceived likelihood of redress. Indeed, recent work documents that citizens do indeed complain at (slightly) higher rates when they anticipate greater government responsiveness to their complaints (Sjoberg, Mellon, and Peixoto, 2017; Dipoppa and Grossman, 2020).

I proceed by developing a model of service provision that examines the adoption of bureaucratic oversight institutions in the form of a contract. Consistent with this discussion, the contract consists of (i.) the sanction for bureaucratic errors; and (ii.) monitoring rates in the presence or absence of citizen complaints. I then examine the distributional implications of these oversight institutions populations that varies in their propensity to complain.

2 Model

The model examines the choice of bureaucratic oversight institutions in a service provision setting. The model of service provision builds upon Prendergast (2003), with two central departures discussed at length in the model exposition.

I consider three actors: a citizen (C), a bureaucrat (B), and a politician (P). Define a state, $\omega \in \{0, 1\}$, where $\omega = 1$ with probability $\frac{1}{2}$. The state can be thought of as a characteristic of a citizen, specific to a single interaction. It is not a fixed characteristic of the citizen (e.g., type). In various service provision settings, the state could refer to sick or healthy; guilty or innocent; or eligible or ineligible. The state is private information to the citizen.

In this model, implementation capacity refers to the congruence between the ultimate service outcome, $a^\dagger \in \{0, 1\}$ and a citizen's state. I denote this congruence C in Equation 1. In existing work including Prendergast (2003), congruence is often assumed to generate a social surplus. I abstract from the assumption that accurate targeting of a service (higher congruence) leads to "better" outcomes. As in the motivating examples, accurate targeting of a service could well promote the rule of law or public health. On the other hand, the targeting of state repression is also a manifestation of capacity, but is not typically assumed to generate a social surplus. The framework developed here allows for the comparative study of capacity across society under weaker normative assumptions about the outcomes of state services.

$$C = \begin{cases} 1 & \text{if } \omega = a^\dagger \\ 0 & \text{else} \end{cases} \tag{1}$$

The bureaucrat is tasked with providing a citizen with some service, allocating a. He determines whether to exert effort, $e \in \{0, 1\}$, to try to ascertain the citizen's state ω. Exerting effort ($e = 1$) incurs cost $d > 0$. The bureaucrat correctly ascertains the state with probability $q + pe$ where $q \in [\frac{1}{2}, 1]$ and $p \in [0, 1 - q]$. The parameter q should be interpreted as a measure of bureaucratic quality and $q+pe$ can be interpreted as the measure of bureaucratic capacity that incorporates both quality and effort.

Upon observation of their allocation, the citizen determines whether to complain ($c = 1$) or not ($c = 0$) to the politician about their allocation, at cost $\theta > 0$. θ represents the legal, expertise, time, and/or psychological costs of contesting the bureaucrat's allocation. θ can be thought of as an individual citizen's type and is common knowledge. The assumption that complaints are costly represents the first substantial departure from Prendergast (2003). A direct implication of costless complaints is that, conditional on the state and allocation received, we should not observe variation in citizens' equilibrium complaint-making behavior. This implication stands at odds with recent work measuring citizen claim-making (Bussell, 2019; Kruks-Wisner, 2018). In examining the distributional outcomes of these contracts, after characterizing the equilibrium, I consider implications of these contracts for a heterogeneous population (conceived as a different θ's).

The politician observes the bureaucrat's allocation and the citizen's complaint (resp. non-complaint) and audits the bureaucrat's decision according to a pre-specified contract that stipulates the rate of auditing as a function of a and c. Denote this rate $\rho(a,c) \in [0,1]$. If audited, the politician pays a cost, $\frac{\rho(a,c)^2}{2}$, to learn ω. If the politician audits and observes that $a = \omega$, she will not change the allocation. If $\omega \neq a$, the citizen's ultimate allocation is $1-a$. Thus, the ultimate allocation of the service, $a^\dagger$ is given by:

$$a^\dagger = \begin{cases} 1-a & \text{if politician monitors and } \omega \neq a \\ a & \text{else} \end{cases} \tag{2}$$

When the politician reverses a bureaucrat's allocation, the bureaucrat is sanctioned with a penalty of $\Delta \in [0, \overline{\Delta}]$. $\overline{\Delta}$ is an exogenous upper bound on permissible penalties. This parameter can be interpreted as a measure of bureaucratic *non*-insulation. Lower values of $\overline{\Delta}$ constrain the punishment that the penalty the politician can impose, insulating the bureaucrat. Canonical descriptions of personnel systems suggest a lower $\overline{\Delta}$ under civil service systems than under patronage-based systems.

The citizen's decision about whether to complain depends on her valuation of the bureaucrat's allocation, and what can be recovered through the politician's auditing. I assume that citizens value receiving the service, regardless of state, i.e., citizens prefer to receive benefits, even when they are not "qualified." Citizens gain utility normalized to 1 if they ultimately receive the service and 0 otherwise. The citizen's utility is therefore:

$$U_C = a^\dagger - \theta c \tag{3}$$

The bureaucrat exerts effort in order to deter the penalty Δ. His utility is given by Equation 4, where r is an indicator function that takes the value of 1 if the politician audits and reverses the bureaucrat's allocation. w is a wage that satisfies the bureaucrat's participation constraint.

$$U_B = w - de - \Delta r \tag{4}$$

The politician contracts the bureaucrat, specifying the probabilities of audit, $\boldsymbol{\rho}(a, c)$, and sanction for errors, Δ. The politician seeks to optimize the accuracy of services provided to to serve to someone "like herself," net the costs of investigation. Formally, I assume that politicians, like citizens, are indexed by type, denoted θ_P, and politicians maximize accuracy (congruence) to serve a citizen for whom $\theta = \theta_P$.

This specification of the politician's preferences represents the second major departure from Prendergast (2003). In a population in which citizens may be differentiated, an additional assumption is needed to justify which citizens a politician seeks to serve. Consistent with a large literature on targeted distribution by politicians, the assumption here is simply politicians value the state's capacity to serve a specific type of citizen, not necessarily the population as a whole (when costs of complaint vary across the population). When all citizens prefer to receive the service, why might a politician, who seeks to serve a citizen "like herself," care instead about accuracy in allocation? Politicians often pursue policies like education, health, and security to achieve policy goals, like a more educated population, better health, or less crime, for reasons beyond targeting specific voters or groups.[3] Indeed, the underlying service (policy) is not targeted on the basis of citizen type, only on their eligibility (state). Yet, politicians presumably still care about how voters experience service provision, and may weigh a specific citizen or group of citizens relative to others.

In the main model, I therefore assume that a politician focuses on the service provision outcomes of a certain type of citizen, θ_P. In an extension in Section 6, I consider a politician that seeks to maximize the accuracy of service provision for serve all citizens. This assumption is closer in spirit to the welfare-maximizing principal in Prendergast (2003), but maintains the possibility of heterogeneity in citizen type.

[3]There are typically means through which politicans can provide citizens with private benefits that are much more direct than trying to produce and distribute public services.

Given the present assumption that politicians maximize accuracy for their own type, the politician's *ex-post* utility, given the state, the bureaucrat's allocation, and the presence or absence of a citizen complaint is:

$$U_P = \begin{cases} 1 - \frac{\rho(a,c)^2}{2} & \text{if } \omega = a \\ \rho(a,c) - \frac{\rho(a,c)^2}{2} & \text{if } \omega \neq a \end{cases} \tag{5}$$

Clearly monitoring effort is always costly to the politician. If the bureaucrat has erred in the allocation – when $\omega \neq a$ – the politician benefits from recovering the service for the citizen, which occurs with probability $\rho(a, c)$. However, the politican must commit to monitoring rates under different bureaucratic allocations and patterns of citizen complaint *ex-ante*. Calculation of the politician's expected utility incorporates three components. First, recall that each state occurs with probability $\frac{1}{2}$. Second, $\omega = a$ with probability $q + pe$. The politican may be able to induce the bureaucrat to exert effort ($e = 1$) and therefore increasing the bureaucrat's accuracy by providing effort incentives, Δ. Finally, the observed pattern of complaints, given the state and bureaucrat's allocation, depends on the citizen's type, θ. As such, the politican's expected utilty is given by:

$$\begin{aligned} E[U_P(\boldsymbol{\rho}(a,c), \Delta)] =& \frac{1}{2}\left[(q+pe)(1 - \frac{\rho(1,c)^2}{2}) + (1-q-pe)(\rho(0,c) - \frac{\rho(0,c)^2}{2})\right] + \\ & \frac{1}{2}\left[(q+pe)(1 - \frac{\rho(0,c)^2}{2}) + (1-q-pe)(\rho(1,c) - \frac{\rho(1,c)^2}{2})\right] \end{aligned} \tag{6}$$

2.1 Sequence, Assumption, Equilibrium Concept

1. The politician chooses a contract specifying $\boldsymbol{\rho}(a, c)$ and Δ.

2. The state, ω is realized and revealed to only the citizen.

3. The bureaucrat chooses effort level, e, allocating the service to the citizen, a.

4. The citizen observes a and decides whether or not to complain, c.

5. The politician monitors according to the contract. When she monitors, any bureaucratic errors are reversed and the bureaucrat is punished.

6. Utilities are realized.

I impose one assumption on $\overline{\Delta}$ in order to eliminate corner solutions. Note, however, that admission of a continuous $\overline{\Delta}$ does not change the qualitative findings of the model.

Assumption 1. *$\overline{\Delta} \in \{\overline{\Delta}_L, \overline{\Delta}_M, \overline{\Delta}_H\}$, where $\overline{\Delta}_L < \frac{d}{p}$, $\overline{\Delta}_M = \frac{2d(p+q+(1-q-p)^2)}{p}$, and $\overline{\Delta}_H \geq \frac{d}{p(1-q-p)}$.*

I characterize a Bayesian Nash equilibrium. The politician's contract is given by $\Delta \in [0, \overline{\Delta}]$ and $\rho(a, c) \in [0, 1]$ for $a \in \{0, 1\}$ and $c \in \{0, 1\}$. The bureaucrat's effort is given by $e : [0, \overline{\Delta}] \times [0, 1]^4 \rightarrow \{0, 1\}$, and his allocation is given by $a : [0, \overline{\Delta}] \times [0, 1]^4 \times \{0, 1\} \rightarrow \{0, 1\}$. The citizen's complaint strategy is given by the mapping: $c : [0, \overline{\Delta}] \times [0, 1]^4 \times \{0, 1\} \times \{0, 1\} \rightarrow \{0, 1\}$.

2.2 Comments on the Model

Before proceeding to the characterization of equilibrium contracts, I emphasize two features of the model.

Three tensions: The model features three tensions. First, there exists a standard agency problem: the politician would like the bureaucrat to exert effort to improve the accuracy of the allocation but effort is costly to the bureaucrat and unobserved to the politician. Second, all citizens prefer to receive the service, whereas the policy goal is to match the service to citizens' state. This implies a tension between individual and social welfare. This feature is common to many (but not all) services. Services may be targeted to eligible individuals instead of the entire population due to scarcity (i.e., limited doses available), budget constraints, or policy objectives (i.e., means-tested transfers). Finally, the politician's objective is particularistic: she seeks to optimize service for a specific type of citizen (one who is "like her"). In this setting, politicians are not social welfare maximizers, as is standard in much of political economy. The idea that politicians may priortize policy implementation as opposed to the utility of individual voters can be thought of as a reduced form budget constraint that seeks to direct resources where they can most efficiently serve a subset of the population. In the discussion, I consider the contribution of each of these tensions to the implications of each of these tensions to the distributive consequences of oversight institutions.

Observability of citizen type: I assume throughout that citizen type (θ) – their cost of complaint – is observed. The bureaucrat is able to condition service on the observed θ, potentially treating a prospective complainant differently than a citizen who would not complain. Substantively, conditioning service on θ corresponds to the idea that a bureaucrat may receive a complaint (or credible threat thereof) in advance of allocating the service. Indeed, the promise to "ask for a manager" is familiar to service providers in multiple contexts. The now-popular concept of "Karens" in the United States suggests that complaint-making behavior might be seen as an inherent, observable personality trait, consistent with this modeling of observable costs of complaint. Monitoring is conditioned on θ, but only indirectly through the realized complaints. I allow for direct conditioning of monitoring on citizen type in Section 6.

3 Equilibrium Analysis

Given that the politician pre-commits to the monitoring strategy, consider first the citizen's decision to complain. First note that, if a politician audits, she will observe the state. As such, if the state were $\omega = 0$, no citizen would complain. Even if the citizen were allocated $a = 0$, they would not recover the service via an audit and complaints are costly. As such, they will not complain. In contrast, when the state is $\omega = 1$, a citizen will complain if an increased probability of recovering the service exceeds the citizen's cost of complaint, θ:

$$\rho(0,1) - \rho(0,0) \geq \theta \tag{7}$$

This implies that there exists some threshold, $\widetilde{\theta} \equiv \rho(0,1) - \rho(0,0)$, above which citizens do not provide information to the politician via complaints. I refer to citizens for whom $\theta < \widetilde{\theta}$ as "legible" to the state. Building off of Scott (1998) and Lee and Zhang (2016), "legible" here refers to a citizen that could be induced to share private information about their state via a complaint to the politician. The informativeness of a complaint to the politician depends on both the citizen's type and the allocation. The the ability to complain provides information only if the citizen is legible and the bureaucrat allocates $a = 0$. If $a = 1$, the citizen has no incentive to complain in either state.

Lemma 1. ***Informational value of citizen (non-)complaints***:

(i) If $\theta > \widetilde{\theta}$, the citizen never complains $(c = 0)$. Upon observing no complaint, the politician's posterior belief about the probability of non-congruence is: $Pr(a \neq \omega) = 1 - q - pe$ for any a.

(ii) If $\theta \leq \widetilde{\theta}$, the citizen complains if and only if $\omega = 1$ and $a = 0$. As such, the politician's posterior belief about the probability of non-congruence between ω and a is:

$$Pr(a \neq \omega) = \begin{cases} 1 & \textit{if } a = 0, c = 1 \\ 0 & \textit{if } a = 0, c = 0 \\ 1 - q - pe & \textit{if } a = 1 \end{cases}$$

Now, consider the bureaucrat's decision to exert effort. The bureaucrat will exert effort $(e = 1)$ to avoid a penalty, Δ, in the instance that his investigation is mistaken. The probability of such mistakes is $1 - q - pe$. The bureaucrat will exert effort if the penalty is sufficiently large and monitoring is sufficiently likely relative to the marginal cost of effort:

$$\Delta \geq \frac{2d}{p[\rho(1,c) + \rho(0,c)]} \tag{8}$$

Equation 8 implies that if politicians monitor the bureaucrat's allocation at higher rates in the presence of citizen complaints, if $\rho(0,1) > \rho(0,0)$, the bureaucrat can be induced to exert effort with weaker incentives, Δ, on behalf of a citizen is expected to complain when wrongly denied the allocation. In considering the bureaucrat's behavior, one further consideration is warranted: is it always incentive compatible for the bureaucrat to follow his investigation?

Given that the effort incentive, Δ, is symmetric for an error of either type, any incentive to allocate the service contrary to the findings of a bureaucrat's investigation must be driven by different monitoring rates. Suppose first that the bureaucrat's research suggests $\omega = 0$. If he distributes $a = 0$ but is wrong (with probability $1 - q - pe$), he draws a monitoring rate of $\rho(0, c)$ where c depends on citizen type (θ). In contrast, if the bureaucrat goes against his research allocating $a = 1$, he is more likely to be wrong (with probability $q + ep$). However if the monitoring rate $\rho(1, c)$ is sufficiently low relative to $\rho(0, c)$, the bureaucrat may ignore his research. This incentive compatability constraint is given by:

$$\frac{\rho(1, c)}{\rho(0, c)} \geq \frac{1 - q - ep}{q + ep} \tag{9}$$

The right hand side of the inequality in Equation 9 is bounded between 0 and 1. Therefore, if $\rho(1, c) \geq \rho(0, c)$, this condition is always satisfied and the bureaucrat will always follow an investigation suggesting that $\omega = 0$. If this inequality does not hold, the bureaucrat will give $a = 1$ even when his research suggests that $\omega = 0$ to reduce the likelihood of an investigation. Consider now the case in which the bureaucrat's research suggests that $\omega = 1$. By a similar logic, in order for the bureaucrat to allocate $a = 1$, the following inequality must hold:

$$\frac{\rho(0, c)}{\rho(1, c)} \geq \frac{1 - q - ep}{q + ep} \tag{10}$$

Comparing Equations 9 and 10, it is clear that if all relevant monitoring rates are equivalent, the bureaucrat will always follow his investigation. One final observation is warranted: if $\Delta = 0$, the bureaucrat indifferent between ignoring and following his investigation in all cases. As in Prendergast (2003), I assume that bureaucrat's indifference is broken by following his investigation.

Finally, consider the politician's determination of the bureaucrat's contract. Recall that the politician is trying to maximize the probability that a citizen of type $\theta = \theta_P$ receives the "correct" service relative to their state, given costs of monitoring. As is clear from Equation (7), the determination of the marginal legible citizen, $\tilde{\theta}$, depends on the monitoring rates specified in the contract.

Consider first a politician that represents citizens that cannot be incentivized to complain regardless of the bureaucrat's allocation, $\theta_P > 1$. Because a citizen of the type $\theta = \theta_P$ will never complain, the politician never learns such a citizen's state. Substituting $\rho(0,0)$ and $\rho(1,0)$ into the politician's objective and maximizing, $\rho(0,0)^* = 1 - q - ep$, $\rho(0,1)^* = 0$, $\rho(1,0)^* = 1 - q - ep$, and $\rho(1,1)^* = 0$. Further, the politician always prefers that the bureaucrat exert effort to improve the accuracy of his allocation. To incentivize effort, the politician must set $\Delta \geq \frac{d}{p(1-p-q)}$. However, she can only provide incentives sufficient to induce effort when $\overline{\Delta} = \overline{\Delta}_H$.

Second, consider the case of a politician whose type can be induced to complain if wrongly denied the service, e.g., $\theta_P \leq 1$. Such a citizen will complain when wrongly denied the service (when $a = 0$ and $\omega = 1$). Substituting the relevant monitoring rates into the politician's objective and optimizing yields $\rho(0,0)^* = 0$, $\rho(0,1)^* = 1$, $\rho(1,0)^* = 1-q-pe$, and $\rho(1,1)^* = 0$. However, if the politician sets these monitoring rates, any bureaucrat of quality $q < 1$ would always accede to a citizen of type $\theta \leq 1$, by allocating $a = 1$ regardless of her investigation because $1 - q - pe < \frac{1-q-ep}{q+ep}$, the incentive compatibility constraint in Equation (9). This is a manifestation of the "truth-telling" problem identified by Prendergast (2003). However, the problem also manifests in a second form with a heterogeneous population of citizens. When serving an illegible citizen, a bureaucrat will only face the prospect of monitoring when she allocates $a = 1$, since $\rho^*(0,0) = 0$. As such, when effort incentives are provided (when $\Delta > 0$), the bureaucrat is better off allocating $a = 0$ to a citizen that would never complain. Because the politician's objective is to maximize service provision for someone "like her," the capacity loss from the former problem (acquiescence to a prospective complainant) is of concern, but the latter is not.

The politician can do strictly better than allowing the bureaucrat to accede to every prospective complainant. She can employ one of two strategies. First, she can eliminate incentives, setting $\Delta = 0$ and monitoring at these optimal rates. If the bureaucrat does not fear punishment, he will not accede. Moreover, the bureaucrat then has no reason to uniformly deny service to a citizen that would not complain. However, when $\Delta = 0$, the bureaucrat cannot be induced to exert effort, reducing the accuracy of the initial allocation.

Alternatively, Equation 9 gives the highest highest ratio of monitoring rates under which a bureaucrat will not accede to a potential complainant. Maximizing subject to this incentive compatibility constraint $\frac{\rho(1,0)}{\rho(0,1)} = \frac{1-q-ep}{q+ep}$ reduces monitoring rates when a subject is denied the service to $\rho(0,1)^* = \frac{q+p}{q+p+(1-q-p)^2}$, and increases monitoring rates when the service is granted to $\rho(1,0)^* = \frac{1-q-p}{q+p+(1-q-p)^2}$. However, this second strategy is only available when a politician can enact sufficient effort incentives, when $\overline{\Delta} \in \{\overline{\Delta}_M, \overline{\Delta}_H\}$. The politician faces a trade-off between less efficient monitoring and incentivizing bureaucratic effort. If the return to bureaucratic effort, p, is sufficiently high, providing incentives is preferred. Denote $\widehat{p}(q)$ as the solution to:

$$E[U_P(\rho(0,0) = 0, \rho(0,1) = 1, \rho(1,0) = 1-q, \Delta = 0)] =$$
$$E[U_P(\rho(0,0) = 0, \rho(0,1) = \frac{q+p}{q+p+(1-q-p)^2}, \rho(1,0) = \frac{1-q-p}{q+p+(1-q-p)^2}, \Delta \geq \Delta_M)],$$

expressed as a function of q. When $p \geq \widehat{p}(q)$ the politician prefers the contract with effort incentives even though she must monitor at a higher intensity. When $p < \widehat{p}(q)$, the politician prefers the incentive-free contract.

Inspection of the optimal $\rho(0,1)^*$ with and without incentives reveals that the composition of prospective complainants changes when incentives are used, as $\frac{q+p}{q+p+(1-q-p)^2} \leq 1$. This means that a politician of type $\theta_P \in (\frac{q+p}{q+p+(1-q-p)^2}, 1]$ can only incentivize complaints and bureaucratic effort by monitoring cases of complaints at a higher rate. To avoid forcing the bureaucrat to acede to a possible complainant, the politician must also increment the rate of monitoring when $a = 1$ ($\rho(1,0)$). The additional monitoring is costly to the politician and can only be sustained when the returns to bureaucratic effort are sufficiently high. I denote the threshold at which the politician is indifferent to providing effort incentives as $\overline{p}(q)$, as in the previous case. When $p \geq \overline{p}(q)$, the politician opts for a contract with information and incentives; when $p < \overline{p}(q)$, the politician adopts the contract with information but no incentives ($\Delta = 0$). Note that because inducing effort requires higher rates of auditing for a politician of this type, $\overline{p}(q) \geq \widehat{p}(q) \forall q$.

In describing equilibrium contracts throughout this paper, I emphasize two qualitative features

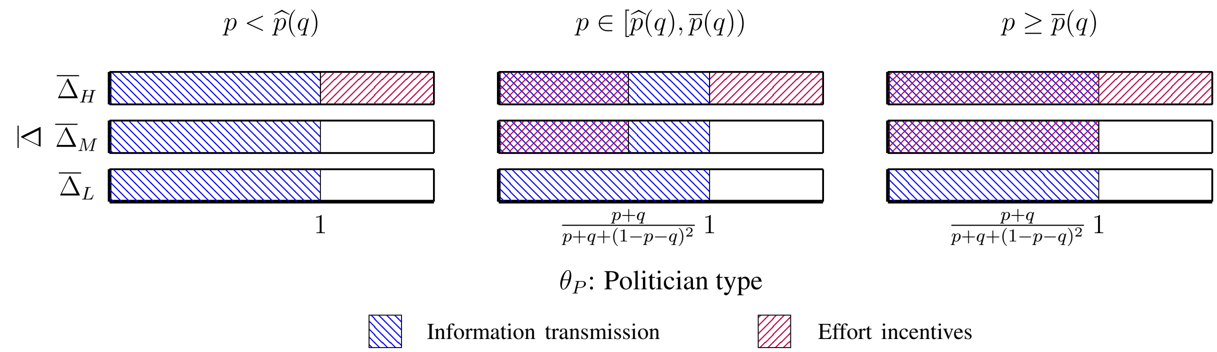

Figure 2: Visualization of the qualitative features of equilibrium contracts in Proposition 1 across the parameter space. The blue pattern shows that any politician for whom $\theta_P \leq 1$ will always incentivize information transmission from some citizens by setting $\rho(0,1) \geq \rho(0,0)$. The purple shading shows the regions of the parameter space where effort incentives are implemented, i.e. where Δ is large enough to sustain bureaucratic effort.

of contracts. First, a contract incentivizes information transmission if $\rho(0,1) > \rho(0,0)$. This occurs whenever the politician recovers the service for the citizen at a higher rate when a citizen complains about an incorrect denial of the service. Second, the politician provides effort incentives for the bureaucrat whenever $\Delta > 0$. Proposition 1 characterizes the equilibrium contracts.

Proposition 1. *Equilibrium contracts:*

(i) A politician of type $\theta_P > 1$ implements a contract that does not incentivize information transmission. The contract provides effort incentives if and only if $\overline{\Delta} = \overline{\Delta}_H$.

(ii) A politician of type $\theta_P \in (\frac{p+q}{q+p+(1-p-q)^2}, 1]$ implements a contract that incentivizes information transmission. The contract provides effort incentives if and only if $p > \overline{p}(q)$ and $\overline{\Delta} \in \{\overline{\Delta}_M, \overline{\Delta}_H\}$.

(iii) A politician of type $\theta_P \leq \frac{p+q}{q+p+(1-p-q)^2}$ implements a contract that incentivizes information transmission. The contract provides effort incentives if and only if $p > \widehat{p}(q)$ and $\overline{\Delta} \in \{\overline{\Delta}_M, \overline{\Delta}_H\}$. (All proofs in appendix.)

Figure 2 depicts the qualitative features of the contracts in Proposition 1 graphically across the parameter space. The x-axis in all plots gives politician type, θ_P. The y-axis depicts the level of bureaucratic (non-)insulation, $\overline{\Delta} \in \{\overline{\Delta}_L, \overline{\Delta}_M, \overline{\Delta}_H\}$. The horizontal panels depict different levels of p, the accuracy gains attributable to bureaucratic effort. Three findings are of note. First, there exist contracts with information transmission incentives, bureaucratic effort incentives, both incentives, or neither incentive. Second, the use of citizen information can support bureaucratic effort incentives at a lower $\overline{\Delta}$. Finally, effort is not uniformly preferred in the presence of information transmission. This is a consequence of the trade-off between incentivizing bureaucratic effort and monitoring at optimal rates.

In the remainder of this paper, I use the contracts characterized here to develop implications for state implementation capacity and inequality in societies of different compositions. The composition of a society is given by $f(\cdot)$, the density of θ, and its cdf $F(\cdot)$. I assume that $F(0) = 0$ which implies that all citizens pay a non-zero cost of complaint, though these costs may be arbitrarily small. Consistent with descriptions of legibility before the state, the continuum of costs of complaint suggests that citizens are not equal in their ability (or propensity) to generate information on state service provision outcomes (Lee and Zhang, 2016; Scott, 1998). The properties of $F(\cdot)$ offer a means to consider societies in comparative perspective.

4 Oversight and Implementation Capacity

I proceed by formalizing the definition of implementation capacity. Specifically, implementation capacity is a measure of the state's ultimate ability to match service outputs to an unknown state associated with each citizen in a population. Given the definition of C as an indicator for the match between an allocation and the service provided, capacity is given by $E[C]$, where the expectation is evaluated over both a citizen's state ω, and their type θ. As noted above, capacity need not be limited to the allocation of private goods (services) to individual citizens. The logic can productively be extended to the distribution of club or local public goods across communities as a function of communities' mobilization capacity.[4]

Definition 1. ***State Implementation Capacity:*** State implementation capacity is the rate at which the ultimate service provided is matched to each citizen's state across the population, formally $E[C]$.

[4]This extension admits a reduced-form interpretation of θ as a community's mobilization capacity.

As is clear from Definition 1, implementation capacity is not explicitly defined in terms of the amount of services given to a population or their distribution across the population, only the match between the allocation and a citizen's state. Because capacity is defined in terms of the ultimate service provided, the measure combines both the bureaucrat's equilbrium allocation and the politician's equilibrium monitoring strategy. As such, capacity incorporates bureaucratic effort, the bureaucrat's determination of whether to follow his investigation, and the rate at which the politician recovers the correct allocation via monitoring.

The contracts characterized in Proposition 1 also provide implications for the distribution of state services across the population. To this end, it is useful to examine $E[a^{\dagger}]$, the expectation of the ultimate allocation received by a citizen, as a measure of distributional outcomes.

Table A1 enumerates conditional expectations measuring capacity and distribution for different types of citizens. By conditioning on citizen type, the calculations in this table clarify several insights. The mapping between institutions (contracts) and the outcomes of interest – capacity and distribution – depends critically on societal composition. In particular, any of the contracts that incentivize citizens to provide information (with or without bureaucratic effort incentives) lead to different levels of capacity and allocation across different segments of the population, as a function of θ. Additionally these calculations show that implementation capacity can only be achieved when bureaucrats can perfectly allocate the service, with or without effort.

Remark 1. *Bureaucratic quality and implementation capacity: Perfect bureaucratic quality, $q = 1$, is a sufficient condition to achieve complete implementation capacity, $E[C] = 1$. Complete implementation capacity cannot be achieved under any contract if bureaucratic capacity is incomplete, $q + p < 1$.*

When bureaucratic quality is perfect, $q = 1$, it is impossible (and unnecessary) to provide the bureaucrat with effort incentives. Either contract without effort incentives (with or without information) can be implemented in equilibrium. In this case, both contracts yield observationally equivalent behavior and outcomes since the bureaucrat never wrongly denies the benefit and the citizen never complains. It is possible to achieve complete capacity if $q + p = 1$ and if the whole population could be induced to complain and it were feasible to provide effort incentives to the bureaucrat. The remainder of the paper considers the remaining cases – arguably those consistent with empirical observation – in which bureaucratic capacity is limited ($q + p < 1$).

Consider the relationship between oversight institutions and implementation capacity. Figure 3 provides a visualization of state implementation capacity under the contracts characterized in Proposition 1. The y-axis, $E[C|\theta]$ measures the likelihood that the ultimate (post-monitoring) allocation matches the citizen's state under each contract. The horizontal dashed line serves as a benchmark and depicts the level of implementation capacity under the contract without information transmission or bureaucratic effort incentives. Each panel of the graph plots $E[C|\theta]$ for a different contract. Three findings are of note. First, in the absence of information, effort incentives (in isolation) increase capacity. Second, information transmission increases capacity among those that can complain, while decreasing capacity among those that cannot. Third, the combination of both incentives magnifies the consequences of information alone: it yields higher capacity for all citizens that are induced to complain while minimizing capacity to serve citizens who will not complain.[5]

As is evident from Figure 3, state capacity is calculated as the weighted average of $E[C|\theta]$ over the distribution of θ and the state space. One immediate implication is that increases in capacity for legible populations generated by monitoring on the basis of complaints *reduce* the state's capacity to accurately serve the population that cannot complain. As such, using information transmitted by citizens in the form of complaints has an ambiguous effect on capacity depending on the proportion of citizens that can complain. Proposition 2 indicates that using information volunteered by citizens can only increase capacity when a sufficient share of the population can be induced to complain when wrongly denied the service.

Proposition 2. ***Information transmission and capacity****: There exists a threshold,* $\lambda \in [0, 1]$*, for which* $F(\widetilde{\theta}) \geq \lambda$ *implies that monitoring on the basis of citizen complaints weakly increases state*

[5]Hypothetically, it is possible that $E[C|\theta]$ falls below $\frac{1}{2}$ if the bureaucrat were to allocate in contrast to his investigation in both states. In equilibrium, the bureaucrat will only deviate from his investigation if his investigation suggests that $\omega = 1$.

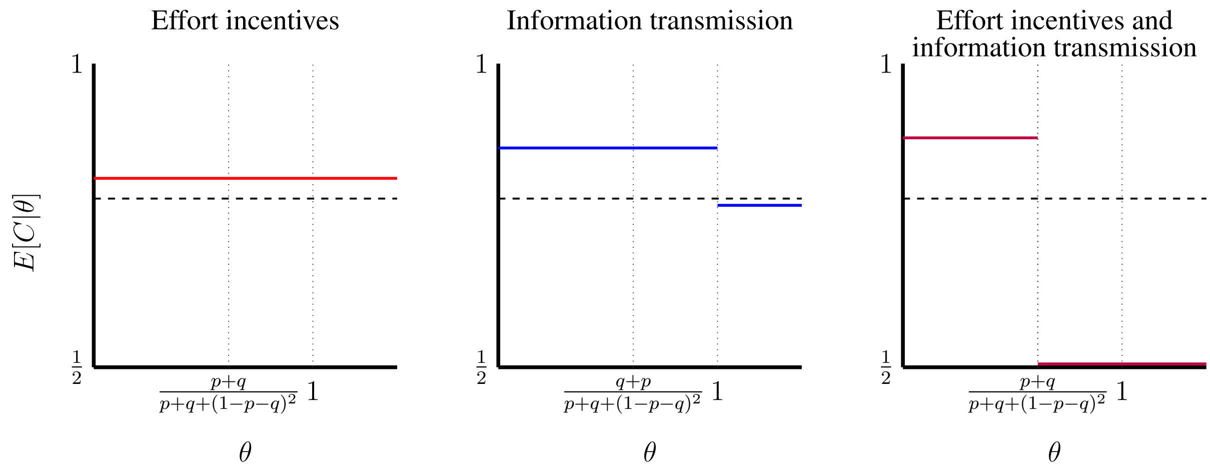

Figure 3: Graphical representation of state implementation capacity, conditional on citizen type, θ. The black dashed horizontal line measures capacity under contract without information transmission or effort incentives, and serves as a benchmark. This benchmark is compared to the contract with effort incentives alone in the left panel; the contract with information transmission alone in the middle panel; and a contract with both features in the right panel.

capacity. If $F(\widetilde{\theta}) < \lambda$, monitoring on the basis of complaints decreases state capacity.

Capture of the state by individuals or groups has been forwarded as corrosive to state capacity in different domains (Bardhan, 2002; Suryanarayan, 2020). Figure 3 suggests a novel mechanism underlying state capture. In the contracts with information transmission, politicians commit to using information from citizens to monitor service providers. Such contracts, however, yield weakly less capacity to serve illegible citizens. The result resembles capture: by incentivizing some citizens to provide information to the state, legible citizens procure better service at the expense of the accuracy of services rendered to their illegible counterparts. The tradeoff between capture and the informational benefits of citizen complaints generates the ambiguous result in Proposition 2.

How do incentives to induce bureaucratic effort influence capacity? From Figure 3, it is clear that in the absence of information transmission, effort incentives increase capacity by increasing bureaucratic effort and accuracy. Specifically, the inclusion of bureaucratic effort incentives alone yields weakly higher capacity for all citizens, and thus the population as a whole. However, the effect of incentives is ambiguous in the presence of information transmission. Relative to a contract with only information transmission incentives, a contract with both incentives introduces two counterveiling effects. Most obviously, effort incentives can increase the accuracy of targeting for at least citizens that complain. Less obviously, adding effort incentives reduces the share of legible citizens from $F(1)$ to $F(\frac{q+p}{p+q+(1-p-q)^2})$. Thus, while capacity is higher with incentives for a citizen of type $\theta < \frac{q+p}{p+q+(1-p-q)^2}$ in the parameter space in which effort is adopted, these gains come at a cost of creating more illegible citizens and reducing capacity among these types.

Politicians incentivize information transmission from citizens and effort incentives to increase the state's capacity to accurately serve a specific client. However, Proposition 2 establishes that the direction of the effect of these oversight tools on implementation capacity depends fundamentally on the underlying composition of the population as a whole. In particular, the use of information improves the state's capacity to serve legible citizens at the expense of other citizens. These dynamics are magnified in the presence of information incentives.

Collectively, the analysis of implementation capacity provides insights about the role of information transmission for bureaucratic oversight in comparative perspective. In particular, the effect of incentivizing citizens to volunteer information depends critically on the underlying potential legibility of the population. Where this distribution implies that an insufficient proportion can be made legible, relying on information from the legible population can harm outcomes for illegible citizens. The use of effort incentives alongside information transmission can compound these harms and can be particularly detrimental to state capacity in settings where few citizens are legible. This observation hints at the distributional consequences of oversight that are developed below.

5 Inequality

While oversight institutions have implications for capacity, they also influence the distribution of the service across a population. To this end, I proceed by considering the relationship between the types in a population – in terms of costs of complaint – and the distribution of state services. The service in question, $a^\dagger$, would be given to half the population if capacity were complete because $Pr(\omega = 1) = \frac{1}{2}$.[6] However, because $\omega \perp \theta$, when the service is "perfectly" allocated, there

[6]It is straightforward to see that the Gini coefficient on the capacity-maximizing allocation is equal to $\frac{1}{2}$.

are no differences in likelihood of receiving the service as a function of θ. The focus here is how inequality can emerge as a function of citizen type (cost of complaint), θ, under under the contracts enumerated in Proposition 1. As such, I develop a metric of inequality that abstracts from inequality generated by the state, ω.

The metric of inequality used to measure inequality as a function of θ is depicted geometrically in Figure 4. Specifically, I examine the share of total services devoted to each type of citizen. Note that under each of the contracts, there are at most two levels of service provision $E[a^{\dagger}|\theta]$, defined in terms of a (possible) cut-point, $\widetilde{\theta}$, which corresponds to the marginal legible citizen. Further, note that under any contract, moving from a citizen with $\theta = \theta'$ to a citizen of type $\theta = \theta''$ where $\theta' < \theta''$ implies that citizen of type $\theta = \theta'$ will, in expectation, be weakly more likely to receive the service. On the graph, the x-axis is the CDF of θ, $F(\cdot)$ and the y-axis is the cumulative share of service (a) received by citizens with lower θ's. The area of the shaded triangles thus visualizes the proposed metric of inequality, type-attributable inequality (TAI), defined formally in Definition 2. The maximum area of the triangle is theoretically $\frac{1}{2}$, so I normalize inequality to a more familiar $[0, 1]$ domain by doubling the area.

Definition 2. Type-attributable inequality (TAI) measures inequality in the expectation of services provided as a function of citizen cost of complaint, θ. It is given by the formula:

$$TAI = 2\mu_2 \left((0,0), (F(\widetilde{\theta}), \frac{F(\widetilde{\theta})E[a^{\dagger}|\theta \leq \widetilde{\theta}]}{F(\widetilde{\theta})E[a^{\dagger}|\theta \leq \widetilde{\theta}] + (1 - F(\widetilde{\theta}))E[a^{\dagger}|\theta > \widetilde{\theta}]}), (1,1) \right)$$

where $\mu_2(\cdot)$ represents the area of the triangle defined by the three coordinates. $TAI \in [0, 1]$, and higher values of TAI indicate higher levels of inequality.

Proposition 3 describes the consequences of conditioning oversight on citizen complaints for inequality in access to services. As is evident from Table A1, when a contract precludes responsiveness to complaints, low-θ citizens respond by pooling with high-θ citizens by not lodging complaints, regardless of the service they receive. All citizens then receive the same allocation in expectation, resulting in no type-attributable inequality. In contrast, when politicians adopt moni-

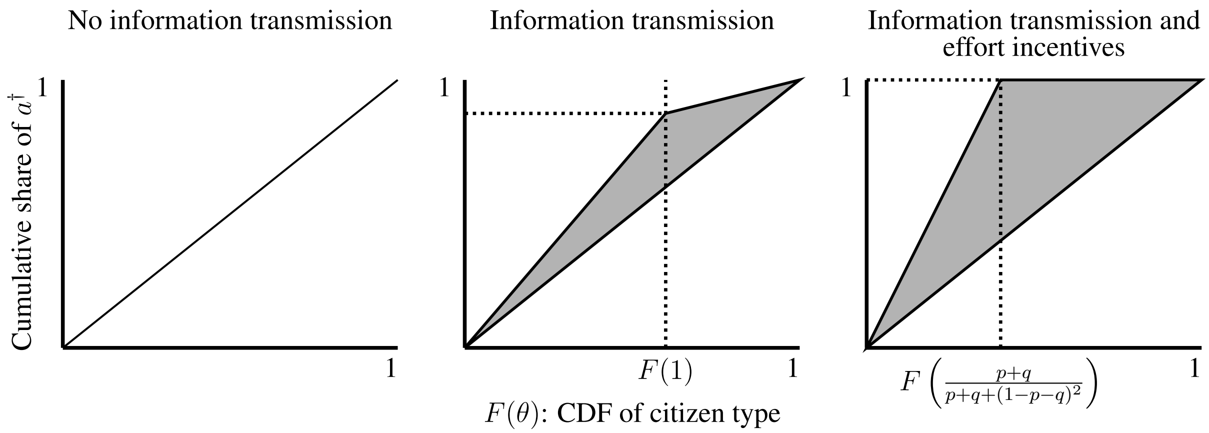

Figure 4: Geometric representation of inequality measure under each contract. The inequality measure, type-attributable quality (TAI), is equivalent to twice the area of the shaded region.

toring systems that respond to citizen complaints, inequality in the expectation of service allocation emerges. Comparing the information-only contract to any contract with information and effort incentives, the combination of effort incentives and information generates weakly higher levels of inequality than information transmission alone.

Proposition 3. ***Oversight and inequality.*** *For any $q + p < 1$ and $F(1) \in (0, 1)$, conditioning oversight on citizen complaints introduces inequality in the allocation of a across the population, implying $TAI > 0$. TAI is weakly greater under a contract with information transmission and effort incentives than under the contract with information transmission alone.*

Combining the discussion of capacity and inequality provides several insights about the implications of bureaucratic oversight. In societies in which some citizens can be induced to complain and others cannot, there exists a tradeoff between employing oversight institutions that maximize a state's capacity to define and serve legible citizens and equity in outputs. When examining capacity and equity across the whole population, using citizen information in oversight can either: (i) increase capacity at the cost of increased inequality in outputs; or (ii) decrease capacity while increasing inequality. The latter is more likely when relatively few citizens can be induced to complain (lower $F(1)$).

The canonical outcomes of civil service systems, captured here by higher bureaucratic quality (higher q) and higher bureaucratic insulation (lower $\overline{\Delta}$), reduce the magnitude of the inequalities that are generated by reliance on citizen complaints. However, this presents a paradox. States where bureaucratic quality is low or insulation is absent are low are precisely those places where use of citizen information in oversight can deliver the largest gains in capacity to (endogenously) legible citizens. As such, the distributional considerations highlighted here may be most salient in states with canonically weaker bureaucracies.

This model abstracts from considerations of political selection, or how θ_P is chosen. Given the importance of societal composition in determining the distributional consequences of oversight, some discussion of the the mapping between the distribution of politicians (the density of θ_P) and the population as a whole (θ) may shed light on the extent to which these dynamics are realized empirically. It seems plausible that potential politicians are disproportionately of a low θ_P relative to the population as a whole, whether in an autocracy or democracy.[7] If this is the case, we may expect a bias toward reliance on information transmission in oversight, relative to what might be generated by randomly drawing a politician from the population or an oversight strategy designed to appeal to the median voter.

6 Politician's Objective and Implications for Policy Design

To this point, I have considered a setting in which a politician maximizes the state's accuracy to serve a citizen "like her," net the costs of monitoring. The analysis thus considers the consequences of oversight policies based on an instance of an interaction between a single politician, a single bureaucrat, and a single citizen. The oversight strategy tailored to one citizen type is thus uniformly applied across to the population of citizens; in this case, the politician does not internalize the consequences of its application to other citizens. In this section, I consider different approaches to modeling a politician's design of oversight that considers the *population* of citizens.

I focus, therefore, on the oversight strategies adopted by a politician that maximize capacity

[7] Arguments in support of the idea that politicians are drawn from a population with lower costs of complaint include: findings of positive electoral selection in democracies (e.g., Dal Bó et al., 2017; Besley and Reynal-Querol, 2011); accounts of dynastic politics and familial persistence in political office (e.g., Querubin, 2016; Smith, 2018); and studies of the importance of political connections for promotion in autocracies (e.g., Jia, Kudamatsu, and Seim, 2015).

across the population. In so doing, I depart from the assumption that monitoring rates are fixed across the population. In the previous analysis, I have assumed that the oversight contract is uniform across citizen types. Indeed, a politician catering to a particular type of citizen would set the monitoring rate at 0 for all other citizen types if she were allowed to do so. Bureaucrats would respond by not exerting effort for any citizen of type $\theta \neq \theta_P$, regardless of effort incentives, and the likelihood of receiving the correct allocation (ultimately) would fall to $E[C] = q$ across the population for any continuous distribution of θ.

Instead, consider a politician that seeks to maximize capacity (net of costs) for every citizen and can implement a contract as a function of citizen type. This approach aggregates across a population of citizens by simply considering infinite number of politician-bureaucrat-citizen interactions across the continuum of citizens, for which $\theta_P = \theta$ in each interaction. I assume that the bureaucratic quality and capacity are fixed across all interactions. This benchmark analysis thus abstracts from changes in the composition of who complains.

Following Proposition 1, thus, it is clear that for any $F(1) \in (0, 1)$ and $q < 1$, different monitoring rates will be adopted for different citizens. This can be visualized by examining Figure 2 for a fixed $\overline{\Delta}$ and p. The politician adopts different contracts – here different monitoring rates – for different citizen types in the population. Importantly, every contract incentivizes information transmission from some citizens by setting $\rho(0, 1) > \rho(0, 0)$, as .

One implication of these capacity-maximizing contracts is that when there is variation in the legibility of a population, these contracts necessarily generate inequality in the allocation of the service across the population. This is evident from the variation in the levels of $E[a^\dagger|\theta]$, reported in Table A1. Thus, while information transmission from some citizens is necessary to maximize capacity across the population, when not all citizens can be induced to communicate, capacity is necessarily uneven.

Proposition 4. *For any $F(1) \in (0, 1)$ and $q < 1$, any capacity maximizing contract incentivizes information transmission from some citizen types. For any such contract, there exists inequality in expected allocations across the population ($TAI > 0$). However, relative to a uniform applica-*

tion of the most unequal "constituent" contract, conditioning the contract on citizen type reduces inequality (TAI).

Proposition 4 further finds that the levels of inequality generated by the capacity-maximizing contract are *lower* than those generated by any of the constituent contracts with information when applied uniformly. This occurs because the use of type-specific monitoring rates effectively breaks the capture mechanism. The service provided to illegible citizens is no longer compromised due to oversight optimized for legible citizens. This implies that contracts that mandate unequal treatment of citizens by bureaucrats or their principals can *reduce* inequality in outputs. This finding has implications for a burgeoning literature on bureaucratic bias or discrimination. Studies that measure such biases often assert perverse implications (immediate or downstream) of differential treatment of citizens by bureaucrats ranging from disenfranchisement to inability to access state benefits (White, Nathan, and Faller, 2015; Hemker and Rink, 2017; Slough, 2019). The present result suggests that with a heterogeneous population of citizens, differential responses by bureaucrats to citizens of different types can actually reduce inequality in outcomes.

The finding that contracts that condition oversight on citizen type can reduce inequality in outputs raises several important considerations. First, benefits in terms of increased capacity or reduced in inequality that can be realized by conditioning oversight on citizen type rely on the assumptions about the politician's objective. If a politician is not motivated to, for example, maximize capacity for each citizen, the ability to monitor service provision differentially by citizen type can be corrosive to efforts to build capacity and may exacerbate inequality. This distinction points to the importance of characterizing the agency problem between politicians and bureaucrats for the interpretation of empirical measures of bureaucratic behavior, particularly with respect to empirical documentation of bias or discrimination. In either of these cases, we may observe disparate service provision behavior by bureaucrats as a function of citizen type. Yet, the implications for capacity and inequality (as defined in this paper) may be starkly different. Second, such conditioning may not be legal or feasible in certain contexts. Equal rights guarantees may preclude this form of conditioning state processes (here forms of oversight) on citizen type in program or institutional design.

This section extends the analysis to explore the tradeoffs between capacity and inequality when a politician seeks to maximize the accuracy of service provision across the population of citizens. One of the two central findings from the baseline model that monitoring bureaucrats on the basis of information transmitted by citizen complaints leads to inequality in service provision remains unchanged. However, in contrast to some cases in Proposition 2, using citizen information in monitoring cannot reduce overall implementation capacity across the population. Indeed, the politician is effectively maximizing implementation capacity when they opt to incentivize information transfer. Under this assumption about the politician's objective, therefore, there necessarily exists a tradeoff between state capacity (across the population) and equity that is not always present with a particularistic politician. The features of "capture" are eliminated by a politician that values accurate service provision across the population and can tailor oversight policies to the client. As such, the main results of this paper are robust to several specifications of the politician's objective. Nevertheless, accurate characterization of this objective can refine the predictions in terms of the effects of oversight.

7 Conclusion

This paper posits a new connection between oversight institutions and their implications for state implementation capacity and the distribution of state services across a population. Specifically, I examine how a politician's adoption of these institutions conditions the state's ability to accurately match service outcomes to an unknown citizen state. In particular, I study when oversight contracts provide citizens with incentives to complain about services rendered by bureaucrats. Citizen communication of private information helps the government match service to the citizen's state. However, when the state cannot incentivize all citizens to complain, a commitment to use information in monitoring improves capacity among legible citizens that can complain and can reduce implementation capacity among citizens that cannot. These dynamics generate inequality in the distribution of services across the population.

This theory speaks to many potential empirical applications. Most crucially, it emphasizes a broader role for the study of implementation in distributive politics. In the model, the policy is not targeted to any citizen type. It is directed on the basis of a citizen's state, which is assumed to be independent of observable characteristics (type). Yet, the politician's choice of contract generates substantial variation in "who gets what." In a large body of work that measures targeting of state resources in terms budgetary appropriations, the account of distribution developed in this paper would generally be undetectable in the data. As such, measuring only targeting in appropriations stage can yield inferences that do not reflect distributional outcomes.

Moving from theory to application suggests a need for new measures of the use of information transmission in bureaucratic oversight. First, more systematic data is needed to characterize variation in the role of citizen information provision cross-nationally and across policy areas subnationally. National regulation of procedures for complaint and information transfer appear to vary substantially in stylized cases. Moreover, measures of citizen willingness to provide information represent important variables in behavioral research that can develop our understanding of costs of complaint or legibility (as conceptualized in this article). Both sets of measures are critical to better formulating the relationship between politicians, bureaucrats, and citizens in the study of distributive politics.

This article views implementation capacity as the outcome of an interaction between a government and its subjects. By considering heterogeneity among citizens in terms of willingness to provide information, I provide a novel institutional foundation for observed unevenness in implementation capacity across the population or territory (e.g., Scott, 1998; Soifer, 2015). The model proceeds to link this unevenness to the co-occurrence of inequality in the distribution of state services. In so doing, it suggests new limits on states' ability to develop greater capacity for policy implementation without generating disparities in the distribution public goods and services.

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Appendices

A Proofs

Proof of Proposition 1

Consider three cases, defined in terms of partitions of the politician type space, θ_P.

- Case #1: $\theta_P > 1$:

  First, note that a citizen of the politician's type, $\theta = \theta_P > 1$ could never be induced to complain per Equation 7. Substituting $\rho(0,0)$ and $\rho(1,0)$ into the politician's objective, the politician maximizes:

$$\max_{\substack{\rho(0,0),\rho(0,1),\\ \rho(1,0),\Delta}} \begin{aligned} &\frac{1}{2}\big[(q+ep)(1-\frac{\rho(1,0)^2}{2}) + (1-q-ep)(\rho(0,0)-\frac{\rho(0,0)^2}{2}) + \\ &(q+ep)(1-\frac{\rho(0,0)^2}{2}) + (1-q-ep)(\rho(1,0)-\frac{\rho(1,0)^2}{2})\big] - \frac{\rho(0,1)^2}{2} - \frac{\rho(1,1)^2}{2} \end{aligned} \tag{A1}$$

  Optimal monitoring rates $\rho^*(0,0) = (1-q-pe)^2$, $\rho^*(0,1) = 0$, $\rho^*(1,0) = (1-q-pe)$, and $\rho^*(1,1) = 0$ follow from inspection of Equation A1. Substituting $\rho^*(0,0)$ and $\rho^*(1,0)$, the bureaucrat's IC constraint in Equation 8 simplifies to:

$$\Delta \geq \frac{2d}{2p(1-q-p)} = \frac{d}{p(1-q-p)}$$

  Note that $\frac{d}{p(1-q-p)} \in (\overline{\Delta}_M, \overline{\Delta}_H]$. As such, effort incentives can only be provided if $\overline{\Delta} = \overline{\Delta}_H$. The bureaucrat's additional IC constraints in Equations 9 and 10 are satisfied because $\rho^*(0,0) = \rho^*(1,0)$. Define the two resultant contracts (without and with effort incentives) as:

$$\boldsymbol{\varrho}_\emptyset = \{\rho(0,0) = 1-q, \rho(0,1) = 0, \rho(1,0) = 1-q, \rho(1,1) = 0, \overline{\Delta} < \frac{d}{p(1-q-p)}\}$$
$$\boldsymbol{\varrho}_E = \{\rho(0,0) = 1-q-p, \rho(0,1) = 0, \rho(1,0) = 1-q-p, \rho(1,1) = 0, \overline{\Delta} \in [\frac{d}{p(1-q-p)}, \overline{\Delta}_H]\}$$

  The difference in the politician's expected utility with and without bureaucratic effort is:

$$E[U_P(\boldsymbol{\varrho}_E)] - E[U_P(\boldsymbol{\varrho}_\emptyset)] = \frac{p(2q+p)}{2} \geq 0$$

  Thus, for $\overline{\Delta} = \overline{\Delta}_H$, the politician will implement these monitoring rates of $\rho(0,0) = \rho(1,0) = 1-q-p$ and set $\Delta \in [\frac{d}{p(1-q-p)}, \overline{\Delta}_H]$. For $\overline{\Delta} \in \{\overline{\Delta}_L, \overline{\Delta}_M\}$, the politician will implement these monitoring rates of $\rho(0,0) = \rho(1,0) = 1-q$ and set $\Delta \in [0, \overline{\Delta}]$.

- Case #2: $\theta_P \leq \frac{q+p}{q+p+(1-p-q)^2}$:

  First, consider a politician of a type that could always be induced to complain, i.e. $\theta_P \to 0$ if $\omega = 1$ and $a = 0$. Substituting $\rho(0,0)$, $\rho(0,1)$, and $\rho(1,0)$ into the politician's objective, the politician maximizes:

$$\max_{\substack{\rho(0,0),\rho(0,1),\\ \rho(1,0),\Delta}} \begin{array}{l} \frac{1}{2}\big[(q+ep)(1-\frac{\rho(1,0)^2}{2}) + (1-q-ep)(\rho(0,1)-\frac{\rho(0,1)^2}{2})+ \\ (q+ep)(1-\frac{\rho(0,0)^2}{2}) + (1-q-ep)(\rho(1,0)-\frac{\rho(1,0)^2}{2})\big] - \frac{\rho(1,1)^2}{2} \end{array} \tag{A2}$$

  Maximization of Equation A2 yields $\rho^*(0,0) = 0$, $\rho^*(0,1) = 1$, $\rho^*(1,0) = (1-q-ep)$, and $\rho^*(1,1) = 0$. However, these monitoring probabilities violates the IC constraint in Equation 9:

$$\frac{\rho(1,0)}{\rho(0,1)} = \frac{(1-q-ep)}{1} < \frac{1-q-pe}{q+pe}$$

  Violation of this constraint implies that the bureaucrat would not exert effort ($e = 0$) and would (i) allocate $a = 1$ to all citizens for whom $\theta \leq 1$, per Equation 9. Further, the inequality in Equation 10 is not satisfied so the bureaucrat allocates $a = 0$ to all citizens for whom $\theta > 1$ regardless of his investigation.

  Per the result in Prendergast (2003), the politician can pursue two alternative contracts. First, consider the case when the politician sets $\Delta = 0$ and maintains the optimal monitoring probabilities. Denote this contract $\boldsymbol{\varrho}_I$:

$$\boldsymbol{\varrho}_I = \{\rho(0,0) = 0, \rho(0,1) = 1, \rho(1,0) = 1-q, \rho(1,1) = 0, \Delta = 0\}$$

  In the absence of a penalty, the bureaucrat exerts no effort ($e = 0$) and (by assumption) breaks indifference by following his investigation. The politician's expected utility is given by:

$$E[U_P(\boldsymbol{\varrho}_I)] = \frac{2+q+q^2}{4}$$

  $E[U_P(\boldsymbol{\varrho}_I)] - E[U_P(\boldsymbol{\varrho}_\emptyset)] = \frac{q-q^2}{4} > 0$ indicating that any politician of type $\theta < 1$ prefers $\boldsymbol{\varrho}_I$ to $\boldsymbol{\varrho}_\emptyset$. Note that any deviation to $\Delta > 0$ induces the to bureaucrat accede to the citizen with certainty granting $a = 1$ per Equation 9. This yields an expected utility of $\frac{1+q-q^2}{2} < \frac{2+q+q^2}{4}$. Thus, the politician cannot increase Δ while maintaining optimal monitoring rates.

  Alternatively, the politician can provide effort incentives and adjust monitoring rates such that the bureaucrat cannot profitably accede to a prospective complainant. Equation 9 provides the relevant IC constraint to ensure that the bureaucrat does not accede to a legible citizen. Maximizing Equation A2 subject to the constraint implied by Equation 9 yields:

$$\rho^*(0,0) = 0, \qquad \rho^*(0,1) = \frac{q+pe}{q+pe+(1-q-pe)^2},$$
$$\rho^*(1,0) = \frac{1-q-pe}{q+pe+(1-q-pe)^2}, \qquad \rho^*(1,1) = 0$$

Substituing $\rho^*(0,1)$ and $\rho^*(1,0)$ into the bureaucrat's (other) IC constraint in Equation 8 yields:

$$\Delta \geq \frac{2d(q+p+(1-q-p)^2)}{p} = \overline{\Delta}_M$$

Define this contract as:

$$\boldsymbol{\varrho}_{\overline{IE}} = \{\rho(0,0) = 0, \rho(0,1) = \frac{q+p}{q+p+(1-q-p)^2}, \rho(1,0) = \frac{1-q-p}{q+pe+(1-q-pe)^2},$$
$$\Delta \in \left[\overline{\Delta}_M, \overline{\Delta}\right]\}$$

The politician's expected utility is:

$$E[U_P(\boldsymbol{\varrho}_{\overline{IE}})] = \frac{1+4p^3+3q-4q^2+4q^3+4p^2(-1+3q)+p(3-8q+12q^2)}{4(q+p+(1-q-p)^2)}$$

The politician cannot profitably deviate by forgoing information as $E[U_P(\boldsymbol{\varrho}_{\overline{IE}})] - E[U_P(\boldsymbol{\varrho}_E)] > 0$. For $\overline{\Delta} \in \{\overline{\Delta}_M, \overline{\Delta}_H\}$, the politician adopts the contract $\boldsymbol{\varrho}_{\overline{IE}}$ if $E[U_P(\boldsymbol{\varrho}_{\overline{IE}})] \geq E[U_P(\boldsymbol{\varrho}_I)]$. Define $\widehat{p}(q)$ as the solution to $E[U_P(\boldsymbol{\varrho}_{\overline{IE}})] = E[U_P(\boldsymbol{\varrho}_I)]$, expressed as a function of q. Note that $\widehat{p}(q) \in [0, \frac{1}{2}]\ \forall q \in [\frac{1}{2}, 1)$ and $\widehat{p}(q) < 1-q\ \forall q \in [\frac{1}{2}, 1)$.

Note that with incentives, the marginal complainant, is $\theta = \frac{q+p}{p+q+(1-p-q)^2}$. Thus, for any politician of type $\theta_P \leq \frac{q+p}{p+q+(1-p-q)^2}$, the equilibrium contract is given by:

$$\boldsymbol{\varrho} = \begin{cases} \boldsymbol{\varrho}_{\overline{IE}} & \text{if } \overline{\Delta} \in \{\overline{\Delta}_M, \overline{\Delta}_H\} \text{ and } p \geq \widehat{p}(q) \\ \boldsymbol{\varrho}_I & \text{else} \end{cases}$$

- Case #3: $\theta_P \in (\frac{q+p}{q+p+(1-p-q)^2}, 1]$:

  Finally, consider politicians of intermediate types, $\theta_P \in (\frac{q+p}{q+p+(1-p-q)^2}, 1]$. Per Equation, 7, such a citizen can be induced to complain when $\rho(0,1) - \rho(0,0) \geq \theta_P$. As such, the objective is identical to the previous case. In this case, the contract without incentives ($\boldsymbol{\varrho}_I$) implies that a citizen of type $\theta \in (\frac{q+p}{q+p+(1-p-q)^2}, 1]$ can be induced to complain. This contract follows directly from the proof of the previous case and is thus omitted.

For a contract with effort incentives, however, the politician can only induce complaints by monitoring at higher rates than the contract $\boldsymbol{\varrho}_{\overline{IE}}$. Noting that the optimal $\rho(0,0) = 0$ as above and Equation 7, the politician must monitor at the rate $\rho(0,1) = \frac{\theta_P}{y}$ to incentivize complaint from her type of citizen. In this interval, it is straightforward to see that $\frac{\theta_P}{y} > \frac{q+p}{q+p+(1-p-q)^2}$. Substituting $\rho(0,1)$ into Equation 9, and rearranging, the politician must set $\rho(1,0) = \frac{\theta_P(1-p-q)}{q+p}$ to satisfy the bureaucrat's "truth-telling" constraint. Substituing $\rho(0,1)^*$ and $\rho(1,0)^*$ into the bureaucrat's (other) IC constraint in Equation **??** yields:

$$\Delta \geq \frac{2d(q+p)}{p\theta_P} \in (\overline{\Delta}_L, \overline{\Delta}_M]$$

in the relevant parameter space. Thus, denote the contract with effort incentives:

$$\boldsymbol{\varrho}_{\underline{IE}} = \{\rho(0,0) = 0, \rho(0,1) = \frac{\theta_P}{y}, \rho(1,0) = \frac{\theta_P(1-q-p)}{q+p}, \Delta \in [\overline{\Delta}_M, \overline{\Delta}]\}$$

The politician's expected utility is:

$$\begin{aligned} E[U_P(\boldsymbol{\varrho}_{\underline{IE}})] =& 2\theta_P(q-q^2)(1+\theta_P) - \theta_P^2 + (q^3+p^3)(4y^2+\theta^2) + p^2(-2\theta(y+\theta) + 3q(4y^2+\theta^2)) + \\ & p(2\theta(y+\theta) - 4q\theta(y+\theta) + 3q^2(4y^2+\theta^2)) \end{aligned}$$

As in the previous case, he politician cannot profitably deviate by forgoing information as $E[U_P(\boldsymbol{\varrho}_{\underline{IE}})] - E[U_P(\boldsymbol{\varrho}_E)] > 0$. For $\overline{\Delta} \in \{\overline{\Delta}_M, \overline{\Delta}_H\}$, the politician adopts the contract $\boldsymbol{\varrho}_{\underline{IE}}$ if $E[U_P(\boldsymbol{\varrho}_{\underline{IE}})] \geq E[U_P(\boldsymbol{\varrho}_I)]$. Define $\bar{p}(q)$ as the solution to $E[U_P(\boldsymbol{\varrho}_{\underline{IE}})] = E[U_P(\boldsymbol{\varrho}_I)]$, expressed as a function of q. Note that $\bar{p}(q) \in [0, \frac{1}{2}]\ \forall q \in [\frac{1}{2}, 1)$; $\bar{p}(q) < 1-q\ \forall q \in [\frac{1}{2}, 1)$; and $\bar{p}(q) < \widehat{p}(q)$.

Thus, for any politician of type $\theta_P \in (\frac{q+p}{q+p+(1-p-q)^2}, 1]$, the equilibrium contract is given by:

$$\boldsymbol{\varrho} = \begin{cases} \boldsymbol{\varrho}_{\underline{IE}} & \text{if } \overline{\Delta} \in \{\overline{\Delta}_M, \overline{\Delta}_H\} \text{ and } p \geq \bar{p}(q) \\ \boldsymbol{\varrho}_I & \text{else} \end{cases}$$

■

A.1 Capacity and Distribution under each contract

Table A1 provides calculations of two quantities relevant to the distributional implications of the contracts. Panel A gives the conditional expectation of the ultimate (post-monitoring) allocation given citizen type, $E[a^\dagger|\theta]$ and Panel B gives the conditional expectations of implementation capacity by citizen type, $E[C|\theta]$.

Proof of Remark 1

For $E[C] = 1$, $E[C|\theta] = 1 \forall \theta$. First, consider Contract $\boldsymbol{\varrho}_\emptyset$. Under this contract $E[C] = 1 \Rightarrow q + (1-q)^2 = 1$. The unique solution is $q = 1$.

Contract	Citizen type, θ: $\theta \leq \frac{p+q}{p+q+(1-p-q)^2}$	$\theta \in (\frac{p+q}{p+q+(1-p-q)^2}, \theta_P]$	$\theta_P \in (\max\{\frac{p+q}{p+q+(1-p-q)^2}, \theta_P\}, 1]$	$\theta > 1$
PANEL A: ULTIMATE (POST-MONITORING) ALLOCATION $E[a^\dagger \vert \theta]$				
$\boldsymbol{\varrho}_\emptyset$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\boldsymbol{\varrho}_E$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\boldsymbol{\varrho}_I$	$\frac{1}{2}(1+q-q^2)$	$\frac{1}{2}(1+q-q^2)$	$\frac{1}{2}(1+q-q^2)$	$\frac{1}{2}(2q-q^2)$
$\boldsymbol{\varrho}_{\overline{IE}}$	$\frac{2(p+q-pq)-q^2-p^2}{2(p+q+(1-p-q)^2)}$	N/A	0	0
$\boldsymbol{\varrho}_{\underline{IE}}$	$\frac{p+q+\theta_P[3(q+p)-2(q^2+p^2)-4qp-1]}{2(p+q)}$	$\frac{1}{2} + \frac{\theta_P[3(q+p)-2(q^2+p^2)-4qp-1]}{2(p+q)}$	0	0
PANEL B: IMPLEMENTATION CAPACITY BY CITIZEN TYPE $E[C \vert \theta]$				
$\boldsymbol{\varrho}_\emptyset$	$1-q+q^2$	$1-q+q^2$	$1-q+q^2$	$1-q+q^2$
$\boldsymbol{\varrho}_E$	$q+p+(1-q-p)^2$	$q+p+(1-q-p)^2$	$q+p+(1-q-p)^2$	$q+p+(1-q-p)^2$
$\boldsymbol{\varrho}_I$	$\frac{1}{2}(2-q+q^2)$	$\frac{1}{2}(2-q+q^2)$	$\frac{1}{2}(2-q+q^2)$	$\frac{1}{2}(1+q^2)$
$\boldsymbol{\varrho}_{\overline{IE}}$	$q+p+\frac{1-p-q}{2(q+p+(1-p-q)^2)}$	N/A	$\frac{1}{2}$	$\frac{1}{2}$
$\boldsymbol{\varrho}_{\underline{IE}}$	$q+p+\frac{\theta_P(1-p-q)}{2(p+q)}$	$q+p+\frac{\theta_P(1-p-q)}{2(p+q)}$	$\frac{1}{2}$	$\frac{1}{2}$

Table A1: Implications of each contract for distribution, measured by $E[a^\dagger|\theta]$, and implementation capacity, measured by $E[C|\theta]$, by citizen type. N/A means that this interval is empty when the contract $\boldsymbol{\varrho}_{\overline{IE}}$ is adopted.

Second, consider contract $\boldsymbol{\varrho}_E$. $E[C] = 1 \Rightarrow q + p + (1 - q - p)^2 = 1$, which implies $q + p = 1$. Adoption of $\boldsymbol{\varrho}_E$ does not occur when $q + p = 1$ because, as $p + q = 1, \overline{\Delta}_H \to \infty$.

Third, consider Contract $\boldsymbol{\varrho}_E$. To achieve $E[C] = 1$, it must be the case that (i) $E[C|\theta \leq y] = 1$ and $F(1) = 1$ or (ii) $E[C|\theta \leq y] = E[C|\theta > y] = 1$. (i) requires that $\frac{2-q+q^2}{2} = 1$, which implies that $q \in \{0, 1\}$; only $q = 1$ is within the domain of q and $F(1) = 1$. (ii) implies that $\frac{2-q+q^2}{2} = \frac{(1+q^2)}{2} \Rightarrow q = 1$.

Fourth consider contract $\boldsymbol{\varrho}_{\overline{IE}}$. To achieve $E[C] = 1$ it must be the case that $q+p+\frac{1-p-q}{2(p+q+(1-p-q)^2)} = 1$ and $F(\frac{1-p-q}{2(p+q+(1-p-q)^2)}) = 1$. $q + p + \frac{1-p-q}{2(p+q+(1-p-q)^2)} = 1$ implies that $q + p = 1$.

Finally consider contract $\boldsymbol{\varrho}_{\underline{IE}}$. To achieve $E[C] = 1$ it must be the case that $q + p + \frac{\theta_P(1-p-q)}{q+p} = 1$ and $F(q + p + \frac{\theta_P(1-p-q)}{q+p}) = 1$. $q + p + \frac{\theta_P(1-p-q)}{q+p} = 1$ implies that $q + p = 1$.

■

Proof of Proposition 2

Following Table A1, the measure of implementation capacity in the presence of information transmission is given by the following expression. With some abuse of notation, the I subscript refers to any equilibrium contract (in a given parameter space) with information transmission.

$$F(\widetilde{\theta})E[C(\boldsymbol{\varrho}_I)|\theta \leq \widetilde{\theta}] + (1 - F(\widetilde{\theta}))E[C(\boldsymbol{\varrho}_I)|\theta < \widetilde{\theta}]$$

In the absence of information transmission, implementation capacity is given by:

$$E[C(\boldsymbol{\varrho}_{\neg \boldsymbol{I}})]$$

where the $\neg I$ subscript refers to any equilibrium contract (in a given parameter space) without information transmission.

Denote by λ the share of the legible population, $F(\widetilde{\theta})$, at which implementation capacity is equivalent in contracts with and without information, formally:

$$\lambda(E[C(\boldsymbol{\varrho}_I)|\theta \leq \widetilde{\theta}]) + (1 - \lambda)E[C(\boldsymbol{\varrho}_I)|\theta < \widetilde{\theta}] = E[C(\boldsymbol{\varrho}_{\neg I})]$$

A sufficient condition for $\lambda \in [0, 1]$ is $E[C(\boldsymbol{\varrho}_I)|\theta \leq \widetilde{\theta}] \geq E[C(\boldsymbol{\varrho}_{\neg I})]$ and $E[C(\boldsymbol{\varrho}_I)|\theta > \widetilde{\theta}] \leq E[C(\boldsymbol{\varrho}_{\neg I})]$.

Proceed by considering cases defined by regions of the parameter space denoted in Proposition 1, using the implementation capacity calculations from Table A1.

- Case #1: $\overline{\Delta} = \overline{\Delta}_L$

In this case, compare implementation capacity under Contract $\boldsymbol{\varrho}_I$ to Contract $\boldsymbol{\varrho}_\emptyset$:

$$E[C(\boldsymbol{\varrho}_I)|\theta \leq \widetilde{\theta}] = \frac{2-q+q^2}{2}$$
$$E[C(\boldsymbol{\varrho}_I)|\theta \leq \widetilde{\theta}] = \frac{1+q^2}{2}$$
$$E[C(\boldsymbol{\varrho}_\emptyset)] = 1-q+q^2$$

Clearly, for any $q \in [\frac{1}{2}, 1)$, $\frac{1+q^2}{2} < 1-q+q^2 < \frac{2-q+q^2}{2}$, which is sufficent for $\lambda \in [0,1]$.

- Case #2: $\overline{\Delta} = \overline{\Delta}_M$ and $p < \widehat{p}(q)$:
  This case is identical to the previous case for any θ_P and is thus omitted.

- Case #3: $\overline{\Delta} = \overline{\Delta}_M$ and $p \in [\widehat{p}(q), \overline{p}(q))$:
  In this case, compare implementation capacity under Contract $\boldsymbol{\varrho}_{\overline{IE}}$ to $\boldsymbol{\varrho}_\emptyset$:

$$E[C(\boldsymbol{\varrho}_{\overline{IE}})|\theta \leq \widetilde{\theta}] = q+p+\frac{1-p-q}{2(q+p+(1-p-q)^2)}$$
$$E[C(\boldsymbol{\varrho}_{\overline{IE}})|\theta > \widetilde{\theta}] = \frac{1}{2}$$
$$E[C(\boldsymbol{\varrho}_\emptyset)] = 1-q+q^2$$

  For any $q \in [\frac{1}{2}, 1)$, $p \in (\widehat{p}(q), 1-q]$, $\frac{1}{2} < 1-q+q^2 < q+p+\frac{1-p-q}{2(q+p+(1-p-q)^2)}$. The latter inequality holds when $p=0$ and note that $\frac{dE[C(\boldsymbol{\varrho}_{\overline{IE}})|\theta \leq \widetilde{\theta}]}{dp} > 0$.
  The comparison between Contract $\boldsymbol{\varrho}_I$ and Contract $\boldsymbol{\varrho}_\emptyset$ is equivalent to Case #1 and is therefore omitted.

- Case #4: $\overline{\Delta} = \overline{\Delta}_M$ and $p \geq \overline{p}(q)$:
  The analysis of $\boldsymbol{\varrho}_{\overline{IE}}$ and $\boldsymbol{\varrho}_\emptyset$ is identical to the previous case.

  Compare implementation capacity under Contract $\boldsymbol{\varrho}_{\underline{IE}}$ to Contract $\boldsymbol{\varrho}_\emptyset$:

$$E[C(\boldsymbol{\varrho}_{\overline{IE}})|\theta \leq \widetilde{\theta}] = q+p+\frac{\theta_P(1-p-q)}{2(q+p)}$$
$$E[C(\boldsymbol{\varrho}_{\overline{IE}})|\theta > \widetilde{\theta}] = \frac{1}{2}$$
$$E[C(\boldsymbol{\varrho}_\emptyset)] = 1-q+q^2$$

  For any $q \in \frac{1}{2}, 1)$, $p \in (\widehat{p}(q), 1-q]$, $\frac{1}{2} < 1-q+q^2 < q+p+\frac{\theta_P(1-p-q)}{2(q+p)}$. By Propositoin 1, in this parameter region, $\frac{\theta_P(1-p-q)}{2(q+p)} > q+p+\frac{1-p-q}{2(q+p+(1-p-q)^2)}$ from the previous case. Combined with the previous case, this is sufficient for the the inquality to hold.

- Case #5: $\overline{\Delta} = \overline{\Delta}_H, p < \widehat{p}(q)$: Compare implementation under Contract $\boldsymbol{\varrho}_I$ to Contract $\boldsymbol{\varrho}_E$

as follows:

$$E[C(\boldsymbol{\varrho}_I)|\theta \leq \widetilde{\theta}] = \frac{2-q+q^2}{2}$$
$$E[C(\boldsymbol{\varrho}_I)|\theta \leq \widetilde{\theta}] = \frac{1+q^2}{2}$$
$$E[C(\boldsymbol{\varrho}_\emptyset)] = q+p+(1-p-q)^2$$

For any $q \in \frac{1}{2}, 1)$, $p \in (\widehat{p}(q), 1-q]$, $\frac{1+q^2}{2} < q+p+(1-p-q)^2$. If $p < \frac{1}{2}(1-2q+\sqrt{1-2q+2q^2})$, $\frac{2-q+q^2}{2} > q+p+(1-p-q)^2$. This condition is satsfied for any $p < \widehat{p}(q)$.

- Case #6: $\overline{\Delta} = \overline{\Delta}_H, p \in [\widehat{p}(q), \overline{p}(q))$:
  The comparison of Contracts $\boldsymbol{\varrho}_I$ to $\boldsymbol{\varrho}_E$ is identical to the previous case, though note that $p < \frac{1}{2}(1-2q+\sqrt{1-2q+2q^2})$ is also satisfied for any $p < \overline{p}(q)$.

  Compare implementation capacity under contracts $\boldsymbol{\varrho}_{\overline{IE}}$ and $\boldsymbol{\varrho}_E$:

$$E[C(\boldsymbol{\varrho}_{\overline{IE}})|\theta \leq \widetilde{\theta}] = q+p+\frac{1-p-q}{2(q+p+(1-p-q)^2)}$$
$$E[C(\boldsymbol{\varrho}_{\overline{IE}})|\theta > \widetilde{\theta}] = \frac{1}{2}$$
$$E[C(\boldsymbol{\varrho}_E)] = q+p+(1-q-p)^2$$

  For any $q \in \frac{1}{2}, 1)$, $p \in (\widehat{p}(q), 1-q]$, it is clear from inspection that $\frac{1}{2} < q+p+(1-q-p)^2 < q+p+\frac{1-p-q}{2(q+p+(1-p-q)^2)}$.

- Case #7: $\overline{\Delta} = \overline{\Delta}_H, p \geq \overline{p}(q)$: The comparison of implementation capacity under Contracts $\boldsymbol{\varrho}_{\overline{IE}}$ and $\boldsymbol{\varrho}_E$ is equivalent to the previous case.

  Compare implementation capacity under contracts $\boldsymbol{\varrho}_{\underline{IE}}$ and $\boldsymbol{\varrho}_E$:

$$E[C(\boldsymbol{\varrho}_{\underline{IE}})|\theta \leq \widetilde{\theta}] = q+p+\frac{\theta_P(1-p-q)}{2(q+p)}$$
$$E[C(\boldsymbol{\varrho}_{\underline{IE}})|\theta > \widetilde{\theta}] = \frac{1}{2}$$
$$E[C(\boldsymbol{\varrho}_E)] = q+p+(1-q-p)^2$$

  For any $q \in \frac{1}{2}, 1)$, $p \in (\widehat{p}(q), 1-q]$, it is clear from inspection that $\frac{1}{2} < q+p+(1-q-p)^2 < q+p+\frac{\theta_P(1-p-q)}{2(q+p)}$.

$\blacksquare$

Proof of Proposition 3

First, note that the area of the triangle defined by the coordinates in Definition 2 is given by:

$$\mu_2\left((0,0),(F(\widetilde{\theta}),\frac{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]}{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]+(1-F(\widetilde{\theta}))E[a^\dagger|\theta>\widetilde{\theta}]}),(1,1)\right)$$
$$=\frac{1}{2}\left(\frac{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]}{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]+(1-F(\widetilde{\theta}))E[a^\dagger|\theta>\widetilde{\theta}]}-F(\widetilde{\theta})\right)$$

Consider each of the five contracts. For Contracts $\boldsymbol{\varrho}_\emptyset$ and $\boldsymbol{\varrho}_E$, $E[a^\dagger|\theta]$ is equivalent for all a. This implies that the point $F(\widetilde{\theta})=\frac{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]}{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]+(1-F(\widetilde{\theta}))E[a^\dagger|\theta>\widetilde{\theta}]}$. Thus, $TAI(\boldsymbol{\varrho}_1)=TAI(\boldsymbol{\varrho}_2)=0$ and $\frac{\partial TAI(\boldsymbol{\varrho}_1)}{\partial q}=\frac{\partial TAI(\boldsymbol{\varrho}_2)}{\partial q}=0$.

Under Contract $\boldsymbol{\varrho}_I$:

$$\frac{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]}{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]+(1-F(\widetilde{\theta}))E[a^\dagger|\theta>\widetilde{\theta}]}=\frac{F(1)(2-q+q^2)}{F(1)-F(1)q+(2-q)q}$$
$$\Rightarrow TAI(\boldsymbol{\varrho}_I)=\frac{F(1)(2-q+q^2)}{F(1)-F(1)q+(2-q)q}-F(1)$$
$$=\frac{F(1)(1-F(1))(1-q)}{F(1)(1-q)+(2-q)q}>0$$

Note that $\frac{\partial TAI(\boldsymbol{\varrho}_I)}{\partial q}=\frac{(F(1)-1)F(1)(2-2q+q^2)}{(F(1)(q-1)+(q-2)q)^2}<0$.

Under Contract $\boldsymbol{\varrho}_{\overline{IE}}$, $E[a^\dagger|\theta<\frac{q+p}{q+p+(1-q-p)^2}]=0$. Therefore:

$$\frac{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]}{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]+(1-F(\widetilde{\theta}))E[a^\dagger|\theta>\widetilde{\theta}]}=1$$
$$\Rightarrow TAI(\boldsymbol{\varrho}_{\overline{IE}})=1-F\left(\frac{q+p}{q+p+(1-q-p)^2}\right)$$

Note that $\frac{\partial TAI(\boldsymbol{\varrho}_{\overline{IE}})}{\partial q}=-f(\frac{q+p}{q+p+(1-q-p)^2})\frac{1-p^2-q^2-2qp}{(p+q+(1-p-q)^2)^2}$. $f(\cdot)$ is the pdf of θ and is non-negative. As such $\frac{\partial TAI(\boldsymbol{\varrho}_4)}{\partial q}\le 0$.

Finally, under Contract $\boldsymbol{\varrho}_{\underline{IE}}$, $E[a^\dagger|\theta<\frac{\theta_P}{y}]=0$. Therefore:

$$\frac{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]}{F(\widetilde{\theta})E[a^\dagger|\theta\le\widetilde{\theta}]+(1-F(\widetilde{\theta}))E[a^\dagger|\theta>\widetilde{\theta}]}=1$$
$$\Rightarrow TAI(\boldsymbol{\varrho}_{\underline{IE}})=1-F\left(\frac{\theta_P}{y}\right)$$

Note that $\frac{\partial TAI(\boldsymbol{\varrho}_{\underline{IE}})}{\partial q}=0$.

Comparing TAI across the contracts with information transmission, $TAI(\boldsymbol{\varrho}_{\overline{IE}}) > TAI(\boldsymbol{\varrho}_{I})$ can be seen by inspection of the inequality:

$$1 - F\left(\frac{q+p}{q+p+(1-q-p)^2}\right) > \frac{F(1)(2-q+q^2)}{F(1)-F(1)q+(2-q)q} - F(1)$$

Note that $1 > \frac{F(1)(2-q+q^2)}{F(1)-F(1)q+(2-q)q}$ and $F\left(\frac{q+p}{q+p+(1-q-p)^2}\right) \leq F(1)$. Similarly, $TAI(\boldsymbol{\varrho}_{\underline{IE}}) > TAI(\boldsymbol{\varrho}_{I})$ is given by:

$$1 - F\left(\frac{\theta_P}{y}\right) > \frac{F(1)(2-q+q^2)}{F(1)-F(1)q+(2-q)q} - F(1)$$

as $1 > \frac{F(1)(2-q+q^2)}{F(1)-F(1)q+(2-q)q}$ and $F\left(\frac{\theta_P}{y}\right) \leq F(1)$.

■

Proof of Proposition 4

Optimal contracts and incentives, by citizen type, follow directly from Proposition 1 and are represented in Table A2.

	Parameter region		Citizen type, θ		
Contract	$\overline{\Delta}$	p	$\theta \leq \frac{q+p}{p+q+(1-p-q)^2}$	$\theta \in (\frac{q+p}{p+q+(1-p-q)^2}, 1]$	$\theta > y$
ς_1	$\overline{\Delta}_L$	any	$\boldsymbol{\varrho}_I$	$\boldsymbol{\varrho}_I$	$\boldsymbol{\varrho}_\emptyset$
	$\overline{\Delta}_M$	$p < \widehat{p}(q)$			
ς_2	$\overline{\Delta}_M$	$p \in [\widehat{p}(q), \overline{p}(q))$	$\boldsymbol{\varrho}_{\overline{IE}}$	$\boldsymbol{\varrho}_I$	$\boldsymbol{\varrho}_\emptyset$
ς_3	$\overline{\Delta}_M$	$p > \overline{p}(q)$	$\boldsymbol{\varrho}_{\overline{IE}}$	$\boldsymbol{\varrho}_{\underline{IE}}$	$\boldsymbol{\varrho}_\emptyset$
ς_4	$\overline{\Delta}_H$	$p < \widehat{p}$	$\boldsymbol{\varrho}_I$	$\boldsymbol{\varrho}_I$	$\boldsymbol{\varrho}_E$
ς_5	$\overline{\Delta}_H$	$p \in [\widehat{p}, \overline{p})$	$\boldsymbol{\varrho}_{\overline{IE}}$	$\boldsymbol{\varrho}_I$	$\boldsymbol{\varrho}_E$
ς_6	$\overline{\Delta}_H$	$p \geq \overline{p}$	$\boldsymbol{\varrho}_{\overline{IE}}$	$\boldsymbol{\varrho}_{\underline{IE}}$	$\boldsymbol{\varrho}_E$

Table A2: Optimal contracts, by citizen type.

Each contract imposes monitoring rates of $\rho(0,1) > \rho(0,0)$ for some citizen type by employing contracts $\boldsymbol{\varrho}_I$, $\boldsymbol{\varrho}_{\overline{IE}}$ or $\boldsymbol{\varrho}_{\underline{IE}}$. Given the assumption $F(1) \in (0,1)$, $\rho(0,1) > \rho(0,0)$ induces some citizen to complain.

Per Definition 2, a sufficient condition for $TAI > 0$ is that $\exists \theta', \theta'' \in supp(f)$ such that $E[a^\dagger|\theta'] \neq E[a^\dagger|\theta'']$. The expressions for $E[a^\dagger|\theta]$ in A1, indicate for any $F(1) \in (0,1)$ and $q < 1$, $TAI > 0$ for contracts $\boldsymbol{\varrho}_1$ to $\boldsymbol{\varrho}_6$.

Finally, compare the levels of inequality generated by the contracts in Table A2 to inequality generated by their any constituent contract with information. For contract with two "constituent" contracts (ς_1 and ς_4), these comparisons are straightforward:

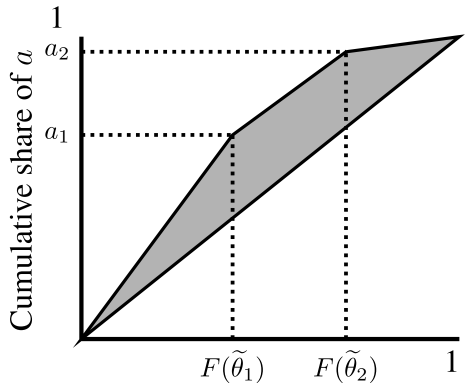


Figure A1: Geometric representation of inequality measure with three partitions of the type space (x-axis). Note that TAI is equivalent to double the shaded area.

$$TAI(\boldsymbol{\varsigma}_1) - TAI((\boldsymbol{\varrho}_I) = \frac{F(1)(1+q-q^2)}{1+F(1)(q-q^2)} - F(1) - \left[\frac{F(1)(1+q-q^2)}{(2-q)q+F(1)(1-q)} - F(1)\right] < 0$$

$$TAI(\boldsymbol{\varsigma_2}) - TAI(\boldsymbol{\varrho}_I)) = \frac{F(1)(1+q-q^2)}{1+F(1)(q-q^2)} - F(1) - \left[\frac{F(1)(1+q-q^2)}{(2-q)q+F(1)(1-q)} - F(1)\right] < 0$$

In the case of contracts $\boldsymbol{\varsigma}_2$, $\boldsymbol{\varsigma}_3$, $\boldsymbol{\varsigma_5}$, and $\boldsymbol{\varsigma}_6$ there exist two thresholds defining different contracts that are applied across the population. Geometrically, the area measure relevant to the calculation of TAI is depicted for the quadrilateral representing $\boldsymbol{\varsigma}_3$ in Figure A1.
Given the notation in the Figure, $TAI(\boldsymbol{\varrho})$ is equivalent to:

$$2\mu_2\left((0,0),(F(\widetilde{\theta}_1),{a_1}^\dagger),(F(\widetilde{\theta}_2),{a_2}^\dagger),(1,1)\right) = {a_2}^\dagger(1-F(\widetilde{\theta}_1)) + F(\widetilde{\theta}_2)({a_1}^\dagger - 1)$$

Note two observations about contracts $\boldsymbol{\varsigma}_2$, $\boldsymbol{\varsigma}_3$, $\boldsymbol{\varsigma_5}$, and $\boldsymbol{\varsigma}_6$. Each includes contract $\boldsymbol{\varrho}_{\overline{IE}}$ for some segment of the population. In this case, $F(\widetilde{\theta}_1)$ is equivalent as the marginal complainant under contract $\boldsymbol{\varrho}_{\overline{IE}}$ is the same. As such, TAI is greater under $\boldsymbol{\varrho}_{\overline{IE}}$ than under any contract in: $\boldsymbol{\varsigma}_2$, $\boldsymbol{\varsigma}_3$, $\boldsymbol{\varsigma}_5$, $\boldsymbol{\varsigma}_6$ if:

$$1 - F(\widetilde{\theta}_1) > a_2^\dagger(1-F(\widetilde{\theta}_1)) + F(\widetilde{\theta}_2)(a_1^\dagger - 1)$$

This inequality is always satisfied since $a_2^\dagger < 1$ and $a_1^\dagger < 1$.

■

B Empirical Motivation, Continued

The text provides three possible reasons for variation in complaint rates across geographic units in the same city. I will refer to these units as "neighborhoods."

1. Different rates of service utilization as a function of characteristics of the composition of neighborhood residents. Some neighborhoods' populations may be more reliant on specific government services (or types of government services) than others.

2. Different quality of service provision across different neighborhoods. Lower quality services may yield more complaints.

3. Citizens vary in their costs of complaint in a manner that correlates with the neighborhoods they live in.

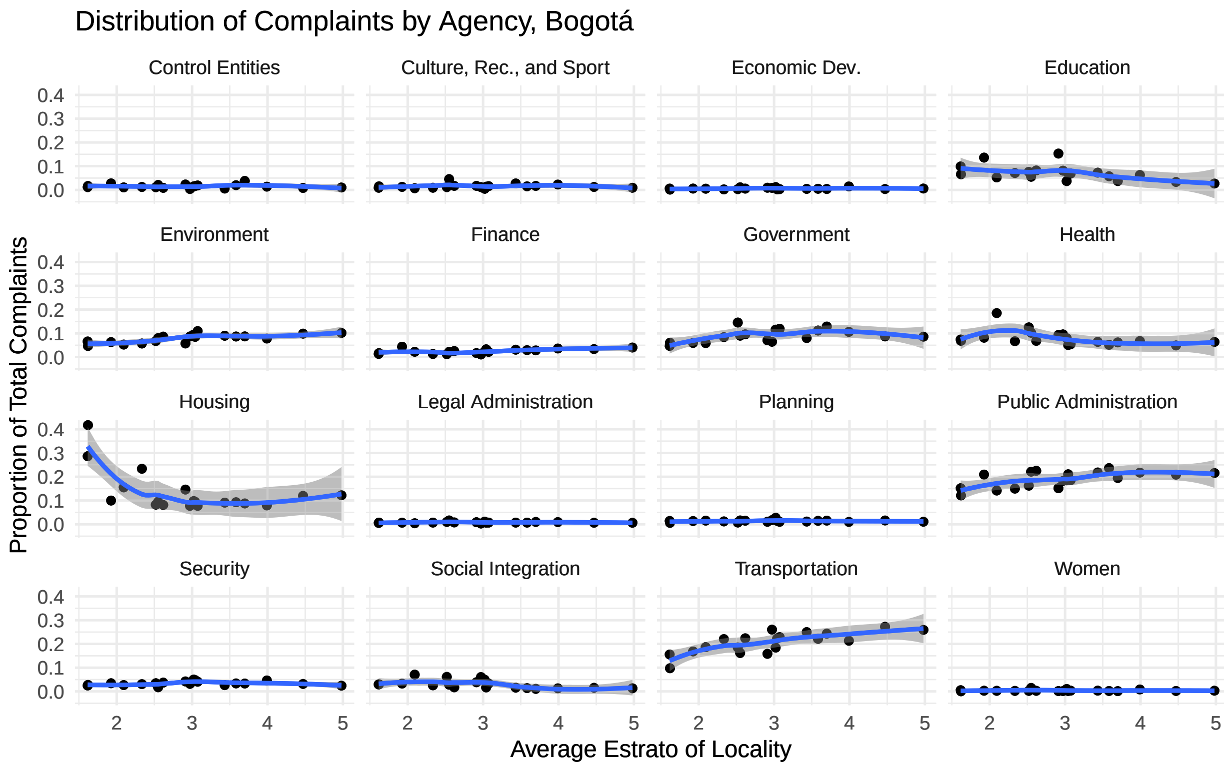
To assess these possibilities, I descriptively examine rates of complaint across geographic units in Bogotá and New York, by wealth of residents. I use this measure because wealth is believed to correlate positively with service provision (#2) in both cities. The relative magnitude of this correlation across the cities, however, is not evident.

To examine #1, I disaggregate complaints by the agency to which complaints were directed. This is provided in both datasets. I plot this data descriptively in Figure A2. Clear gradients emerge in the usage of some services as a function of neighborhood (unit) wealth. In particular, departments of housing are the most frequent recipient of complaints in poorer neighborhoods. This makes sense as their services are disproportionately used by lower-income citizens in both cities. This supports the argument in #1 but it does not speak to variation in rates of complaint.

Figure A3 looks at variation in the volume of complaint by neighborhood wealth with and without housing-related complaints. In Bogotá, despite widespread evidence and perceptions that services are *better* in rich localities, they also file substantially more complaints than poor localities. The relationship looks quite similar with and without housing complaints given the low rate of complaints from poor localities in general.

In New York, the relationship between census tract wealth and complaint-filing is less clear. Overall, there appears to be slight non-monotonicity in complaint rates by neighborhood wealth. This occurs even though popular wisdom holds that service quality is *increasing* in neighborhood wealth. When health complaints are omitted, a positive correlation between neighborhood wealth and complaint rate emerges, albeit at a lower magnitude than in Bogotá.

The inverse relationship between service quality and complaint rates in both cities, even when adjusting (symmetrically) for different types of service utilization, suggests variation in the propensity of citizens to make complaints. The model captures these tendencies in terms of costs of complaint.



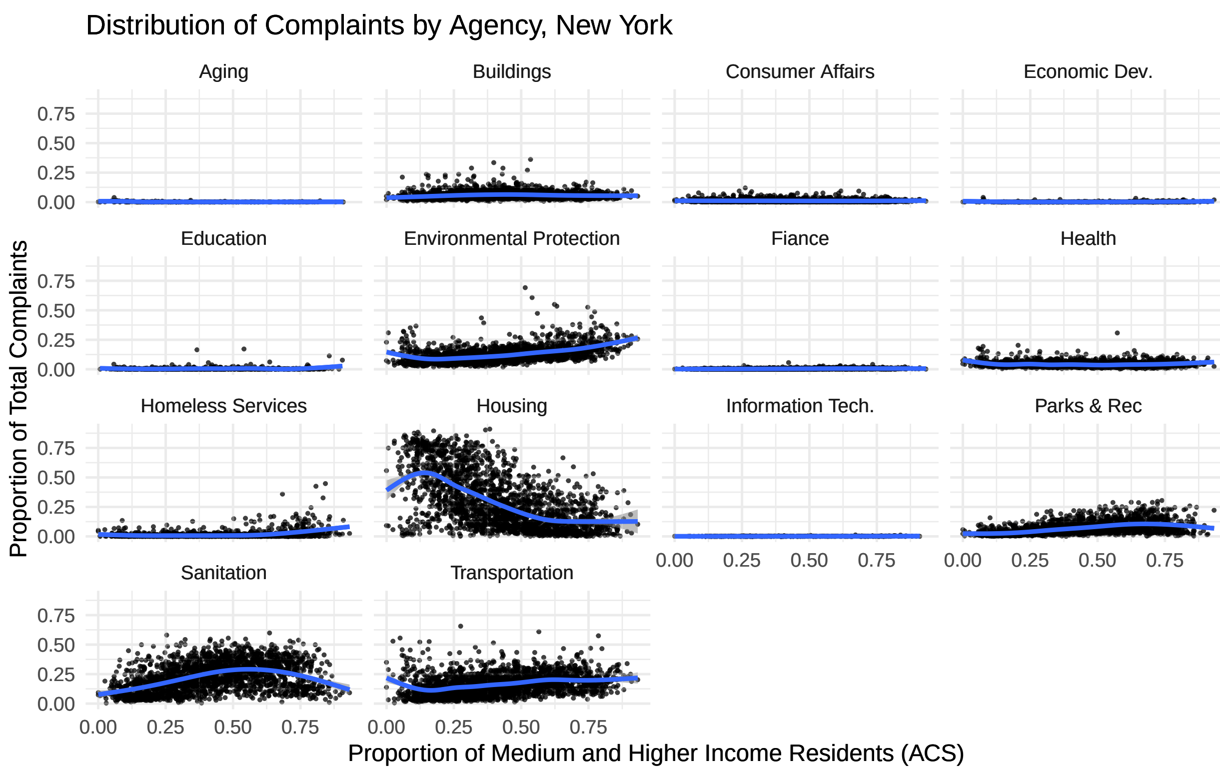


Figure A2: Proportion of total complaints directed to each city government agency in Bogotá and New York, by neighborhood wealth. The x-axis is increasing in neighborhood wealth. The complaints are aggregated over the January 2017-June 2018 period in both cities.

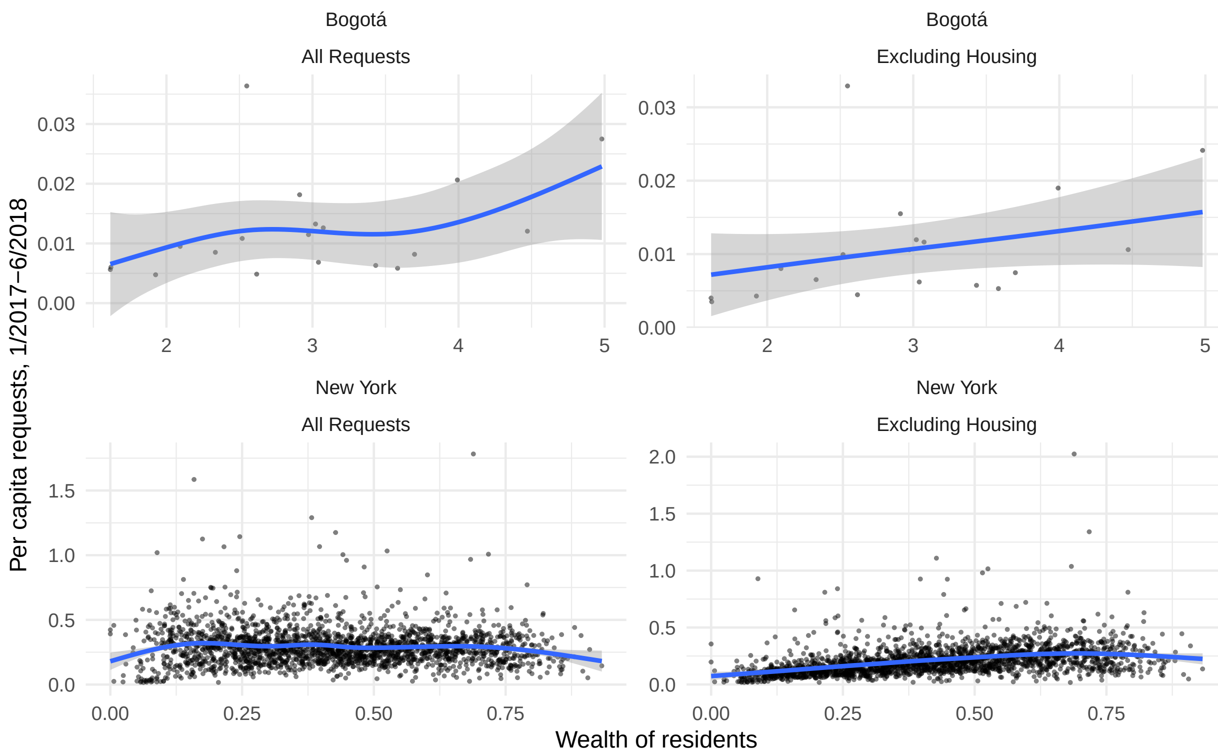


Figure A3: Per-capita rate of complaint-making by neighborhood wealth. The x-axis is increasing in neighborhood wealth. The rows index the two cities and the columns report the rate of "all complaints" and all non-housing complaints.