Essays on Information Revelation in Political Organizations

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ABSTRACT

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Informational problems are prevalent in political organizations. To understand incentive structures, transparency and policy expertise in political organizations, we need to examine their informational problems. This collection of essays is a contribution to the theory and application of information revelation in political organizations.

In Chapter 1, I develop a theory of office incentives in a setting in which agents' effort is crucial for learning policy information. Many organizations, such as government agencies and NGOs, learn about policy effectiveness through decentralized experimentation. However, unobserved effort by an agent can affect the outcome of an experiment, thus limiting its informativeness. A principal can improve the informativeness of an experiment by motivating the agent, using office as an incentive. The principal may keep the agent in office only when the outcome of an experiment is good, thereby creating high-powered office incentives for the agent. High-powered office incentives motivate the agent's effort in implementing the experiment in order to stay in office. However, they also reduce the agent's expected informational benefits from experimentation, which

can reduce the effort expended by the agent in implementing the experiment. The degree to which the agent values achieving organizational goals affects such trade-offs. I show that the principal is more likely to use high-powered incentives when the agent places a high value on achieving organizational goals and when multiple agents implement the same experiment.

In Chapter 2, I analyze a model where an autocrat may choose transparency in disclosing information to members of ruling group, particular information pertaining to the effectiveness of valence-policy by her. The effectiveness of the autocrat's policy directly reflects her competence. The members' belief about autocrat's competence in valence-policy making affects their support. If the autocrat is transparent about policy effectiveness, particularly tell the truth of an ineffective policy, a favorable message of policy effectiveness will be convincing. The members will support the autocrat upon receiving a favorable message thereby. However, transparency also means a higher frequency of unfavorable message which leads to the withdrawal of support by the members of ruling group. The model shows the effect of intra elite conflicts on transparency. When the ruling faction doesn't depend much on the autocrat, the autocrat tends to be more transparent. Further, there is a non-monotonic relationship between the degree of ideological conflict among competing factions and transparency. As conflict increases, transparency increases up to a threshold. Beyond this threshold, increased conflict is associated with reduced transparency. In addition, the model has implications on quality of bureaucracies that gather and report information.

Finally, in Chapter 3, I study how political polarization at the mass level affects politicians' policy making in common value issues. In the model, politicians

representing two groups of voters with divergent ideologies compete for office. Voters have limited information about policy as well as politicians' competence in policy making. After observing the incumbent's policy choice, voters make voting decisions. I study two variations of election. First, there is a majority group and a minority group in the society. Second, society is composed of two competitive groups. In both variations, I show that in a society with a high level of polarization, the incumbent politician is more likely to exercise her expertise regarding common value issues.

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to my mom.

Chapter 1

Office Incentives and Policy Experimentation

1.1 Introduction

Many organizations, such as government agencies and NGOs, learn through experimentation. Outcomes of experimentation often depend significantly on unobserved effort decisions made by agents. For instance, if a legislature wants to learn about the efficacy of a new education program, individual schools decides how much effort to exert in implementing the experimental program. Similarly, when donors try out a new developmental project, NGOs that implement the project choose their level of effort in it. In China, experimentation has decisively shaped the making of policies in many domains, such as economic reform, inter-party democracy, public eduction, etc.[1]

for discussion on policy experimentation on various issues. To learn how effective a new policy is, the authority in the central government often experiments

[1]See Cao, Qian, and Weingast 1999; Fewsmith 2013; Heilmann 2008; Wang 2009; Xu 2011.

with it at the local level.[2] Local officials implement experimental policies, and the outcomes of experiments provide feedback for the central authority's future policy making. An ineffective policy produces bad outcomes. An effective policy could also produce bad outcomes if agents shirk in implementation. With low effort of agents, little could be learnt about the efficacy of a policy. In such a process, agents' unobserved effort limits the informativeness of an experiment.[3]

To maximize information, principals often use office itself to motivate the agent to put effort into experiment. Because public bureaucracies and NGOs do not offer much formal bonus pay for performance, using office as an incentive is crucial to these organizations. An important component of office value comes from agent's preference for achieving organizational goals. The agent may intrinsically share organizational goals.[4] In the public sector, public service motivation is the major source of intrinsic motivation (Francois 2000; Le Grand 2006; Perry and Hondeghem 2008). The agent may also identify with organizational goals other than serving the public good (Akerlof and Kranton 2005; Besley and Ghatak 2005; Sheehan 1996; Wilson 1989). In addition, whether an organization achieves its goal affects its funding and survival. Downs 1967 argues that "No

[2] Local-initiated policy experimentation, and center-sponsored experimentation, distinguished by the source of the policy decision, are the two main types of experimentation at the local level. In local-initiated policy experiment, the local officials make the policy decision to experiment. In center-sponsored experimentation, the central authority imposes experimental policies on the local agents. In both types of experimentation, local officials are responsible for implementation. Scholars debate about whether a specific local experiment is local-initiated or center-sponsored (see Cai and Treisman 2006 for more discussion). The model in paper helps to understand center-sponsored experimentation.

[3] Hirsch 2016 and Chassang, Miquel, and Snowberg 2012 also discuss the implication of agent's effort decision for learning in experiments.

[4] The literature conceptualizes intrinsic motivation in two ways. Some consider that individuals obtain payoffs only when they are working on the provision of the policy (Andreoni 1990; Besley and Ghatak 2005). Others regard intrinsic motivation as a sort of pure altruistic concern that causes individuals to care about the policy regardless of the policy provider's identity (Francois 2000; Gailmard and Patty 2007). I take the first approach in this paper.

bureau can survive unless it is continually able to demonstrate that its services are worthwhile to some group with influence over sufficient resources to keep it alive." Because the agent's material well-being hinges on the organization's funding and his career on the organization's survival, the agent is concerned with achieving organizational goals.

How should the principal use office to motivate the agent in decentralized experimentation? Should she keep the agent in office only when the outcome of an experiment is good, thereby creating high-power office incentives or should she keep the agent in office regardless of the outcome? To address these questions, I develop a formal model to analyze the principal's decision of whether to introduce high-powered office incentives in decentralized experimentation. The principal cares about achieving the organizational goal. When in office, the agent also has a preference for achieving the organizational goal. A status quo policy and an experimental policy are available. The effectiveness of the status quo policy in achieving the organizational goal is known. The effectiveness of the experimental policy in achieving the organizational goal is unknown *ex ante*. An effective policy is more likely to achieve the organizational goal if the agent works harder. An ineffective policy always fails. To learn about the effectiveness of the experimental policy, the principal chooses the experimental policy for the agent to implement in the beginning.

The game begins with the principal's decision of whether to retain the agent only when the outcome of the experiment is good or to retain the agent unconditionally. The former type of re-appointment rule creates high-powered office incentives and the latter, low-powered office incentives. The agent sets a level of effort in implementing the experimental policy. At the end of the first period, the policy outcome is revealed to all players. According to the re-appointment rule,

the principal retains an agent in office or replaces him with a new agent who shares the preference in achieving the organizational goal with the sitting agent. In the second period, learning from the policy experiment, the principal decides whether to adopt the experimental policy or the status quo policy. An agent in office decides how much effort to expend in implementing the second-period policy.

One building block of the model is that effort expended by the agent in experimentation in the first period affects information about the experimental policy, which is used for policymaking in the second period. A higher level of effort provides better information about the experimental policy. Based on better information, the principal can make better policy decisions in achieving organizational goals, which benefits both the principal and the agent in future office. In other words, both the principal and the agent in future office derive informational benefits from experimentation.

To gain better information, the principal chooses office incentives that motivate the agent's effort in experimentation. On the one hand, if the principal adopts high-powered incentives, the agent may not stay in office. Yet the agent's effort in experimentation leads to his informational benefit in the second period only if he stays in office. Higher-power incentives thus make the agent hold back experimentation effort in the first place. On the other hand, high-powered incentives may also motivate the agent. In order to stay in office, the agent puts effort into experimentation. When the expected payoff of future office is higher, this motivation effect of high-powered incentives are stronger.

The degree to which the agent values achieving organizational goals affects the principal's trade-offs. When the agent places a low value on achieving organizational goals, the agent is less motivated to exert effort. With low effort,

his chance of staying in office to reap learning benefits is low. Thus, he is more likely to hold back effort in experimentation given high-powered incentives. In addition, a lower effort in experimentation leads to a lower informational benefit in future office and hence a lower total expected payoff in future office. The motivation effect of high-powered incentives is weaker. Therefore, high-powered incentives are more likely to dampen incentives for the agent who places a low value on achieving organizational goals. Consequently, the principal refrains from using high-powered incentives when the agent places a low value on achieving organizational goals.

Decentralized experimentation often involves multiple agents. Take China, for an example, where most policy experiments are implemented by local officials in different localities.[5] Likewise, American bureaucracies are replete with of examples in which different agencies or branches within an agency carry out same task.[6] I extend the basic model to incorporate a situation with two agents. I contrast the principal's choice of incentive structures in a one-agent setting with that in a two-agent setting. In the one-agent environment, only one agent's effort matters for policy learning. In the two-agent environment, both agents' effort contributes to policy learning. If the other agent exerts more effort, an agent's own effort becomes less crucial for policy learning, and the marginal informational benefits of one's own effort diminishes. Balancing the cost of effort and its return at the margin, an agent is less concerned with not reaping the learning benefit in this case. In addition, if the other agent exerts more effort, information about an experimental policy improves and an agent's future office becomes more valuable. This strengthens the motivation effect of high-powered incentives. Gen-

[5]See footnote 1 and footnote 2.

[6]For example, Bendor 1985 discusses issues in welfare policy in the 1960s.

erally speaking, compared to the one-agent setting, the principal is more likely to introduce high-powered incentives in the two-agent setting.

This paper contributes to the literature on incentive issues outside a standard private-sector context (Acemoglu, Kremer, and Mian 2008; Akerlof and Kranton 2005; Alesina and Tabellini 2007; Benabou and Tirole 2003; Besley and Ghatak 2005; Dixit 2002; Maskin and Tirole 2004). It relates to the policy experimentation literature, specifically the strand of literature that examines the aspect of career risk involved with policy innovation (Cai and Treisman 2009; Majumdar and Mukand 2004; Rose-Ackerman 1980). The difference between this paper and that strand of literature is that this paper emphasizes how unobserved effort affects the experimental outcome. In addition, this paper speaks to the literature on policy experimentation in federal systems. One focus of the literature is on the informational externality associated with policy experimentation across regions (Callander and Harstad 2015; Strumpf 2002; Volden, Ting, and Carpenter 2008). Finally, vast literature discusses learning in the private sector (Bolton and Harris 1999; Keller, Rady, and Cripps 2005). Some research examines learning in a principal-agent setting where agents are motivated by monetary incentives (Bergemann and Hege 2005; Bonatti and Hörner 2011; Halac, Kartik, and Liu 2016; Manso 2011).

1.2 Model

Environment and Players

The game takes place over two periods, denoted by $t = 1, 2$. A principal P makes a policy choice. Agent A_1 and agent A_2 implement the policies in their own jurisdictions. P commits to a re-appointment rule which is based on A_i's

policy outcome in period 1. There are two policy options: a status quo policy, denoted by 0, and an experimental policy, denoted by 1. In order to learn about the experimental policy, P chooses the experimental policy in the first period. A_i sets an effort level $a_{i1} \in [0,1]$ in policy experimentation. In period 2, P chooses a policy $p_2 \in \{0,1\}$. If A_i is re-appointed, he sets an effort level $a_{i2} \in [0,1]$ in implementing policy in period 2. Otherwise, a new appointee implements the policy.

Let x_{it} be the policy outcome in jurisdiction i at period t. If the policy is successful, it yields an outcome of 1. If it fails, it yields an outcome of 0. The effectiveness of a policy and effort in implementation jointly determine the policy outcome. The effectiveness of an experimental policy, denoted by θ, is *ex ante* unknown. It could be $\underline{\theta}$ or $\overline{\theta}$. Throughout, I refer to type $\underline{\theta}$ as "ineffective" and type $\overline{\theta}$ as "effective". All players share common prior beliefs about θ, where $\Pr(\theta = \overline{\theta}) = \frac{1}{2}$. If $\theta = \underline{\theta}$, the experimental policy fails. If $\theta = \overline{\theta}$, with probability a_{it}, the policy succeeds; with probability $1 - a_{it}$, the policy fails. When the status quo policy is implemented, the probability of success is γa_{it}. γ thus measures the effectiveness of the status quo policy. It is known to all players that $\gamma \in [\frac{1}{2}, \frac{2}{3}]$.[7] In the end of period t, policy outcome x_{it} is revealed to all players. I summarize policy outcome as follows.

[7] When $\gamma \geq 1/2$, the *ex ante* outcome of the experimental policy in the first period is not better than the outcome of the status quo policy. When $\gamma > 2/3$, even if the experimental policy is revealed to be effective *ex post*, the principal is better off adopting the status quo in the first period. Thus, the lower bound ensures that the principal undertakes experimentation in the first period to learn about the experimental policy, and the upper bound ensures that experimenting in the first period is possibly beneficial for the principal in the long run.

If $p_t = 0$, the policy outcome x_{it} is distributed as follows.

$$x_{it} = \begin{cases} 1 & \text{with probability } \gamma a_{it} \\ 0 & \text{with probability } 1 - \gamma a_{it}. \end{cases} \tag{1.1}$$

If $p_t = 1$, the policy outcome x_{it} is distributed as follows.

$$x_{it} = \begin{cases} 1 & \text{with probability } a_{it} \text{ if } \theta = \overline{\theta};\ \text{with probability 0 if } \theta = \underline{\theta} \\ 0 & \text{with probability } 1 - a_{it} \text{ if } \theta = \overline{\theta};\ \text{with probability 1 if } \theta = \underline{\theta}. \end{cases} \tag{1.2}$$

In the beginning, P commits to a re-appointment rule that specifies a threshold of the first-period policy outcome, denoted by $\sigma \in \{0, 1\}$. Only if $x_{i1} \geq \sigma$, P re-appoints A_i in the second period. If $\sigma = 0$, P offers low-powered office incentives. If $\sigma = 1$, P provides high-powered office incentives.

P cares about policy outcomes in both jurisdictions, receiving $x_{1t} + x_{2t}$ in period t. P's payoff function is

$$V_P = \sum_i \sum_t x_{it}.$$

A_i cares about policy outcome in his own jurisdiction and receives λx_{it} if he is in office in period t. $\lambda \in [0, 1]$ thus measures the degree to which A_i is motivated by organizational goals. The value of λ is known to all players. A_i incurs a cost of implementation $c(a_{it}) = \frac{a_{it}^2}{2}$. If A_i is replaced, a new agent has the same degree of organizational-goal motivation as A_i. This assumption is to rule out the possibility that P replaces A_i for pure selection reason, and thus to focus on the moral hazard problem. A_i's payoff function is

$$V_{A_i} = \lambda x_{i1} - c(a_{i1}) + I_i(\lambda x_{i2} - c(a_{i2})),$$

where I_i is an indicator function. $I_i = 1$, if A_i stays in office in period 2; and $I_i = 0$, otherwise.

Sequence

This two-period game proceeds as follows.

1. Nature draws the value of θ.
2. P commits to a re-appointment rule σ.
3. A_i chooses a_{i1} in period 1.
4. Nature reveals policy outcomes x_{i1} to P and A_i.
5. P chooses p_2.
6. The agent in jurisdiction i in period 2 chooses a_{i2}.

Solution Concept

This game has a component of information revelation, so I derive perfect Bayesian equilibria in pure strategies. I focus on symmetric equilibrium where both agents adopt the same strategies. Let H^1 be the set of all period 1 histories. The equilibrium consists of strategies: σ, a_{it}, p_2, and beliefs about the experimental policy's type. $\sigma \in \{0,1\}$. $a_{i1} : \{0,1\} \rightarrow [0,1]$ maps P's threshold choice onto into A_i's effort choice in period 1. $p_2 : H^1 \rightarrow \{0,1\}$ maps the set of period 1 history to period 2 policy choice. $a_{i2} : H^1 \times \{0,1\} \rightarrow [0,1]$ maps the set of histories leading to period 2 effort choice to period 2 effort choice in jurisdiction i. For each history, players also have beliefs about the probabilities of the experimental policy's type. All players share the same prior belief, denoted by ρ_0. Let ρ_{1j} be player j's posterior belief by the end of period 1, where $j \in \{P, A_1, A_2\}$.

1.3 Results

To show the cost and benefit of high-powered incentives in generating informative experimentation, I begin with an example of one agent. Then, I consider the case of two agents. In each case, I first derive players' strategies in period 2 and describe how effort in experimentation in period 1 affects decisions in period 2. Then, I analyze the agents' strategies in period 1 under different incentive structures. The principal's choice of incentive structures is then discussed. Finally, I compare incentive structures in equilibrium across two cases.

1.3.1 One Agent

In the basic setup, the notations are developed for a two-agent case. Here, I make some necessary notational changes for a one-agent case. An agent is denoted by A, his effort in period t by a_t, policy outcome in period t by x_t, P's second-period choice by p_2^s, and her re-appointment rule by σ^s.

Period 2 Decisions

A key feature of the model is that information available to players in period 2 is endogenous to effort into experimentation in period 1. Suppose that the agent exerts effort a_1 in period 1 in equilibrium. Players update their beliefs over the experimental policy's type using Bayes' rule.[8] If the experiment succeeds, knowing an ineffective policy always fails, all players infer that the experimental policy is an effective type ($\rho_{1j} = 1$). If the experiment fails, it could be caused by an ineffective policy or by insufficient effort. More specifically, the posterior belief

[8]In the appendix, I show that given any belief that the principal could hold off-equilibrium, the agent has no incentive to deviate from his equilibrium action.

that the experimental policy fails despite being effective for player j is

$$\rho_{1j} = \frac{\frac{1}{2}(1-a_1)}{\frac{1}{2}(1-a_1)+\frac{1}{2}} \leq \frac{1}{2}.$$

In the case of experimentation failure, the posterior beliefs of all players are less than or equal to their priors.

Based on the information about the experimental policy, players make second-period decisions. The second-period decisions include the principal's policy choice p_2 and an effort decision a_2 by an agent in office. Because the second period is the last period, the principal chooses a policy that gives her a higher expected payoff in single period, and the agent exerts effort to maximize his single period payoff. Suppose that the principal adopts the experimental policy in the second period. In this case, an agent in office exerts effort $a_2 = \lambda\rho_1$ and the resulted expected policy payoff is $\rho_1^2\lambda$. If P chooses the status quo policy in the second period, an agent in office exerts effort $a_2 = \lambda\gamma$ and the expected policy payoff in the second period is $\gamma^2\lambda$. If the posterior belief that the experimental policy is an effective type is greater than the effectiveness of the status quo policy ($\rho_1 > \gamma$), the experimental policy yields a higher policy payoff. This condition holds if and only if the first-period experiment succeeds. Observing an successful first-period experiment, the principal adopts the experimental policy in the second period. The following remark summarizes the principal's policy choice in the second period.

Remark 1. *Given the outcome of policy experimentation in period 1, P's period 2 policy*

choice in the one-agent setting is as follows.

$$p_2^{s*} = \begin{cases} 1, & \text{if } x_1 = 1; \\ 0, & \text{otherwise.} \end{cases}$$

The Learning Premium

As discussed in the previous section, the principal's second-period policy decision depends on information revealed through first-period policy experimentation. Here, I show that policy experimentation is valuable to the principal and the agent who stays in office. The value of policy experimentation depends on how much effort the agent puts into experimentation.

Given the first-period effort a_1 and the prior about the experimental policy, the *ex ante* probability of an experiment being successful is $\frac{1}{2}a_1$. By Remark 1, the *ex ante* probability of the principal adopting the experimental policy in period 2 is $\frac{1}{2}a_1$ and that of choosing the status quo policy is $1 - \frac{1}{2}a_1$. Her expected second-period policy payoff is as follows.[9]

$$E(v(a_1)) = \lambda\frac{1}{2}a_1(1-\gamma^2) + \lambda\gamma^2. \tag{1.3}$$

The term $\lambda\frac{1}{2}a_1(1-\gamma^2)$ in the above equation is the principal's learning premium. It represents the effect of the agent's first-period effort in experimentation on the principal's second-period payoff. When an experiment fails, the exper-

[9]The derivation of the following equation is as follows.

$$\begin{aligned} E(v(a_1)) &= \frac{1}{2}a_1\lambda\rho_{1P}^2 + (1-\frac{1}{2}a_1)\lambda\gamma^2 \\ &= \frac{1}{2}a_1\lambda(1-\gamma^2) + \lambda\gamma^2 \end{aligned}$$

imental policy is rejected by the principal in the second period. However, the experimental policy might be effective and the agent's shirking causes the failure. As the agent exerts more effort, the probability that an effective experimental policy is rejected decreases. More effort into experimentation thus increases the learning premium.

If the agent stays in office in the second period, he also benefits from policy experimentation. In addition to the benefit from a better policy decision by the principal in the second period, better information about the experimental policy helps A calibrate his effort better. He works harder for a more effective policy and avoids wasting effort on a less effective policy. Denote the agent's expected payoff in second-period office as $E(w(a_1))$.

$$E(w(a_1)) = \frac{\lambda^2}{2}\frac{1}{2}a_1(1-\gamma^2) + \frac{\lambda^2}{2}\gamma^2 \tag{1.4}$$

As part of expected payoff in future office, the learning premium of an agent in office is captured by the term $\frac{\lambda^2}{2}\frac{1}{2}a_1(1-\gamma^2)$. The higher degree to which the agent is motivated by organizational goals, the more he values policy experimentation, and the higher leaning premium he receives. The more effective the status quo policy, the less valuable the policy experimentation, and the lower the learning premium.

Low-Powered Office Incentives

First, consider that the principal chooses $\sigma^s = 0$. Regardless of the performance, the agent stays in office and receives the learning premium in the second period. Expecting this, the agent sets an effort level $a_1 \in [0,1]$ in period 1 to

maximize the following objective function.

$$\max_{a_1} \lambda \frac{1}{2} a_1 - c(a_1) + E(w(a_1)).$$

First order condition characterizing the interior solution is as follows.

$$\frac{1}{2}\lambda + \frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2) = a_1. \tag{1.5}$$

The right-hand side of the above equation is the marginal cost of effort. The first part in the left-hand side is the current marginal return. The second part in the left-hand side is the marginal learning premium. The agent sets an effort level such that the marginal cost equals the sum of marginal returns in two periods. The following remark summarizes the agent's decision in the first period given low-powered incentives.

Remark 2. *In the subgame where the re-appointment threshold $\sigma^s = 0$, effort in experimentation in period 1 is*

$$a_1^{l*} = \frac{1}{2}\lambda(1 + (1-\gamma^2)\frac{\lambda}{2}),$$

where the superscript denotes that the re-appointment rule provides low-powered office office incentives.

Under a re-appointment rule that provides low-powered office incentives, as the agent becomes more motivated by organizational goals, his effort in experimentation in period 1 increases; as the status quo policy becomes more effective, the effort decreases. Current effort leads to better current and future policy outcomes. The stronger the organizational-goal motivation, the more the agent values policy outcomes, and the more effort the agent exerts. When the status

quo policy is more effective, learning about the experimental policy becomes less beneficial.

High-Powered Office Incentives

Now, consider that the principal sets $\sigma^s = 1$. She rewards the agent's good performance with future office. The agent's effort in experimentation contributes to good performance. In addition, his effort affects the learning premium which is part of the expected payoff in future office. The following optimization problem characterizes A's effort choice in the first period.

$$\max_{a_1} \lambda \frac{1}{2} a_1 - c(a_1) + \frac{1}{2} a_1 E(w(a_1)).$$

The agent chooses an effort level according to the following first order condition:

$$\frac{1}{2}\lambda + \frac{1}{2}\frac{\lambda^2}{2}(\frac{1}{2}a_1(1-\gamma^2)+\gamma^2) + \frac{1}{2}a_1\frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2) = a_1. \tag{1.6}$$

The right-hand side of the above equation is the marginal cost of effort. The marginal current return is captured in the first term in the left-hand side. The future marginal return has two components. The first component, represented in the second term in the left-hand side, is the marginal increase in the probability of staying in office times the expected payoff in future office. With high-powered office incentives, good performance is rewarded with future office. A higher expected payoff in future office provides stronger incentives to work today. The second component, represented in the third term in the left-hand side, is the marginal increase in learning premium, holding the expected probability of staying in office constant. Given high-powered office incentives, the agent also faces uncertainty in reaping the learning premium. The uncertainty plays a larger

influence on his effort decision when the marginal learning premium is higher. Balancing the marginal cost and benefit, I derive the agent's equilibrium strategy in the subgame where the threshold $\sigma = 1$ as follows.

Remark 3. *In the subgame where the re-appointment threshold $\sigma^s = 1$, effort in experimentation in period 1 is:*

$$a_1^{h*} = \frac{\frac{1}{2}\lambda(1 + \frac{\lambda}{2}\gamma^2)}{1 - \frac{\lambda^2}{2}\frac{1}{2}(1 - \gamma^2)},$$

where superscript denotes that the re-appointment provides high-powered incentives.

With high-powered office incentives, both the organizational-goal motivation and the effectiveness of the status quo policy have positive effects on experimentation effort. Intuitively, an agent who is highly motivated by organizational goals works harder. But why does an agent put more effort in experimentation if the status quo policy becomes more effective? On the one hand, when the status quo policy becomes more effective, the learning premium becomes smaller, and the agent's tendency to shirk in experimentation increases. One the other hand, when the status quo policy becomes more effective, the payoff in future office increases, and the agent tends to work harder to attain office. Because the agent reaps a learning premium with probability $\frac{1}{2}a_1$, his tendency towards shirking is discounted by $\frac{1}{2}a_1$. Overall, the agent works harder when the status quo policy is more effective.

The Principal's Choice of Incentive Structures

As established in Equation (3), the agent's effort in experimentation in the first period contributes to the principal's expected second-period payoff. Moreover, the agent's effort in the first period increases the probability of a good first-period policy outcome and thus the principal's expected first-period payoff. As a result, the principal chooses an incentive structure that induces more effort in experi-

mentation.

A comparison between Equation (5) and Equation (6) demonstrates the cost and benefit of high-powered office incentives. On the one hand, by rewarding good performance with future office, high-powered office incentives motivate the agent to put effort into experimentation. The motivation effect is captured as $\frac{1}{2}\frac{\lambda^2}{2}(\frac{1}{2}a_1(1-\gamma^2)+\gamma^2)$ in Equation (5). The effect is greater when the value of future office is higher. On the other hand, high-powered office incentives introduce uncertainty in reaping the learning premium and thus discourage effort in policy experimentation. Given high-powered office incentives, the agent could only benefit from learning if he stays in office. His expected marginal learning premium is $\frac{1}{2}a_1\frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2)$. Provided with low-powered office incentives, the agent benefits from learning with certainty and receives a learning premium of $\frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2)$. The agent's expected marginal learning premium given high-powered office incentives is $(1-\frac{1}{2}a_1)\frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2)$ less than that given low-powered office incentives. $(1-\frac{1}{2}a_1)\frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2)$ thus represents the cost of high-powered incentives. As the marginal learning premium becomes greater, the cost becomes larger.

The degree to which the agent values achieving organizational goals affects the principal's trade-offs. When the agent places a low value on achieving organizational goals, the agent is less motivated to exert effort. With low effort, his chance of staying in office to reap learning benefits is low. Thus, he is more likely to hold back effort in experimentation. In other words, the cost of high-powered incentives is larger when the agent is less motivated by organizational goals. In addition, when effort in experimentation is low, the expected payoff in future office is low. The motivation effect is thus small. As a result, the principal refrains from using high-powered incentives when the agent places a low value on achieving organizational.

To examine formally how the agent's organizational-goal motivation affects the principal's choice of office incentives, I derive the difference between the equilibrium effort under two types of incentive structures as a function of the value that the agent places on achieving organizational goals and the effectiveness of the status quo policy.

$$a_1^{h*} - a_1^{l*} = \frac{1}{2}\lambda\left(\frac{(1+\frac{\lambda}{2}\gamma^2)}{1-\frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2)} - (1+(1-\gamma^2)\frac{\lambda}{2})\right)$$

Based on the above expression, I display the overall effect of the agent's value of achieving organizational goals on the relative effectiveness of high-powered office incentives in Figure A.1. As the level of the organizational-goal motivation increases, the relative effectiveness of high-powered office incentives first decreases and then increases. As a result, the principal provides low-powered office incentives when the agent places a low value on achieving organizational goals is low and high-powered office incentives when the agent places a high value on achieving organizational. The principal's decision about the incentive structure is stated in the following proposition and illustrated in Figure A.2.

Proposition 1.

$$\sigma^{s*} = \begin{cases} 1 & \text{, if } \bar{\lambda^s} \leq \lambda \leq 1 \\ 0 & \text{, otherwise.} \end{cases}$$

where $\bar{\lambda^s} = \frac{\sqrt{5-8\gamma^2}}{1-\gamma^2} + \frac{1}{\gamma^2-1}$

The principal chooses high-powered office incentives when the agent's value of achieving organizational goals is higher than a threshold, and low-powered

incentives otherwise. The threshold is decreasing in the effectiveness of the status quo policy. In other words, the principal is more likely to introduce high-powered office incentives as the status quo policy becomes more effective and as the agent becomes more motivated by organizational goals.

1.3.2 Two Agents

In a two-agent setting, policy learning depends on the agents' joint effort. The other agent's effort also contributes to an agent's future office value. If the other agent exerts more effort, information about an experimental policy becomes better and an agent's future office becomes more valuable. Because of the increase in the expected payoff in future office, the motivation of high-powered office incentives is stronger. At the same time, as the other works harder in experimentation, an agent's own effort becomes less crucial for policy learning, and the marginal learning premium of an agent's effort diminishes. If provided with high-powered office incentives, an agent is less concerned about not reaping the informational premium. The cost of high-powered office incentives becomes weaker. Generally speaking, the existence of the other agent strengthens the benefit of high-powered office incentives and reduces its cost. The principal who would have not chosen high-powered office incentives in a one-agent environment now adopts high-powered office incentives in a two-agent case. I formally demonstrates the above ideas in the following.

I consider symmetric strategies of two agents. It is useful to denote with a subscript $-i$ parameters belonging to the agent that is not A_i. I start the analysis with players' period 2 decisions and a discussion of the learning premium. Then I derive agents' strategies under each incentive structure. Finally, I analyze the

principal's choice of incentive structure.

Period 2 Decisions

In the two-agent setting, the beliefs over the experimental policy's type are updated through policy outcomes in both jurisdictions. If $x_{i1} = 1$ or $x_{-i1} = 1$, $\rho_{1j} = 1$. As long as one jurisdiction observes a successful experiment, all players infer that the experimental policy is an effective type. If $x_{i1} = 0$ and $x_{-i1} = 0$, for any player j, the posterior belief that the experimental policy is effective is

$$\rho_{1j} = \frac{\frac{1}{2}(1 - a_{i1})(1 - a_{-i1})}{\frac{1}{2}(1 - a_{i1})(1 - a_{-i1}) + (1 - \frac{1}{2})} \leq \frac{1}{2}.$$

When experimentation in both jurisdictions fails, for each player, the posterior beliefs about the experimental policy are less than or equal to the prior.

Based on information of the experimental policy, the derivation of the agents' effort choices and the principal's policy choice resembles that in the one-agent case. If the status quo policy is implemented, an agent in future office sets an effort level at $\lambda\gamma$, which results in $\gamma^2\lambda$ policy payoff in expectation. If the experimental policy is implemented, an agent in future office exerts $\lambda\rho_{1p}$ level of effort and the expected policy payoff is $\rho_{1p}^2\lambda$. Clearly, the principal adopts the experimental policy if her posterior belief that the experimental policy is effective is greater than the effectiveness of the status quo policy. As long as one district observes a successful experiment, the principal infers that the experimental policy is an effective type. Therefore, the principal adopts the experimental policy in the second period as long as one of the districts succeeds in experimentation, and the status quo policy otherwise.

Remark 4. *Given the outcomes of policy experimentation in period 1, P's period 2 policy*

choice in two-agent setting is as follows.

$$p_2^* = \begin{cases} 1, & \text{if } x_{i1} = 1 \text{ or } x_{-i1} = 1; \\ 0, & \text{otherwise.} \end{cases}$$

The Learning Premium

The agents' effort affects information revelation and thus the learning benefit of policy experimentation. Given the first-period effort level profile $\{a_{i1}, a_{-i1}\}$ and the prior about the experimental policy, the *ex ante* probability of an experiment being successful is $\frac{1}{2}(1-(1-a_{i1})(1-a_{-i1}))$. Following Remark 4, the principal adopts the experimental policy in period 2 with an *ex ante* probability of $\frac{1}{2}(1-(1-a_{i1})(1-a_{-i1}))$ and the status quo policy with an *ex ante* probability of $1-\frac{1}{2}(1-(1-a_{i1})(1-a_{-i1}))$. Her expected second-period policy payoff is

$$E(v(a_{i1}, a_{-i1})) = \lambda\frac{1}{2}(1-(1-a_{i1})(1-a_{-i1}))(1-\gamma^2) + \lambda\gamma^2, \tag{1.7}$$

where $\lambda\frac{1}{2}(1-(1-a_{i1})(1-a_{-i1}))(1-\gamma^2)$ is the principal's learning premium.[10] Each agent's effort in experimentation affects information revelation and thus the quality of policy decision. The effect of an agent's effort a_{i1} on learning premium is diminishing in the other agent's effort a_{-i1}. An agent's marginal contribution to better policy making is diminishing in the other's effort. As long as one experiment succeeds, an effective experimental policy is not rejected by the principal. The more effort by the other agent, the more likely the other agent's experiment is successful, and the less important an agent's own success is to the policy making.

If an agent A_i stays in office in the second period, he also benefits from policy

[10]The derivation resembles the one in footnote 9.

learning. The expected payoff in future office to an agent A_i is

$$E(w(a_{i1}, a_{-i1})) = \frac{\lambda^2}{2}\frac{1}{2}(1 - (1 - a_{i1})(1 - a_{-i1}))(1 - \gamma^2) + \frac{\lambda^2}{2}\gamma^2. \tag{1.8}$$

$\frac{\lambda^2}{2}\frac{1}{2}(1 - (1 - a_{i1})(1 - a_{-i1}))(1 - \gamma^2)$ is A_i's learning premium. As in the one-agent case, better information helps the principal make a better policy decision, which is also in the interest of an agent. Based on better information, an agent can also calibrate effort better in the second period. The other agent's effort into experimentation contributes to policy learning and thus the value of future office; it also reduces the marginal contribution of an agent's effort to the policy learning.

Low-Powered Office Incentives

When provided with low-powered office incentives, A_i stays in office for two periods. The expected payoff in future office $E(w(a_{i1}, a_{-i1}))$ depends on A_i's effort as well as the other agent's effort. Expecting effort a_{-i1} by the other, A_i exerts an effort $a_{i1} \in [0, 1]$ to solve the following maximization problem.

$$\max_{a_{i1}} \lambda\frac{1}{2}a_{i1} - c(a_{i1}) + E(w(a_{i1}, a_{-i1}))$$

The following first-order condition characterizes A_i's best response.

$$\frac{1}{2}\lambda + \frac{\lambda^2}{2}\frac{1}{2}(1 - \gamma^2)(1 - a_{-i1}) = a_{i1} \tag{1.9}$$

A_i's first-period effort increases the value of learning premium. The marginal learning premium, represented by $\frac{\lambda^2}{2}\frac{1}{2}(1 - \gamma^2)(1 - a_{-i1})$ in the first-order condition, is decreasing in the other agent's effort a_{-1i}. The following remark characterizes A's decision in the first period, given low-powered office incentives.

Remark 5. *In the subgame where the re-appointment threshold $\sigma = 0$, effort in experimentation in period 1 in jurisdiction i is*

$$a_{i1}^{l*} = \frac{1}{2}\lambda \frac{1 + \frac{1}{2}\lambda(1-\gamma^2)}{1 + \frac{1}{4}\lambda^2(1-\gamma^2)},$$

where the superscript denotes that the re-appointment rule provides low-powered office incentives.

As in the one-agent setting, the organizational-goal motivation has a positive effect on level of effort in experiments in the two-agent environment, and the effectiveness of the status quo policy has a negative effect.

High-Powered Office Incentives

With high-powered office incentives, the probability of staying in office depends on an agent's effort a_{i1} in the first period. The value of future office in jurisdiction i depends on both A_i's effort a_{i1} and A_{-i}'s effort a_{-i1}. A_i chooses his first-period effort according to the following optimization problem.

$$\max_{a_{i1}} \lambda \frac{1}{2} a_{i1} - c(a_{i1}) + \frac{1}{2} a_{i1} E(w(a_{i1}, a_{-i1}))$$

A_i's best response is characterized by the following first-order condition.

$$\frac{1}{2}\lambda + \frac{1}{2}\frac{\lambda^2}{2}(\frac{1}{2}(1-(1-a_{i1})(1-a_{-i1}))(1-\gamma^2)+\gamma^2) + \frac{1}{2}a_{i1}\frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2)(1-a_{-i1}) = a_{i1} \tag{1.10}$$

When the principal provides high-powered office incentives, good performance is rewarded with future office. Its value is $\frac{\lambda^2}{2}(\frac{1}{2}(1-(1-a_{i1})(1-a_{-i1}))(1-\gamma^2)+\gamma^2)$. A_{-i}'s effort contributes to A_i's future office value and enhances his incentives to work today. With high-powered incentives, A_i is also concerned

about not reaping the learning premium. The marginal value of learning is $\frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2)(1-a_{-i1})$. Because A_i balances the return and cost of his effort at the margin, what matters is the marginal learning premium. When the marginal learning premium is lower, the concern has less influence on an agent's effort decision. The other's effort a_{-i1} diminishes the marginal learning premium and thus attenuates A_i's concern. As a_{-i1} increases, high-powered office incentives become more effective in inducing A_{i1}'s effort. The following remark summarizes the equilibrium strategy in the subgame where the threshold $\sigma = 1$.

Remark 6. *In the subgame where the re-appointment threshold $\sigma = 1$, effort in experimentation in period 1 in jurisdiction i is*

$$a_{i1}^{h*} = \frac{-(1-\frac{3}{8}\lambda^2(1-\gamma^2)) + \sqrt{(1-\frac{3}{8}\lambda^2(1-\gamma^2))^2 + \lambda^2(1-\gamma^2)\frac{1}{2}\lambda(1+\frac{\lambda}{2}\gamma^2)}}{\frac{\lambda^2}{2}(1-\gamma^2)},$$

where the superscript denotes that the re-appointment provides high-powered office incentives.

In the two-agent case, both the organizational-goal motivation and the effectiveness of the status quo policy have positive effects on an agent's effort in experimentation. As demonstrated in the previous section, the same result holds in the one-agent setting.

Principal's Choice of Incentive Structures

Similar to high-powered office incentives in the one-agent case, high-powered office incentives have costs and benefits in motivating the agent in a two-agent case. The office motivation is represented by the term $\frac{1}{2}\frac{\lambda^2}{2}(\frac{1}{2}(1-(1-a_{i1})(1-a_{-i1}))(1-\gamma^2)+\gamma^2)$ in equation(10). Comparing Equation (9) and Equation (10), an agent's marginal learning premium given high-powered office incentives is

less than that given low-powered office incentives. The difference capturing the cost is $(1-\frac{1}{2}a_{i1})\frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2)(1-a_{-i1})$. As the other agent's effort in experimentation increases, an agent's future office value increases, and the office motivation is stronger. Meanwhile, as the other puts more effort, an agent's marginal contribution to policy learning diminishes, and the cost is less.

How does the level of the organizational-goal motivation affect the principal's choice of the incentive structure in the two-agent setting? In addition to an agent's own organizational-goal motivation, the organizational-goal motivation of the other agent also affects the cost and benefit of high-powered office incentives. Homogenous agents share the same level of organizational-goal motivation. When the organizational-goal motivation increases, the other agent tends to put more effort as well. More effort by the other increases an agent's expected payoff in future office and reduces his marginal contribution to policy learning. This strengthens the office motivation but weakens the the cost of high-powered office incentives. Formally, the effect of the organizational-goal motivation on the relative effectiveness of high-powered office incentives is as follows.

$$a_{i1}^{h*}-a_{i1}^{l*}=\frac{-(1-\frac{3}{8}\lambda^2(1-\gamma^2))+\sqrt{(1-\frac{3}{8}\lambda^2(1-\gamma^2))^2+\lambda^2(1-\gamma^2)\frac{1}{2}\lambda(1+\frac{\lambda}{2}\gamma^2)}}{\frac{\lambda^2}{2}(1-\gamma^2)}$$
$$-\frac{1}{2}\lambda(1+(1-\gamma^2)\frac{\lambda}{2}).$$

Figure A.3 shows how the relative effectiveness of high-powered office incentives changes as the level of the organizational-goal motivation changes, given the effectiveness of the status quo policy. Contrasting Figure A.1 and Figure A.3, I have two observations. First, similar patterns are evident in both settings.

The relationship between the relative effectiveness of high-powered office incentives and the level of the organizational-goal motivation is U-shaped. Second, given the same effectiveness of the status quo policy, the turning point at which the organizational-goal motivation starts to reinforce the relative effectiveness of high-powered office incentives is different in two settings. It is at a lower level in the two-agent setting than that in the one-agent setting.

The following proposition characterizes the principal's choice of the re-appointment rule and Figure A.4 illustrates her choice.

Proposition 2.

$$\sigma^* = \begin{cases} 1 & \text{, if } \bar{\lambda} \leq \lambda \leq 1 \\ 0 & \text{, otherwise} \end{cases}$$

where

$$\begin{aligned} \bar{\lambda} = &- \frac{1}{2(1+\gamma^2)} - \frac{1}{2}\left(\frac{-9+2\gamma^2+16\gamma^4-2\gamma^6-7\gamma^8}{-1+3\gamma^4-3\gamma^8+\gamma^{12}}\right)^{\frac{1}{2}} \\ &+ \frac{1}{2}\left(\frac{2}{(1+\gamma^2)^2} + \frac{-4+12\gamma^2}{-1+\gamma^4} + \frac{-4-8\gamma^2+12\gamma^4}{1-\gamma^2-\gamma^4+\gamma^6}\right. \\ &\left. + \frac{-90-142\gamma^2-56\gamma^4}{(-1+\gamma^2)(1++\gamma^2)^3\sqrt{\frac{-9+2\gamma^2+16\gamma^4-2\gamma^6-7\gamma^8}{-1+3\gamma^4-3\gamma^8+\gamma^{12}}}}\right)^{\frac{1}{2}} \end{aligned}$$

Similar to the results in the one-agent setting, the principal chooses high-powered office incentives only when the organizational-goal motivation is above a threshold. Given the same effectiveness of status quo policy, the threshold in the two-agent case is lower than that in a one-agent case.

1.3.3 Comparison of Incentive Structures in One-Agent Setting and Two-Agent Setting

Figure 5 contrasts incentive structures in the one-agent setting and that in the two-agent setting. When a status quo policy is effective, high-powered office incentives are introduced in both settings. When a status quo policy is ineffective and policy motivation is low, low-powered office incentives are adopted in both settings. When a status quo policy is ineffective but policy motivation is high, high-powered office incentives are chosen in the two-agent setting and low-powered office incentives in the one-agent setting. Unlike the one-agent setting, high-powered office incentives also induce more effort by the other agent in the two-agent setting, which in turn increases the expected payoff in an agent's future office but reduces an agent's marginal contribution to policy learning. This increases the office motivation and decreases the cost of high-powered office incentives. Therefore, high-powered office incentives are more effective in the two-agent setting. Broadly speaking, the principal is more likely to introduce high-powered office incentives in the two-agent environment.

1.4 Applications

In this section, I discuss two main contexts in which the model applies. I begin with a discussion of public bureaucracy reform. I then discuss how the implementation of development programs might fit the model.

1.4.1 Public Bureaucracy Reform

The model casts light on issues in the design of incentives in public bureaucracies. By focusing on office as a key incentive and the notion that agents share organizational goals, my approach highlights the incentive issues in public bureaucracies that are different from those in standard private organizations.

The results developed in the model provide some insight into how to offer office incentives when learning is a crucial matter to the organization. Given that agents' intrinsic motivation is a key reason why agents care about achieving organizational goals, this framework implies that office incentives should vary with the degree to which agents are intrinsically motivated. Because of this, the effect of reform of office incentives in public sectors depends on the degree of agents' intrinsic motivation across sectors. In the case of the Chinese bureaucracy, the introduction of high-powered office incentives in environmental agencies and food and drug agencies is an important issue. It is frequently suggested that the policy outcomes is better when the careers of agents in these sectors are tied to the policy outcomes. The model suggests that this type of high-powered incentive is effective provided that these agents care about achieving the organizational goals. However, agents in the Chinese bureaucracy are often rotated across different sectors, and they often do not decide to work in a specific sector. As a result, they might not intrinsically share the goals of a specific organization. The average level of intrinsic motivation in an organization depends on the profile of all agents' career paths. Without taking agents' career paths into consideration, attempts to introduce high-powered incentives might reduce the efficiency of these agencies.

Another aspect of public sector reform concerns competition among providers of public goods. As Kaufman 1976 suggests, one of the threats to agencies' sur-

vival is competition among agencies for scarce resources. The probability of agency termination is higher when competition among agencies for scarce resources is greatest. A similar logic could hold in the relationship between competition among agencies and agencies' funding. By affecting the survival and funding of an organization, competition changes the degree to which agents care about achieving organizational goals. The approach developed here shows how competition complements high-powered office incentives in the case of learning. High-powered office incentives are more effective when the organization faces fiercer competition. Cross-sectionally, this approach predicts that high-powered office incentives are likely to be negatively correlated with the level of learning when the intensity of competition is low and positively correlated with the level of learning when the intensity of competition is high. It therefore seems unsurprising that high-powered office incentives are often used in the public organizations that face fierce competition. Within the Chinese bureaucracy, for example, local governments that face intense competition in attracting capital investment often provide high-powered office incentives for agents working on issues of economic development. Under the current Hukou institution which controls population movement, beneficiaries of many public goods is less mobile. This implies a low level of competition among public goods providers across localities. It might explain why low-powered office incentives exist in agencies such as local environmental agencies.

1.4.2 Developmental Programs, NGOs and Government Agencies

In developing countries, NGOs have been increasingly involved in the provision of relief, welfare, social services and various development projects.[11] In many of these sectors, a growing emphasis on impact evaluation shows a need for innovation and learning. But the outcomes of similar projects implemented by government agencies and that of NGOs are often different.[12]

It is recognized in the literature that the level of agents' intrinsic motivation varies between NGOs and government agencies. This difference might explain the variation in their performance. As argued by Besley and Ghatak 2001, NGOs may find it easier to screen on motivation than the government and they may also foster public service motivation by providing a better match between the ends of the organization and those of its workers. The electoral concerns of a government imply that some public servants have to carry out policies that they do not believe in. Their public service motivation is thus undermined. Another key issues in the performance variations between the government agencies and NGOs is that of accountability structure. Compared with government agencies, the formal accountability of NGOs is weak. In the context of international development projects, because of the cultural distance between NGOs and local beneficiaries, informal accountability measures, such as social sanctions and enforcement, tends to be weak in the case of NGOs.[13]

[11] See Besley and Ghatak 2001 for a detailed discussion.

[12] For example, using data on 20 different types of interventions, Vivalt 2015 shows that government-implemented programs also had smaller effect sizes than academic/NGO-implemented programs.

[13] Social sanctions and enforcement play a decisive role for accountability. Miguel and Gugerty 2005 studies how an inability to impose social sanctions in diverse communities leads to collective

When explaining the performance difference between NGOs and government agencies, the existing literature treats the effect of agents' intrinsic motivation and the effect of the accountability as separate issues. In terms of the model developed here, different accountability structures correspond to different types of office incentives. This framework thus underlines the complementarity between intrinsic motivation and strong accountability in promoting performance of developmental programs.

In addition to these empirical implications, the model can also provide some insights into issues in strengthening accountability in both NGOs and government agencies. In a setting where learning is important for the social service delivery, the model suggests that strong accountability is suitable for organizations with highly-motivated agents. If it is true that agents in NGOs are on average more motivated than government agents, strengthening accountability in NGO would have a stronger positive effect on performance than strengthening accountability in a government agency. In fact, if government agents are not well motivated intrinsically, strengthening accountability might backfire.

1.5 Conclusion

The aim of this paper is to explore a principal's decision about agents' office incentives in a setting in which agents' effort in experimentation is crucial for policy learning. The principal constructs office incentives to induce agents' effort in experimentation. High-powered office incentives link good performance to office-holding and thus motivate agents to exert effort. At the same time, by introducing uncertainty in whether the agent could reap the informational benefit from learn-

action failures in rural western Kenya.

ing, high-powered office incentives also disincentivize effort in experimentation. When agents are highly motivated by organizational goals, the principal is likely to introduce high-powered office incentives. Compared with the one-agent environment, the principal is more likely to provide high-powered office incentives in the two-agent environment.

These ideas are relevant to the discussion of organizations in which agents have a preference for achieving organizational goals. Examples of such organizations include public bureaucracies and NGOs. However, private firms also socialize their employees to share their organizational goals. In future work, it would be valuable to extend this framework to such firms, in order to understand how the interaction between organizational goals and personnel management affects learning and innovation in the private sector.

Chapter 2

Intra-elite Conflict and Information Disclosure

2.1 Introduction

In the late 1950s, Mao the then leadership of the Chinese government adopted the Great Leap Forward policy. This policy caused one of the greatest famines in human history.[1] Yet, when the famine was spreading over the country, the communist party elites received reports that demonstrate how effective the Great Leap Forward Policy is. In other words, there was low level of transparency about policy effectiveness among party elites. As the party leadership, Mao had control over how information about policy is disclosed to the party elites. He achieved this low level of transparency by structuring the bureaucracy that involved with information gathering and reporting. Mao advocated that politics should take command over the statistical report system. Data collected by party cadres assisted by the masses were supposed to be more accurate than the bureaucrats in the statistical system. The result was gross exaggeration of production figures in 1958 and the breakdown of much statistical reporting for several years (Banister

[1]The mortality estimates range from 16.5 million (Coale 1981) to 30 million (Banister 1991) to 45 million (Dikötter 2010).

1991). In addition, Mao waged political campaign to cultivate low-level officials' radical ideology and to shape their career incentives accordingly. Motivated by radical ideology and career incentives, lower-level officials tend to over-report grain production (Bachman 2006; Kung and Chen 2011). Comparing to Mao's low transparency in disclosing information regarding policy effectiveness, Deng who became the leadership of the communist party promoted transparency. In Deng's era, the Standing Committee of the Politburo, the Politburo, and the Central Committee began meeting regularly, following formal rules of consultation, division of labor, and consensual decision making. In these meetings, information regarding policy effectiveness is shared by party elites (Bo 2010).

Information disclosure takes place through various forums in autocracies other than China. Legislative bodies are main forums where information is disclosed to the ruling group (Boix and Svolik 2013; Svolik 2012). These legislative bodies include politburo, parliament, royal council, etc. The amount of information disclosed in the legislative bodies varies across different regimes. The legislative bodies in PRI Mexico was documented to have more information sharing (Magaloni 2006). In the Egyptian case, the legislative body is depicted as mainly for rents distribution (Blaydes 2010).

How to explain the variations in transparency of policy effectiveness among ruling group? When does an autocrat tell truth of ineffectiveness of her policy to the ruling group? To address these questions, I develop a framework of information disclosure, particular information pertaining the effectiveness of policy, focusing on the elite conflict within the authoritarian regime. Different from the existing research on the transparency of autocrat's behavior (Boix and Svolik 2013; Svolik 2012), I consider a problem of transparency of policy effectiveness. Because the effectiveness of her policy directly reflects her competence in policy making,

the autocrat is concerned with disclosing information of policy effectiveness. This approach focuses on elite conflicts which is a common phenomena in autocracies. The dynamics of elite conflicts are used to explained for various political economic outcome in autocracies.[2] Two main types of elite conflicts are considered. One is the conflict between the incumbent autocrat and the ruling group. The incumbent autocrat prefers to stay in power regardless of her own competence while the ruling group prefers an autocrat with high competence.[3] The other is the conflict among the members of ruling group. There often exists competing factions with different political interest them.[4] This paper considers both types of elite conflicts.

In the framework, there is an incumbent autocrat and a ruling group. The ruling group is split into two factions. The autocrat prefers to stay in power. To stay in power, the autocrat needs to win support from her own faction, call it the ruling faction, and prevent overthrow from the opposition faction. The two factions have different ideologies. The ruling faction shares the same ideology with the autocrat while the opposition faction has a different ideology. Both factions prefer an autocrat who is competent in making valence policy. The autocrat's competence determines the effectiveness of the valence policy. More specifically, high competence leads to effective policy and low competence ineffective policy. Consequently, factions form beliefs of autocrat's competence based on their belief of the policy effectiveness. Ex ante, the autocrat's competence is unknown to both the autocrat and the factions. To affect the factions' belief of her competence, the

[2]see De Mesquita 2005; Gandhi 2008; Geddes 1999 among others.

[3] Besley and Kudamatsu 2007 discuss how this conflict affects performance across autocracies.

[4]see Huang 2006; Teiwes and Sun 1999 for discussion on factional competition in Chinese politics.

autocrat designs a disclosure of information of policy effectiveness: a plan of how to report policy effectiveness. The autocrat commits to her plan of information disclosure. Upon observing the report about policy effectiveness, factions update their beliefs of the autocrat's competence. The ruling faction makes a decision whether to keep the autocrat or replace her with a candidate from the ruling faction. Then the opposition has a chance to decide whether to keep ruling faction's choice or replace her with a candidate from its own faction.

We use the framework to explore how aspects of elite conflict affect transparency. An information disclosure that reveals the truth about ineffective policy more often is more transparent. On the one hand, the frequency of favorable messages about policy is lower under a more transparent information disclosure. On the other hand, a more transparent information disclosure produces a stronger belief of the incumbent's competence given a favorable message. Due to their conflicting ideologies, the opposition requires a stronger belief of the incumbent's competence to support her than the ruling faction. Hence, to persuade the opposition, the ruler has to be more transparent about ineffective policy and sends favorable message less frequently. Yet, if the opposition is convinced by a favorable message, the ruler stays in office for certain. Therefore, when deciding whether to persuade the opposition or just the ruling faction, the ruler faces a trade-off between the frequency that a favorable message arrives and the frequency that a favorable message leads to political survival.

The strength of ruling faction and dependence of ruling faction on the incumbent autocrat decrease the autocrat's incentive to persuade the opposition faction and hence the level of transparency. When the ruling faction is strong, the autocrat stays in office with high probability with only the support of the ruling faction. When the ruling faction depends more on the incumbent ruler, the rul-

ing faction requires a weaker belief of the autocrat's competence to support her. A less transparent information disclosure is needed to win the ruling faction's support.

Ideological conflict has a non-monotonic effect on the level of transparency. When there exists little ideological conflict, the opposition requires a bit stronger belief of the autocrat's competence than the ruling faction. The autocrat hence discloses more transparent information to persuade the opposition. As the ideological conflict increases, a stronger belief of her competence is needed to sustain the support of the opposition, a more transparent information disclosure will be necessary. When there exists a great ideological conflict, the belief of her competence required by the opposition is much stronger than that of the ruling faction. Thus the autocrat chooses to be transparent enough that only the ruling faction is persuaded. As the ideological conflict increases, the ruling faction would incur a large ideological lost if the opposition's ideology is imposed. This makes the ruling faction easier to be persuaded. A less transparent information disclosure will be needed. Overall, as ideological conflict increases, transparency increases up to a threshold. Beyond this threshold, increased ideological conflict is associated with reduced transparency.

In addition, this framework has implications on how elite conflicts affect bureaucratic quality. In the framework, the autocrat commits to her plan of information disclosure. To make the commitment credible, the autocrat often delegates the information gathering and reporting to bureaucracies. Once the bureaucracy is structured, bureaucrats make decision about what information to gather and how to report it. Therefore, the autocrat has some commitment power to truthfully communicate the message produced by the bureaucracy to the ruling

group.[5] By structuring the bureaucracy, the autocrat implements a desirable level of transparency. If the bureaucracy has Weberian aspects such as autonomy, professionalism, and etc., transparency is likely to be high. We expect to see a high quality bureaucracy when the elite conflicts lead to a high level of transparency. For example, the transparency in information disclosure among members of ruling group in China has been improved since Mao's death. The bureaucracies involved in information disclosure in post Mao China have more Weberian feature than the bureaucracies in post Mao's China.

In addition to address the key question about transparency among ruling elites, broadly this paper relates to the literature on various types of transparency in authoritarian regime. The focus of the literature has been on mass media (Egorov, Guriev, and Sonin 2009; Gehlbach and Sonin 2014; King, Pan, and Roberts 2013; Lorentzen 2014; Shadmehr and Bernhardt 2015) and government disclosure of information to the mass (Hollyer, Rosendorff, and Vreeland 2015). The theoretical framework also builds on the notion that elites' privileged positions hinge on the stability of their leader's rule (Besley and Kudamatsu 2007; De Mesquita 2005; Miquel 2007). Finally, this paper contributes to the research on bayesian persuasion which studies an agent's design of the informational environment in a setting where the information is ex ante symmetric (Kamenica and Gentzkow 2011). By incorporating multiple receivers among whom there exists conflict, this paper offers a theoretical as well as a substantive contribution.

The rest of the paper is organized as follows. Section 2 lays out the benchmark model where there exits no conflict among the members of ruling group. The

[5]This assumption that bureaucracy isa commitment device is related to the discussion in the literature that institutionalization is an instrument that autocrat uses to commit. Particularly, institutionalized legislative body and party structure are commitment devices for the autocrat to commit to information sharing (Gehlbach and Keefer 2011; Svolik 2012).

benchmark aims to capture how the conflict between the incumbent autocrat and her ruling group leads to the incumbent's choice over transparency. The model where the ruling group splits into two factions is presented in section 3. The effect of more complicated elites conflict on transparency is discussed. The final section concludes.

2.2 The Benchmark

2.2.1 Setup

First, I present a benchmark model where the ruling coalition is coherent. I show how the autocrat's political survival incentives affect her decision over transparency of policy effectiveness. The autocrat's competence determines the effectiveness of the valence policy. Ex ante both the ruling coalition and autocrat herself don't know her competence. The ruling coalition supports the autocrat when its belief about the autocrat's competence is strong enough. The ruling coalition forms belief of autocrat's competence based on the belief of the policy effectiveness. If the autocrat's competence turns out to be low, policy effectiveness will be low. She could lie about ineffective policy and send a favorable message indicating that policy is effective. The more often she lies, the more frequent a favorable message will arrive. However, if she lies more often, a favorable message will be less convincing, i.e. the ruling coalition's belief that the autocrat is competent is weaker upon receiving a favorable message. Consequently, the autocrat lies at a frequency that the ruling coalition is convinced enough to support her upon receiving a favorable message. When the ruling coalition needs a stronger belief of the autocrat's competence to support her, the autocrat's has to be more

transparent about ineffective policy and lie less about it.

Players

There is an incumbent autocrat A and a ruling coalition C. The autocrat's competence, denoted by θ, could take two values: 0 or 1. It is unknown to the ruling coalition and the incumbent autocrat herself. Let μ^0 be the common prior probability that the incumbent autocrat's competence takes a value of 1. The incumbent autocrat cares only about her own political survival. She makes payoffs of 1 if she stays in office and 0 otherwise. The ruling coalition cares about an autocrat's competence. It is more satisfied when the competence is higher. Let μ be the belief that an autocrat's competence is 1. The ruling coalition's expected payoff is μ if it believes that with probability μ the autocrat's competence is high.

Selection of the Leadership

The ruling coalition decides whether to retain the incumbent or replace her with a candidate. Denote its decision by $\sigma_C \in \{0, 1\}$. All players share the common belief that with probability p that the competence of the candidate is 1. We consider the case where $\mu^0 < p$.[6]

Information Disclosure

The autocrat's competence determines the effectiveness of the valence policy: if her competence is low, the policy is ineffective; if her competence is high, the policy is effective. With the abuse of notation, let the effectiveness of the valence policy be $\theta \in \{0, 1\}$. The ruling coalition forms belief of autocrat's competence based on its belief of the policy effectiveness. To influence the ruling coalition's decision, the autocrat chooses ex ante how information of the policy effectiveness

[6] This assumption is to ensure that it is optimal for the autocrat to disclose some information. If $\mu^0 \geq p.$, the ruler doesn't disclose any information, as the ruling coalition supports her in the absence of additional information.

will be disclosed to the elite ex post. Formally, she can choose any conditional distribution of messages given information. In other words, the autocrat chooses a format of information disclosure π which consists of a finite message space S and a family of distributions $\{\pi(\cdot|\theta)\}_{\theta\in\Theta}$ over S. Later, we will discuss how each information disclosure means for transparency. The autocrat commits to this format of information disclosure by structuring the bureaucracy. Once the bureaucracy is structured, it is costly to implement new format of information disclosure by introducing a new bureaucracy. This gives commitment power to the autocrat.

Sequence:

The timing of the game is as follows.

1. The incumbent autocrat A chooses a information disclosure π.
2. Nature chooses the value of θ.
3. The signal is realized. All players receive the message.
4. The ruling coalition C makes a decision σ_C.

Solution Concept

This game has a component of imperfect information, so I derive perfect Bayesian equilibria in pure strategies. Let H be the set of histories before the ruling coalition C's choice. The equilibrium consists of strategies: $\{\pi(\cdot|\theta)\}_{\theta\in\Theta}$, σ_C, and beliefs about θ for each history.

2.2.2 Results

The Ruling Coalition's Decision

The ruling coalition's decision to support the autocrat depends on its belief of the incumbent autocrat's competence. Given the realization of the signal, the ruling coalition forms a posterior belief μ. The expected payoff from retaining the incumbent is μ. Because the candidate is expected be of high competence with probability p, the expected payoff from replacing the incumbent with a candidate is p. Therefore, the ruling coalition keeps the incumbent if the posterior $\mu \geq p$. The ruling coalition's decision is summarized in the following lemma.

Lemma 1. *The ruling coalition's decision over whether to support the incumber leader is as follows.*

$$\sigma_C(\mu) = \begin{cases} 0 & \text{if } \mu < p \\ 1 & \text{if } \mu \geq p \end{cases} \tag{2.1}$$

The ruling coalition supports the incumbent when its belief that the incumbent is competent is above the expected payoff from choosing the candidate. The higher expected payoff from supporting the candidate, the stronger belief about the incumbent's competence is needed to sustain the ruling coalition's support.

The Autocrat's Choice of Information Disclosure

When designing the information disclosure, the incumbent autocrat prefers the message which leads to retainment by the ruling coalition arrives as often as possible. For any information disclosure π, given message $s \in S$, the ruling coalition holds a posterior belief μ about the policy effectiveness. Because the competence of the incumbent determines the policy effective, μ is also the posterior belief about the incumbent's competence. It retains the incumbent if the posterior belief of the incumbent's competence is above its threshold belief, i.e. $\mu \geq p$, and replaces her otherwise. We call the message that leads to the retainment favorable

message, denoted by s^+, and the message that leads the replacement unfavorable message, denoted by s^-. If a favorable message arrives, the ruling coalition holds the belief that the incumbent's competence is high with probability $\mu^+ \geq p$. If an unfavorable message arrives, the ruling coalition believes that the incumbent's competence is high with probability 0.[7] Let the frequency of favorable message be α. Because the ruling coalition is Bayesian, the more frequent favorable news arrive (i.e.α is higher), the less convincing favorable news are (μ^+ is lower). Formally, bayesian rationality requires that the expectation of the posteriors must equal to the prior:

$$(1-\alpha) \times 0 + \alpha \times \mu^+ = \mu^0.$$

To maximize the frequency of favorable message which lead to retainment, the incumbent disclosures information such that the ruling coalition holds the belief of the incumbent's competence $\mu^+ = p$ upon receiving favorable news.

We construct the optimal information disclosure as follows. The incumbent will send a favorable message s^+ if the competence is high, $\theta = 1$. If the competence is low, $\theta = 0$, the incumbent sends favorable message s^+ with a probability denoted by π_0^+, and unfavorable news with probability π_0^-. In what follows, we refer the probability that low competence is revealed as unfavorable message as the level of transparency. Upon receiving the favorable message, elite posterior belief is

$$\frac{\mu^0}{\mu^0 + (1-\mu^0)\pi_0^+},$$

The incumbent sets the value of π_0^+ such that the above posterior equals to the elite's threshold p. It implies that $\pi_0^+ = \frac{\mu^0(1-p)}{(1-\mu^0)p}$. Therefore, by adopting the fol-

[7]Otherwise, after s^- is realized, the incumbent could construct a further information disclosure where some realization will lead to retainment and thus benefits from this further information disclosure.

lowing information disclosure, the incumbent could achieve her goal of maximizing the frequency of the message that leads to the ruling coalition's retainment. If the competence is high, $\theta = 1$, the incumbent sends favorable message s^+; if the competence is low, $\theta = 0$, the incumbent sends favorable message s^+ with probability $\frac{\mu^0(1-p)}{(1-\mu^0)p}$, and unfavorable message s^- with probability $1 - \frac{\mu^0(1-p)}{(1-\mu^0)p}$. The following proposition summarizes the optimal information disclosure. The proof is in the appendix.

Proposition 1. *The incumbent autocrat A constructs the optimal information disclosure π^*. It includes two possible messages s^- and s^+ where given s^- the posterior $\mu = 0$ and given s^+ the posterior $\mu = p$. Let π_θ^- be the probability that given the competence θ the message is s^- and π_θ^+ be the probability that given the competence θ the message is s^+. We have*

$$\pi_\theta^+ = \begin{cases} 1 & \text{if } \theta = 1 \\ \frac{\mu^0(1-p)}{(1-\mu^0)p} & \text{if } \theta = 0 \end{cases} \tag{2.2}$$

and $\pi_\theta^- = 1 - \pi_\theta^+$, where $\pi_\theta^+ = \Pr[s^+|\theta]$ and $\pi_\theta^- = \Pr[s^-|\theta]$.

Transparency

The level of transparency associated with the equilibrium information disclosure is characterized as follows.

Proposition 2. *Let $\Pr[s^-|\theta^-]$ be the the level of transparency associated with the equilibrium information disclosure. We have*

$$\Pr[s^-|\theta^-] = 1 - \frac{\mu^0(1-p)}{(1-\mu^0)p} \tag{2.3}$$

The transparency level is increasing in p. That is, the incumbent autocrat has to be more transparent about her incompetence if the ruling coalition requires a stronger belief about the incumbent's competence to support her. The transparency is decreasing in μ^0. The weaker the prior belief about the incumbent's competence, the more transparent she needs to be about her incompetence.

Bureaucratic Quality

In this model, the incumbent commits to her plan of information disclosure.[8] That is, the incumbent has to commit that once she learns that the policy is ineffective which is a direct evidence that she is incompetent, she will still send unfavorable message with the designed probability.

To make the commitment credible, the incumbent often delegates information gathering and reporting to bureaucracies. By structuring bureaucracy, the incumbent leader could attain a desirable level of transparency. Weberian bureaucracy with features such as autonomy, professionalism are more likely to result in transparency. By choosing a more Weberian like bureaucracy, the incumbent commits to a high level of transparency in revealing information of ineffective policy, which directly reflects the incumbent's incompetence. For example, to commit to the equilibrium transparency level $1 - \frac{\mu^0(1-p)}{(1-\mu^0)p}$, the incumbent could staff the bureaucracy such that there is a team of $1 - \frac{\mu^0(1-p)}{(1-\mu^0)p}$ honest bureaucrat and $\frac{\mu^0(1-p)}{(1-\mu^0)p}$ corrupted bureaucrat. Both honest and corrupted bureaucrats generate a favorable message when the competence is high. When the competence is low, an honest bureaucrat generates a unfavorable message while a corrupted bureaucrat generates a favorable message. The message generated by the bureaucracy aggregates individual bureaucrats' messages. The bureaucratic quality

[8]The incumbent maximizes her political survival by committing to the optimal information disclosure discussed above.

could be measured by the proportion of honest bureaucrat in the team, denoted by q. Therefore, to commit to an equilibrium transparency level, the incumbent leader chooses a bureaucratic competence q. We have the following proposition regarding bureaucratic quality.

Proposition 3. *In the equilibrium, the ruler L chooses the bureaucratic quality*

$$q^* = 1 - \frac{\mu^0(1-p)}{(1-\mu^0)p}$$

Because a level of bureaucratic quality implements a level of transparency, the relationship between the ruling coalition's threshold belief to support and the bureaucratic quality is the same as the relationship between the ruling coalition's threshold belief to support and the transparency level.

2.3 Model with Divided Ruling Coalition

Now we consider that the ruling coalition are split into two factions, the ruling faction who shares the incumbent autocrat's ideology, and the opposition faction with a differing ideology. With only the ruling faction's support, the incumbent stays in office probabilistically. With the opposition's support, the incumbent stays in office for sure. In the equilibrium, the incumbent chooses between two formats of information disclosure. One information disclosure persuades the ruling faction: upon receiving a favorable message, only the ruling faction supports the ruler. The other information disclosure persuades both the ruling and opposition factions. As demonstrated in the baseline model, if the members of ruling coalition need stronger belief about the incumbent's competence to support the

incumbent, the incumbent has to be more transparent of policy effectiveness. The opposition requires a stronger belief to support the incumbent. To persuade the opposition, the incumbent has to be more transparent of policy effectiveness and consequently send a favorable message that leads to the retainment by the opposition less frequently. However, once the opposition is persuaded, the incumbent stays in office for certain. Therefore, when deciding whether to persuade the opposition or the ruling faction alone, the incumbent faces a trade-off between the frequency that a favorable message arrives and the frequency that a favorable message leads to political survival. We show how aspects of elite division affect this trade-off and hence the incumbent's decision whether to be more transparent to persuade the opposition.

2.3.1 Setup

Players

Consider now that the members of ruling coalition split into two factions: faction R is the ruling faction and faction O is the opposition faction. In addition to valence policy, there is policy over which factions have conflicting interest. Let such policy choice be $x \in \mathbb{R}$. Each faction has an ideal policy z_i where $i \in \{R, O\}$. Faction i's preference over policies is characterized by a quadratic utility function $u_i(x) = -(x - z_i)^2$. Let d be the difference between z_R and z_O. d thus measures the interest conflict among two factions. We refer it as ideological conflict.

An autocrat chooses the policy and she is assumed to choose the ideal policy of her own faction. The value of the autocrat's competence is unknown to the ruling coalition and the incumbent autocrat herself. The competence could take two values, 0 or 1. Factions share the same belief about the competence. Let μ be

the belief that competence is 1. The expected payoff for group i from an autocrat whom is believed to be high competence with probability μ is

$$E(u_i(x)) = -(x - z_i)^2 + \mu$$

The incumbent autocrat A, is a member of ruling faction R. She always chooses group R's ideal policy z_R. The value of her competence, denoted by $\theta \in \{0, 1\}$, is unknown to the both factions as well as to the herself. All players share a common prior belief about the incumbent's valence. Let μ^0 be the common prior probability that A's competence takes a value of 1.[9] The incumbent cares only about her own political survival. She makes payoffs of 1 if she stays in office and 0 otherwise.

Selection of the Leadership under Divided Ruling Coalition

When the ruling coalition splits into two factions, the incumbent's political survival depends on the choices of both factions. All players share the common belief that with probability $\frac{1}{2}$ that the competence of the ruling faction's candidate is 1. The selection of the leadership first starts with the ruling faction R's decision whether to retain the incumbent or replace her with a candidate from its own faction. Denote R's decision by $\sigma_R \in \{0, 1\}$. After the succession process within the ruling faction, the opposition has a chance to vie for power. If the opposition seizes power, it decides whether to replace the politician survived from the ruling faction's succession process with its own candidate. All players share the common belief that with probability $\frac{1}{2}$ that the competence of the opposition faction's candidate is 1. Denote O's decision by $\sigma_O \in \{0, 1\}$. Once the opposition makes

[9]We impose an assumption on the prior μ^0 to ensure that given the prior, the ruling faction doesn't support the incumbent. We assume that the prior belief $\mu^0 < -ed^2 + \frac{1}{2}$. We will be clear about the definition of e later.

the decision, the selection process ends. If the opposition doesn't seize power, the politician who survives the succession process within the ruling faction becomes the new autocrat.

The strength of ruling faction and the ruling faction's dependence on the incumbent affect the selection of leadership. More specifically, if the ruling faction retains the incumbent, the opposition seizes power with probability $1-\rho$. ρ thus measures the ruling faction's strength. In the case where the ruling faction's political entrenchment depends on the incumbent, the replacement of the incumbent erodes the ruling faction's political entrenchment and increases the chance that the opposition can seize power. If the ruling faction replaces the incumbent, the probability that the opposition seizes power is $1-(1-e)\rho$. e thus measures the degree to which the ruling faction's political entrenchment depends on the incumbent.

Information Disclosure

As in the baseline model, to influence factions' decisions, the incumbent autocrat chooses ex ante how information will be disclosed to the factions ex post.

Sequence:

The timing of the game is as follows.

1. A chooses a information disclosure π.
2. Nature chooses the value of θ.
3. The signal is realized. All players receive the message.
4. R makes a decision σ_R.
5. If $\sigma_R = 1$, with probability $1-\rho$, O makes a decision σ_O.

6. If $\sigma_R = 0$, with probability $1 - (1 - e)\rho$, O makes a decision σ_O.

Solution Concept

This game has a component of imperfect information, so I derive perfect Bayesian equilibria in pure strategies. Let H be the set of histories before the choices of R and O. The equilibrium consists of strategies: $\{\pi(\cdot|\theta)\}_{\theta\in\Theta}$, σ_R, σ_O and beliefs about θ. For each history, players also have beliefs about θ. All players share the same prior belief, denoted by μ^0. Let μ be the posterior belief after the realization of the message.

2.3.2 Results

The Opposition Faction's Decision

When the opposition seizes power, the opposition faction makes a decision whether to replace the ruling faction's politician who survives its succession process. In the case where a new politician is selected by the ruling faction, the opposition faction replaces her with a politician from its own group. This is because a new politician from the ruling faction and a politician from the opposition faction share the same expected competence while the politician from the opposition faction represents the ideology of the opposition faction. In the case where the incumbent autocrat survived the succession process, the opposition faction faces a trade-off between expected competence and ideology alignment. After receiving the message, the opposition forms a posterior belief about the incumbent's competence, μ. The expected competence of the incumbent autocrat is thus μ, which is $\mu - 1/2$ greater than the expected competence of politician from the its own faction. The difference between the incumbent's ideology and the opposition faction's ideology is d. Based on the trade-off, the opposition retains the

incumbent if the posterior belief about her competence, μ, is above a threshold $\mu_O \equiv d^2 + \frac{1}{2}$. We summarize opposition faction's decision as follows.

Lemma 2. *The opposition faction's decision over whether to support the incumber autocrat is as follows.*

$$\sigma_O(\mu) = \begin{cases} 0 & \text{if } \sigma_R = 0 \text{ or } \sigma_R = 1 \text{ and } \mu^1 < \mu_O \\ 1 & \text{if } \sigma_R = 1 \text{ and } \mu \geq \mu_O \end{cases} \tag{2.4}$$

where $\mu_O \equiv d^2 + \frac{1}{2}$.

The opposition faction always ousts a new politician survived from the succession process within the ruling faction. It retains the incumbent if its belief that incumbent is competent is high enough to compensate for the difference between the incumbent's ideology and its own ideology.

The Ruling Faction's Decision

When deciding whether to keep the incumbent, the ruling faction faces different tradeoff when factions' belief of the incumbent's competence is in different range. The belief affects the opposition's decision and in turn affects the tradeoff faced by the ruling faction. If the belief is strong enough to compensate for the ideological conflict, the opposition will keep the incumbent if it seizes the power. Because the ruling faction shares the ideology with the incumbent, it requires a weaker belief to support the incumbent. In the case where the belief of incumbent's competence is above the opposition's threshold, the ruling faction will support the incumbent. If the belief of incumbent's competence is below the opposition's threshold, the opposition will replace the incumbent with its own candidate if it seizes the power. The opposition candidate will impose the opposition's ideology. In this case, the ruling faction faces a tradeoff. On the one

hand, replacement of a low competence incumbent increases the payoff in the valence policy dimension. On the other hand, such replacement of an incumbent increases the chance that the opposition's candidate takes over and places its own candidate who imposes the opposition's ideology. To avoid the situation that the other faction's ideology is implemented, the ruling faction is willing to bear a low competence incumbent.

If $\mu \geq \mu_O$, the opposition keeps the incumbent if the incumbent survives the ruling faction's succession process. In this case, the ruling faction always supports the incumbent. That is, the ruling faction never finds it optimal to replace the incumbent if the belief of her being competent is greater than the opposition' threshold value. Because ruling faction shares the incumbent's ideology while the opposition has a divergent ideology, the strength of the belief of the incumbent's competence that the ruling faction requires is lower than that required by the opposition faction. Formally, the ruling faction receives an expected payoff of μ from retaining the incumbent ruler where $\mu \geq \mu_O > \frac{1}{2}$ and an expected payoff of $\frac{1}{2} - (1 - (\rho - e))d^2$ from ousting the incumbent ruler. Notice that replacement of incumbent reduce the expected payoff from μ to $\frac{1}{2}$ in the valence policy dimension, and the expected payoff from 0 to $-(1 - (\rho - e))d^2$ in ideology dimension. The payoff from keeping the incumbent is greater than the payoff from ousting the incumbent, thus the ruling faction supports the incumbent.

If $\mu < \mu_O$, the opposition will place their own candidate when the opposition seizes power. In this case there exists a tradeoff the ruling faction faces in replacing the incumbent. The ruling faction now expects that given the chance the opposition faction will replace any politician who has survived the succession process. The ruling faction makes an expected payoff of $E(u_R^0) \equiv \frac{1}{2} + (1 - (\rho - e))(-d^2)$ from replacing the incumbent with a new politician from its own group, where

$\frac{1}{2}$ is the expected payoff in the valence policy dimension and $(1-(\rho-e))(-d^2)$ is the expected payoff in the ideology dimension. It makes an expected payoff of $E(u_R^1) \equiv \rho\mu + (1-\rho)\frac{1}{2} + (1-\rho)(-d^2)$ from keeping the incumbent leader, where $\rho\mu + (1-\rho)\frac{1}{2}$ is the expected payoff in the valence policy dimension and $(1-\rho)(-d^2)$ is the expected payoff in the ideology dimension. The difference between the two expected payoffs is

$$E(u_R^0) - E(u_R^1) = \rho(\frac{1}{2} - \mu) + e(-d^2)$$

The first term $\rho(\frac{1}{2} - \mu)$ captures the possible benefit in the valence policy dimension. The second term $e(-d^2)$ captures the cost of replacing the incumbent leader in the ideology dimension. A replacement of the incumbent makes ruling faction weaker. The opposition faction thus has a better chance to place its politician as the leader who implements its ideology. This increase in the risk of being under the rule of the opposition which implements its own ideology is the cost of the replacement. When the cost of the replacement exceeds the benefit, the ruling faction retains the incumbent. This happens when the belief of incumbent's competence is above a threshold $\mu_R = -ed^2 + \frac{1}{2}$. Notice that $\mu_R < \mu_O$, thus the ruling faction requires a weaker belief of the incumbent's competence to support her than the opposition faction. We summarize the ruling faction's strategy as follows.

Lemma 3. *The ruling faction's choice of leadership is as follows.*

$$\sigma_R(\mu) = \begin{cases} 1 & \text{if } \mu \geq \mu_R \\ 0 & \text{otherwise} \end{cases} \tag{2.5}$$

where $\mu_R = -ed^2 + \frac{1}{2}$.

The ruling faction supports the incumbent if the belief of her competence is a above threshold. The ruling faction requires a weaker belief of the incumbent's competence as it becomes more dependent on the ruler and as the ideological conflict between two factions increases. The greater dependence on the ruler, a larger increase in the risk of being under the opposition's rule caused by the replacement. The cost of replacement is higher and thus a weaker belief of the incumbent's competence is needed to sustain the ruling faction's support. The greater ideological distance, the more fearful the ruling faction would be of the situation that the other faction's ideal policy is implemented, and the weaker belief of the incumbent's competence is needed to sustain the ruling faction's support.

The Autocrat's Choice of Information Disclosure

The incumbent autocrat can always construct an information disclosure π with three messages: one leads to replacement by the both factions, call it unfavorable message denoted by s^-; one to retain by the ruling faction but the replacement by the opposition faction if it seizes power, call it favorable message denoted by s^+; and other to retain by both the ruling faction and opposition faction if it seizes power, call it very favorable message denoted by s^{++}. After observing s^-, the factions' perception of the ruler's competence must be 0; after observing s^+, the faction's posterior belief $\mu^+ = \mu_R$; and after observing s^{++}, after observing s^{++}, the faction's posterior belief $\mu^{++} = \mu_O$. Let the frequency of favorable message be α_R and the frequency of very favorable message be α_O. The incumbent chooses the frequency of favorable message and frequency of very favorable message to maximize her chance of political survival. Favorable message lead to the support of the ruling faction and hence political survival with probability ρ. Very

favorable message lead to the support of both faction and thus political survival with certainty. Because the factions are Bayesian, it constraints how much lie the incumbent could tell. Formally, the factions update belief about the incumbent's competence following bayesian rationality which requires that the expectation of the posteriors must equal to the prior. The incumbent's maximization problem is thus as follows.

$$\max_{\alpha_R,\alpha_O} V(\pi) = \alpha_R\rho + \alpha_O.$$

$$s.t. \alpha_R \times \mu_R + \alpha_O \times \mu_O = \mu^0.$$

The incumbent faces trade-off when choosing the frequency of sending favorable message and very favorable message. If the ruler sends very favorable message more often (an increases in α_O), she has to send favorable news less often (a decrease in α_R). Moreover, because very favorable message is more convincing than a favorable message, if the ruler sends one additional very favorable message, she has to decrease the favorable message by $\frac{\mu_O}{\mu_R} > 1$. When the very favorable message arrives, the ruler stays in office for certain. However, very favorable message has to be more convincing, one degree increase in the frequency of very favorable message is at the cost of more than one degree decrease in the frequency of favorable message. We call both favorable message and very favorable message favorable message. The ruler thus faces trade-off between the frequency of favorable message and the frequency of political survival upon the arrival of favorable message.

When the political survival return of sending very favorable news is lower or equal to it's cost being less frequent, i.e. $\frac{1}{\rho} \leq \frac{\mu_O}{\mu_R}$, the ruler chooses to send zero very favorable message. She sends favorable message which leads to the retainment only by the ruling faction and least favorable message which lead to

the replacement. The favorable message will lead to retainment only by the ruling faction if the ruler adopts the following information disclosure. That is, if the competence is high, the incumbent sends a favorable message; if the competence is low, the incumbent sends a favorable message with probability $\frac{\mu^0}{1-\mu^0}\frac{1-\mu_R}{\mu_R}$. This information disclosure aims to only persuade the ruling faction: upon receiving very favorable message, only the ruling faction supports the incumbent. When the political survival return of sending very favorable message is higher than it's cost being less frequent, i.e. $\frac{1}{\rho} < \frac{\mu_O}{\mu_R}$, the incumbent sends zero favorable message. She sends very favorable message which leads to the retainment by both factions and least favorable message which lead to the replacement. The favorable message will lead to retainment by both factions if the incumbent adopts the following information disclosure. That is, if the competence is high, the incumbent sends a very favorable message; if the competence is low, the incumbent sends very favorable message with probability $\frac{\mu^0}{1-\mu^0}\frac{1-\mu_O}{\mu_O}$. This information disclosure aims to persuade the opposition faction as well: upon receiving very favorable message, opposition also supports the incumbent. The following proposition summarizes the optimal information disclosure. I show the proof in the appendix.

Proposition 4. *If $\frac{1}{\rho} \leq \frac{\mu_O}{\mu_R}$, the optimal information disclosure, denoted by π_1^+, has support on $\{s^-, s^+\}$. If the signal realization is s^-, the ruling faction replaces the incumbent, $\sigma_R = 0$, and the opposition faction replaces the incumbent given the chance, $\sigma_O = 0$. If the signal realization is s^+, the ruling faction retains the incumbent, $\sigma_R = 1$, while the opposition faction replaces the incumbent given the chance, $\sigma_O = 0$. Let $\pi_\theta^+ = \Pr[s^+|\theta]$.*

We have

$$\pi_\theta^+ = \begin{cases} 1 & \text{if } \theta = 1 \\ \frac{\mu^0}{1-\mu^0}\frac{1-\mu_R}{\mu_R} & \text{if } \theta = 0 \end{cases} \tag{2.6}$$

If $\frac{1}{\rho} > \frac{\mu_O}{\mu_R}$, *the optimal information disclosure, denoted by* π_1^{++}, *has support on* $\{s^-, s^{++}\}$. *If the signal realization is* s^-, *the ruling faction replaces the incumbent,* $\sigma_R = 0$, *and the opposition faction replaces the incumbent given the chance,* $\sigma_O = 0$. *If the signal realization is* s^{++}, *the ruling faction retains the incumbent,* $\sigma_R = 1$, *and the opposition faction retains the incumbent given the chance,* $\sigma_O = 1$. *Let* $\pi_\theta^{++} = \Pr[s^{++}|\theta]$. *We have*

$$\pi_\theta^{++} = \begin{cases} 1 & \text{if } \theta = 1 \\ \frac{\mu^0}{1-\mu^0}\frac{1-\mu_O}{\mu_O} & \text{if } \theta = 0 \end{cases} \tag{2.7}$$

where $\mu_R \equiv -ed^2 + \frac{1}{2}$ *and* $\mu_O \equiv d^2 + \frac{1}{2}$.

When the ruling faction is politically strong (ρ is large), when the ruling faction depends on the incumbent ruler to a large extend (e is large), and when the ideological conflict between the two factions is large (d is large), the benefit of sending more frequent favorable message dominates the cost of lower frequency of political survival upon the arrival of favorable message. When the ruling faction is politically strong, the incumbent stays in office with a high probability with only ruling faction's support. Therefore, the frequency of her political survival if favorable message persuades only the ruling faction is only a bit lower than the frequency of political survival if favorable message persuades both factions. When the ruling faction depends on the incumbent to a large extend, the ruling faction requires a weak belief to support the incumbent. The incumbent

thus could send favorable message which persuades only the ruling faction in a very high frequency. When there exists large ideological conflict among the two factions, the ruling faction requires a weak belief to support the incumbent while the opposition faction requires a stronger belief. The distance in the strength of the beliefs that required by two factions is large. Therefore, the incumbent could send favorable message that persuades only the ruling faction much more frequently than the favorable message that persuades both factions. As a result, the incumbent constructs information disclosure to persuade only the ruling faction under the above conditions.

Transparency

We say that the transparency level is higher if the likelihood of low competence reported as unfavorable news is higher. We summarize the level of transparency given parameters that characterize the intra-elite division in the following proposition.

Proposition 5. *The transparency of information disclosure, defined by* $\Pr[s^-|\theta^-]$*, is as follows.*

$$\Pr[s^-|\theta^-] = \begin{cases} 1 - \frac{\mu^0}{1-\mu^0}\frac{1-\mu_R}{\mu_R} & \text{if } \rho \leq \frac{\mu_R}{\mu_O} \\ 1 - \frac{\mu^0}{1-\mu^0}\frac{1-\mu_R}{\mu_R} & \text{otherwise,} \end{cases} \tag{2.8}$$

where $\mu_R \equiv -ed^2 + \frac{1}{2}$ *and* $\mu_O \equiv d^2 + \frac{1}{2}$.

Figure B.1 shows how aspects of intra-elite division affect the transparency level.

In panel A, I show how the ruling faction's political strength ρ affects transparency. When the ruling faction is politically weak, the incumbent autocrat would stay in office with low probability if she only persuades the ruling faction.

As a result, she adopts a more transparent information disclosure to persuade the opposition faction. When the ruling faction is politically strong, she adopts a less transparent information disclosure to persuade only the ruling faction. Panel B shows how the ruling faction's dependence on the ruler e affects transparency. When the ruling faction's dependence on incumbent is small, the ruling faction requires a strong belief about the incumbent's competence to support her. Thus, the ruler is better off adopting a more transparent information disclosure that persuade opposition faction. When the ruling faction's dependence on incumbent is large, the ruling faction requires a weak belief of the incumbent's competence. As a result, the incumbent adopts a less transparent information disclosure to only persuade the ruling faction. As the ruling faction's dependence on the incumbent increases, the information disclosure that persuades only the ruling faction could be less transparent. Panel C demonstrates the effect of ideological conflict d on transparency. When the ideological conflict is below a threshold, the opposition requires a bit stronger belief than the ruling faction to support the incumbent. The incumbent thus adopts an information disclosure that also persuades the opposition faction. As the ideological conflict increases, the opposition needs a much stronger belief than the ruling faction to support the ruler. Consequently, when the ideological conflict is above a threshold, the incumbent finds it no longer optimal to persuade the opposition and thus adopts an information disclosure that only persuades the ruling faction. As the ideological conflict increases, the incumbent structures a less transparent information disclosure to persuade a ruling faction who supports the incumbent based on a weaker belief.

Bureaucratic Quality

As discussed in the baseline model with coherent group, one way to commit to a form of information disclosure is to delegate the information disclosure to

the bureaucracy. To commit to a more transparent information disclosure, the ruler delegates the information disclosure to a bureaucracy with higher quality. We summarize the bureaucratic quality in the following proposition.

Proposition 6. *In the equilibrium, the bureaucratic quality*

$$q^* = \begin{cases} 1 - \frac{\mu^0}{1-\mu^0}\frac{1-\mu_O}{\mu_O} & \text{if } \rho \leq \frac{\mu_R}{\mu_O} \\ 1 - \frac{\mu^0}{1-\mu^0}\frac{1-\mu_R}{\mu_R} & \text{otherwise,} \end{cases} \tag{2.9}$$

where $\mu_R \equiv -ed^2 + \frac{1}{2}$ *and* $\mu_O \equiv d^2 + \frac{1}{2}$.

Figure B.2 shows how aspects of the intra-elite conflict affect the bureaucratic quality. Because a bureaucracy of a certain level of quality implements an information disclosure of certain transparency level, the pattern between the aspects of elite division and the bureaucratic quality is the same as the pattern between the aspects of intra-elite conflict and transparency.

2.4 Conclusion

In this paper, I study the disclosure of information of policy effectiveness in autocracies. I develop a framework that focuses on the intra-elite conflict and the autocrat's political survival incentives. The model shows that among feasible information disclosures, the autocrat's choice boils down to two formats: one aims to persuade the ruling faction to support her and the other aims to also persuade the opposition faction. If the autocrat adopts an information disclosure that aims to persuade the ruling faction, she could send favorable message which leads to ruling faction's support more frequently; however the success in persuading the ruling faction does not necessarily lead to political survival. The autocrat faces a

trade-off between frequency of favorable message and the frequency of political survival upon a favorable message.

The framework demonstrates how the strength of the ruling faction, the ruling faction's dependence on the ruler, and policy disagreement between the ruling faction and the opposition faction affect the autocrat's design of the information disclosure among members of ruling coalition and consequently level of transparency. In addition, the frameworks has implication on bureaucratic quality in autocracies where the autocrat structures bureaucracies that gather and report information.

Chapter 3

Political Polarization and Policy Expertise

3.1 Introduction

Political polarization, both at the elite and the mass level, is an increasingly salient problem.[1] In particular, most of the research in political science has been focused on the consequences of growing party polarization at elite level for policy making.[2] However, our understanding of how political polarization at the mass level affects politicians' policy decisions is rather limited. The premise behind delegation in democracy is that politicians are usually expected to have expertise in policy making. This expertise is particularly important for all voters in common value issues where they share the same preference.

In this paper, I examine the relationship between political polarization at the mass level and politicians' decisions regarding common value issue. The existing theory of policymaking in common value issue studies an environment with homogenoues voters sharing the same ideology (Canes-Wrone, Herron, and Shotts

[1] see Layman, Carsey, and Horowitz 2006 and Fiorina and Abrams 2008 for the review of the literature on polarization.

[2] see Lee 2015 for the review of the literature on how party polarization affects governace.

2001; Majumdar and Mukand 2004; Maskin and Tirole 2004). It is thus unable to explain politicians' decisions in common value issue where the electorate is divided by voters' opposing ideologies.[3]

The model is motivated by a problem voters face when choosing politicians. First, compared to voters' information about politicians' ideological positions, voters might have poorer information about politicians' competence. Party affiliations provide information on politicians' ideological positions (Downs 1957; Cox and McCubbins 1993; Snyder Jr and Ting 2002). Information about politician's competence is often obscure (Canes-Wrone, Herron, and Shotts 2001). Second, to assess politicians' competence based on their policy choices, voters face a challenge. Voters often don't have policy expertise to know what is the best policy for them. As a result, given a policy choice by a politician, voters' assessment of the politician's competence is complicated by their beliefs of what is the best policy for them.

Given the above, I analyze an accountability model where candidates' ideological positions are known and their competence in policy making in common value issues is private information, and voters are ex ante uncertain about which policy choice in common value issue is best for them. In this model, voters are divided into two groups with differing ideological positions. Candidates representing two groups' ideologies compete for the office. Candidates' competence in policy making in common value issues are private information. The incumbent has access to information regarding common value issues. A competent politician is able to process information better than an incompetent one. Observing the incumbent's

[3]McMurray 2017 studies how voters' opposing beliefs of the common value issue affect electoral outcomes. Different from the setting in his paper, in my setting voters share the same belief in common value issue and they have opposing ideologies in an issue other than the common value issue.

policy choice, each group makes a choice between two candidates. Groups' voting decisions aggregate to the election outcome. I study two variations of such aggregation. First, there is a majority and a minority among the two groups. The majority group's voting decision determines the election result. In this case, the incumbent knows the ideology of the decisive group who determines her career future. Second, society is composed of two competitive groups. If only one group votes for the incumbent, she wins with probability 1/2. It is effectively that the incumbent is uncertain about the ideology of the decisive group.

The incumbent faces a decision between exercising her policy expertise and pandering. She exercises her policy expertise if she makes policy decisions according to her policy information. She panders if she chooses a popular policy when her policy information suggests the opposite. For voters who believe a particular policy is likely to be best for them, a popular policy choice is a positive signal of the incombent's competence and an unpopular choice is a negative signal of her competence. If the ideological polarization is high, voters' beliefs about the incumbent's competence won't matter for their voting decision and the incumbent thus has no incentives to pander. Only when the ideological polarization is not too high, the reputation about valence matters for voter's voting decision. When the reputation about valence matters for voters' voting decision, the analysis produces two main contributions.

First, I show that regardless of whether the decisive group is the incumbent's partisan voter or not, the incumbent is more likely to exercise her policy expertise as ideological polarization increases. As the ideological polarization increases, the partisan voter still votes for the incumbent even if the negative signal of her competence is very informative and the opponent voter votes for the incumbent if the positive signal of her competence is very informative. The more the incumbent

exercises her policy expertise, the more informativeness is the policy choice as a signal of the incumbent's competence. As a result, a re-election concerned incumbent excerises her policy expertise more when the ideology polarization is higher.

Second, when the polarization level is low, pandering equilibrium exists regardless whether the incumbent knows which group is decisive. However, the patterns between level of polarization and pandering probability are different in an environment where the incumbent knows which group is decisive and an environment where she is uncertain of which group is decisive. In the latter environment, as the level of polarization increases, the pandering probability first decreases then jumps to a higher level and then decreases again. This result is due to the incumbent's switching from pandering to her partisan voters to pandering to her opponent. This result contributes directly to the literature that studies how an agent's reputation concern causes inefficient decision making (Scharfstein and Stein 1990; Prendergast and Stole 1996). Contrary to the canonical setting where the ideology of the principal (the principal being voters in my setting) is known, I consider an environment where the agent (the agent being the incumbent in my setting) is uncertain of the principal's ideology.

In addition, the paper contributes broadly to a line of research that studies how institutions of accountability affect politician's performance. This literature starts from the seminal works of Barro 1973, Ferejohn 1986, and Austen-Smith and Banks 1989 to more recent development by Alesina and Tabellini 2007, Alesina and Tabellini 2008, Besley and Coate 2003, and Maskin and Tirole 2004. Along this line of research, the paper speakes directly to the pandering literature which studies how electoral incentives affect decisions by politicians who have private policy information. In addition to early contributions by Canes-Wrone, Herron,

and Shotts 2001, Maskin and Tirole 2004 and Prat 2005, recent work by Morelli and Van Weelden 2013, Acemoglu, Egorov, and Sonin 2013 and Kartik, Squintani, and Tinn 2015 contributes to our understanding of the topic. In what follows I first describe the basic model. The results of two variations of elections are presented. The final section concludes.

3.2 Model

3.2.1 Setup

Policy

The model has two periods $t \in \{1, 2\}$. In each period, there is a state of the world $\omega^t \in \{a, b\}$, which represents information regarding a valence policy. The periods are independent. The prior belief is that $\Pr(\omega^t = a) = \pi > \frac{1}{2}$. In a given period, the politician in office receives a signal $s^t \in \{a, b\}$ regarding the state of the world ω^t. There are two types of politicians, type $T \in \{L, H\}$. High competence politician receives perfect information. The signal that a high competence politician receives matches the state of the world, i.e. $s^t = \omega^t$. Low competence politician receives information with a lower precision. The signal that a low competence politician receives matches the state of the world with a probability $\rho \in (\pi, 1)$, i.e. $\Pr(s^t = \omega^t) = \rho$.[4] After receiving signal, the politician in office makes a policy choice $x^t \in \{A, B\}$.

[4]The assumption ensures that given the signal b the belief that the state of the world $w = b$ is greater than the belief that the state of the world $w = a$, i.e. $\Pr(\omega = b|s = b) > \Pr(\omega = a|s = b)$. The signal received by low competence politician is informative under this assumption. This assumption doesn't affect the equilibrium results. This assumption is to capture the idea that politicians have policy expertise in policy making.

Players

There are four players in the model: an incumbent politician I, a challenger C and two groups of voters. Let one group be group L and the other be group R. Group L has an ideology z_L and group R has an ideology z_R. Candidates represent two groups in ideology dimension. Let the incumbent's ideology be z_I and the challenger's ideology be z_C. Without loss of generality, we assume that the incumbent represents group L and the challenger represents group R. Thus, $z_I = z_L$ and $z_C = z_R$. This is known to all players. The politician's competence is her private information. Group L and group R share the same prior belief about the incumbent's competence type and challenger's competence type. Ex ante they believe that the incumbent and the challenger are of the same competence. The probability that a politician is high competence is $\kappa \in (0,1)$. All players share the same preference in valence policy. They derive a payoff of $g^t = 1$ if $x^t = \omega^t$; a payoff of $g^t = 0$ otherwise.

Politicians derive utilities only when they are in office.[5] Let z^t be the ideology of the politician in office at time t. The payoff function of a politician with ideology z_j at period t, denoted by v_j^t where $j \in \{I, C\}$, is as follows.

$v_j^t = I^t(-(z^t - z_j)^2 + g^t)$,

where $g^t = 1$ if $s^t = \omega^t$, $g^t = 0$ otherwise, and $I^t = 1$ if j is in the office, $I^t = 0$ otherwise.

Voters derive utilities over the two periods. The payoff function of voter with ideology z_i at period t denoted by u_i^t where $i \in \{L, R\}$ is as follows.

$u_i^t = -(z^t - z_i)^2 + g^t$,

[5]The assumption that a politician receives positive utility only when she is in office is a standard assumption in the literature. This assumption allows us to capture the idea that a politician exercises policy expertise in the second period and distortion in the first-period policy making is caused by her electoral concern.

where $g^t = 1$ if $s^t = \omega^t$, $g^t = 0$ otherwise.

All players discount future payoff. We assume the discount factor $\beta \to 1$.

Election

The incumbent makes policy decision x^1 in the first period. Groups observe the policy decision x^1. Then they decide whether to keep the incumbent or replace her with the challenger. Let group i's decision be σ_i, where $i \in \{L, R\}$. $\sigma_i = 1$ if group i re-elects the incumbent and $\sigma_i = 0$ if it removes the incumbent. In the second period, the elected politician makes the policy decision x^2. For the election result we consider two variations. First, one group of the voter is the majority. The majority's voting decision determines the election result. Second, the election is competitive and there is no clear majority group. The election results based on the voting decision is as follows.

$$\sigma = \begin{cases} 0 & \sigma_L = 0 \text{ and } \sigma_R = 0 \\ .5 & \sigma_L = 1 \text{ or } \sigma_R = 1 \\ 1 & \sigma_L = 1 \text{ and } \sigma_R = 1 \end{cases}$$

We summarize the timing as follows.

Timing

1. Nature determines the competence of the incumbent and challenger.
2. Nature determines the first period state of the world ω^1.
3. The incumbent I receives a signal s^1.
4. The incumbent I makes a policy choice x^1.

5. Group i makes a voting decision σ_i.

6. Nature determines the second period state of the world ω^2.

7. The elected politician receives a signal s^2.

8. The elected politician makes a policy choice x^2.

Solution Concept

This is a Bayesian extensive game where the incumbent signals her comeptence type to the electorate via her policy decision. We use perfect Bayesian equilibrium as a solution concept. It includes the incumbent's policy decision strategy, the groups' voting strategies, and groups' beliefs about the incumbent's type.

For the incumbent in the first period, the incumbent receives a signal $s^1 = a$ or $s^1 = b$. Let $\delta^T_{s^1} \in [0,1]$ be the probability that a type $T \in \{L, H\}$ incumbent who receives signal $s^1 \in \{a, b\}$ chooses policy $x^1 = A$. For the politician in the second period, let $\phi^T_{s^2} \in [0,1]$ be the probability that a type $T \in \{L, H\}$ politician who receives signal $s^2 \in \{a, b\}$ chooses policy $x^2 = A$.

For a high-competence politician, let the belief of the state of the world w^t after receieving signal s^t be $\theta^H(w^t|s^t)$. For a low-competence politician, let the belief of the state of the world w^t after receieving signal s^t be $\theta^L(w^t|s^t)$.

Let group i's voting strategy given policy x^1 be $\sigma_i(x^1)$ and their beliefs about the incumbent is high competence be μ_{x^1}.

3.2.2 Second Period Decision

In the second period, the politician in office chooses a policy that gives her the highest expected payoff. The signal is perfect informative for a high-competence

politician. The signal is informative even for the low-competence politician. Therefore, both types of politician follow the signal. $\phi_a^T = 1$ and $\phi_b^T = 0$ for $T \in \{L, H\}$. If the high-competence politician is in the office, she always makes a correct decision and the expected valence policy payoff is 1 in the second period. If the low-competence politician is in office, her decision is correct with probability ρ and thus the expectd valence policy payoff is ρ in the second period.

3.2.3 A Society of Majority Group and Minority Group

Now we consider the equilibrium when there is a clear majority and minority group in the society. The majority's voting decision determines who will be in office. In the first period, when making policy decision, the incumbent is concerned with her electoral outcome. In an election with a clear majority group and minority group, there are two possibilities faced by the incumbent: her partisan voters are the majority and hence the decisive group or her opponent voters are the majority and hence the decisive group. We analyse both variations.

Consider a high-competence politician. When deciding whether to follow the signal, she trades off the current period policy payoff and the next period payoff. The potential payoff gain from choosing policy in the second period never outweighs the loss incurred by choosing the wrong first-period policy. Therefore, the high type always follow the signal in the first period. $\delta_a^H = 1$ and $\delta_b^H = 0$.

The low type politician's strategy in the first period is more complicated. To set up the equilibrium, we first develop the following lemma.If the incumbent follows the policy signal, let the posterior beliefs of the incumbent valence type given policy choice A be $\overline{\mu}$ and the posterior beliefs of the incumbent valence type given the policy choice B be $\underline{\mu}$.

Lemma 1. [6]

$\underline{\mu} < \kappa < \overline{\mu}$.

This lemma follow directly from Bayes' rule. The low competence type is systematically more likely to receive policy signal b. If both types follow a policy signal, a policy A is more likely from a high competent incumbent and a policy B is more likely from a low competent incumbent. Therefore, a policy choice A serves as a positive signal for the incumbent's competence and a policy choice B serves as a negative signal for the incumbent's competence. When both types follow policy signals, policy choices are most informative about the incumbent's type. If the incumbent adopts a policy making strategy other than following policy signals, policy choices will be less informative about her competence.

There are two types of of equilibria, the expertise-exercising equilibria and the pandering equilibria. In the expertise-exercising equilibria, both types of politician follow policy signals. In the pandering equilibria, the high competence politician follows policy signals, and the low competence politician follows signal a and follows signal b with a probability less than 1. We given the following definition.

Definition 1 *An expertise-exercising equilibrium is an equilibrium in which* $\delta_a^H = \delta_a^L = 1$ *and* $\delta_a^H = \delta_a^L = 0$. *A pandering equilibrium is an equilibrium in which* $\delta_a^H = \delta_a^L = 1$, $\delta_a^H = 0$, *and* $\delta_a^L \in [0, 1)$.

The Incumbent Represents the Majority Group

Now suppose the incumbent's partisan voters are the decisive group. When deciding whether to exercise expertise or to pander, the incumbent only needs to consider her partisan voters' decision.

[6] As long as the high competent type receives more precise signal than the low competent type, this result holds.

The incumbent's partisan voter trades off between ideology alignment and competence. If the ideology distance between two groups $d \geq \kappa - \underline{\mu}$, there is an expertise-exercising equilibrium. Even if the incumbent has the worst valence reputation $\underline{\mu}$, the ideology distance between two groups is large enough that her partisan voter prefers the incumbent who shares the same ideology. The low competence incumbent hence exercises her expertise since whether pandering or not won't affect her electoral outcome. If the ideology distance between two groups $d < \kappa - \underline{\mu}$, there is a pandering equilibrium. When the low incompetence incumbent receives a signal that suggests an unpopular policy, if she exercises policy expertise and chooses the policy according to the policy signal, her reputation will be $\underline{\mu}$. The ideology distance between two groups is low so that her partisan voter prefers the candidate from the other group who might have a higher competence level. If she panders and chooses the popular policy A instead, she might be able to increase her reputation and get re-elected. The incumbent chooses the likelihood of pandering such that the negative signal of her competence is not too informative that her partisan voter still votes for her for their ideological alignment. We have the following proposition characterizing the incumbent's equilibrium strategy in the first period. We provide the complete characterization of the equilibrium and proof in the appendix.

Proposition 1. *In the case where the incumbent shares the majority voter's ideology, we have the following unique equilibrium given the parameters.*

If the political polarization level $d \geq \kappa - \underline{\mu}$, there is an expertise-exercising equilibrium.

If the political polarization level $d < \kappa - \underline{\mu}$, there is a pandering equilibrium. The probability that a low competence incumbent panders is decreasing in the level of polar-

ization d.

In the case where the incumbent's ideology is aligned with the majority voter, pandering equilibrium exists when the polarization level is low. In the low level polarization, as the polarization increases, the pandering probability decreases. As the ideological polarization increases, the partisan voter still votes for incumbent even if the negative signal of her competence is very informative. The less the incumbent panders, the more informative the negative signal is. Therefore, as the ideological polarization increases, the incumbent can pander less.

The Incumbent Represents the Minority Group

Now consider the case where the incumbent represents the minority group. The decisive voter is the incumbent's opponent. If the ideology distance $d \geq \overline{\mu} - \kappa$, there is an expertise-exercising equilibrium. Even the best reputation that incumbent could obtain, $\overline{\mu}$, cannot compensate the ideology difference. The incumbent thus has no incentive to pander to increase her reputation. If the ideology distance $d < \overline{\mu} - \kappa$, there is a pandering equilibrium. When receiving a positive signal of her competence, the opponent voter votes for the incumbent if her reputation in valence dimension is high enough to compensate the ideology distance between them. In order to get elected, the incumbent panders as much as she can to deliver such a positive signal. We have the following proposition characterizing the incumbent's equilibrium strategy in the first period. We provide the complete characterization of the equilbrium and proof in the appendix.

Proposition 2. *In the case where the incumbent shares the minority voter's ideology, we have the following unique equilibrium given the parameters.*

If the political polarization level $d \geq \overline{\mu} - \kappa$, there is an expertise-exercising equilibrium.

If the political polarization level $d < \overline{\mu} - \kappa$, there is a pandering equilibrium. The probability that a low competence incumbent panders is decreasing in the level of polarization d.

The same results in an environment where the incumbent represents the majority voter still hold here: pandering equilibrium exits when the polarization level is low; in the low level polarization, as the polarization increases, the pandering probability decreases. The results hold for a logic different from that in the setting where the incumbent represnts the majority. In order to get elected by the opponent, the incumbent panders to deliver a positive signal that could convince the opponent. As the ideological poalrization increases, a positive signal needs to be more informative to convince the opponent voter. The incumbent thus has to pander less to make the positive signal more informative.

3.2.4 A Society of Competitive Groups

When a society is composed of two competitive groups, the election is competitive. The incumbent often doesn't know which group will be decisive in election. Based on how her reputation affects her electoral outcomes, the incumbent makes a decision over whether to exercise expertise or to pander. The incumbent knows if her reputation is μ the probability of being re-elected is as follows.

$$\sigma = \begin{cases} 0 & \mu \leq \kappa - d \\ .5 & \mu \in (\kappa - d, \kappa + d) \\ 1 & \mu \geq \kappa + d \end{cases}$$

In this situation, three levels of political polarization shape different strategic situations. In order to establish the range that characterizes the three level of polarizations, we first develop the following lemma. If the incumbent follows policy signals, the posterior belief given the policy choice A, denoted by $\overline{\mu}$, and the posterior belief given the policy choice B, denoted by $\underline{\mu}$.

Lemma 2. $\overline{\mu} - \kappa < \kappa - \underline{\mu}$.

The above lemma describes the degree of voters' belief updating when the incumbent's policy decisions are most informative about her competence type. The degree of belief update given policy A is smaller than the degree of belief update given policy B. In other words, a negative signal of competence is more informative than a positive signal of competence. Because ex ante the state of the world is more likely to be $\omega^1 = a$, policy A is ex ante more likely to happen. Consequently, the voter updates less when they observe policy A.

If the polarization level high, $d \geq \kappa - \underline{\mu}$, it must be that $d > \overline{\mu} - \kappa$ according to Lemma 2. At this high polarization level, the incumbent's partisan voter will vote for the incumbent even given the worst valence reputation possible while the incumbent's opponent voter will not vote for the incumbent even given the best valence reputation possible. Pandering which changes the incumbent's reputation in the range between the worst and best valence reputation doesn't affect the voting behavior of both groups. The incumbent thus has no incentives to pander. Therefore, in the high polarization level, there is an expertise-exercising equilibrium.

If the polarization level is intermediate such that $\overline{\mu} - k < d < \kappa - \underline{\mu}$, the incumbent's partisan voter won't vote for the incumben given the worst valence reputation possible while the incumbent's opponent voter won't vote for the incumbent even given the best valence reputation possible. The incumbent partisan

voter, however, will vote for the incumbent for a better reputation. The incumbent thus has incentives to pander in order to win the votes from her own partisan group.

If the polarization level is low, $d \leq \overline{\mu} - \kappa$, it must be that $d < \kappa - \underline{\mu}$ according to Lemma 2. At this low polarization level, the incumbent's partisan voter won't vote for the incumbent given the worst valence reputation possible but will vote for the incumbent for a better reputation. The incumbent's opponent voter will vote for the incumbent given the best valence reputation possible. The incumbent has incentives to pander to increase her reputation in valence dimension.

In the low level of polarization, the incumbent considers two types of pandering strategies: either choosing a likelihood of pandering such that only the partisan voter vote for the incumbent or choosing a likelihood of pandering such that both groups vote for the incumbent when observing the popular policy. When the incumbent receives a policy signal that suggests an unpopular policy, the benefit of being elected is greater than the benefit from informative decision making. Therefore, the incumbent chooses the pandering strategy that maximizes her electoral probability. If the incumbent panders to her own partisan voter, her partisan voter votes for her regardless of the policy choice, and thus she gets elected by probability $1/2$. If the incumbent panders to the opponent voter, both groups vote for her only when they observe the popular policy, and her chance of re-election is the probability that she panders. Consequently, the incumbent panders to the partisan voter if the optimal probability of pandering to the opponent is less than $1/2$. Otherwise, she panders to the opponent voter. Because the optimal probability of pandering to the opponent is decreasing in the polarization. We show that the incumbent panders to the partisan voter when the polarization level is above a threshold and then panders to the opponnet when the polarization level

is below that threshold. Given the same level of polarization, the incumbent's policy choice as a signal for her competence is less informative when the incumbent panders to the partisan voter. As a result, at the threshold, when the incumbent switches to pander to the opponent, the probability of pandering drops.

We have the following proposition characterizing the incumbent's equilibrium strategy in the first period. We define the threshold

$$\hat{d} = (\frac{\pi}{\frac{1}{2}(\pi(1-\rho)+(1-\pi)\rho)+\pi\rho+(1-\pi)(1-\rho)+\pi\kappa} - 1)\kappa$$

. We provide the complete characterization of the equilbrium and proof in the appendix.

Definition 2. *We define two kinds of pandering equilibria. We say that the incumbent who represents group L panders to her partisn voter if* $\sigma_L(A) = 1$ *and* $\sigma_R(A) = 0$. *We say that she panders to opponent if* $\sigma_L(A) = 1$ *and* $\sigma_R(A) = 1$.

Proposition 3. *In the case where both groups are competitive, we have the following unique equilibrium given the parameters.*

If the political polarization level $d \geq \kappa - \underline{\mu}$, *there is an expertise-exercising equilibrium.*

If the political polarization level $d \in (\hat{d}, \kappa - \underline{\mu})$, *there is a pandering equilibrium. A low competence incumbent panders to her partisan voter.*

If the political polarization level $d \leq \hat{d}$, *there is a pandering equilibrium. A low competence incumbent panders to her opponent.*

The probability that a low competence incumbent panders is decreasing in the level of polarization d for $d < \hat{d}$, *and for* $d \in (\hat{d}, \kappa - \underline{\mu})$.

In the society where the incumbent knows the ideology preference of the majority and the society where the incumbent is uncertain of which group is decisive,

pandering equilibrium exits when the polarization level is low. The comparative statics results are slightly different. In the society with a clear majority group, in the range of low level polarization, as the polarization increases, the pandering probability decreases. In the society with two competitive groups, in the range of low level polarization, as the polarization increases, the pandering probability first decreases then it jumps to a higher level and then it decreases again.

3.3 Conclusion

How accountability affects politicians' behaviour is a key discussion in the research on political institution. Given the important role of political polarization in politics, it is crucial to understand how political polarization affects the impact of accountability on politicians. This paper develops a model to analyze the effect of political polarization at the mass level on the re-election-concerned politicians' decision. The paper shows that a politician is more likely to exercise her policy expertise and less likely to pander to the electorate in a society with a higher level of political polarization at the mass level. This result holds in two variations of societies. One with a clear majority and a minority group and the other with two competitive groups. The effect of polarization level on the level of pandering is slightly different across these two societies. In the former, as political polarization increases, the level of pandering decreases. In the latter, as polarization increases, the level of pandering decreases first and then jumps to a higher level and then decreases again.

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Appendix A

Appendix to Chapter 1

A.1 Figures

Figure A.1: **The Effect of High-powered Incentives with One Agent**

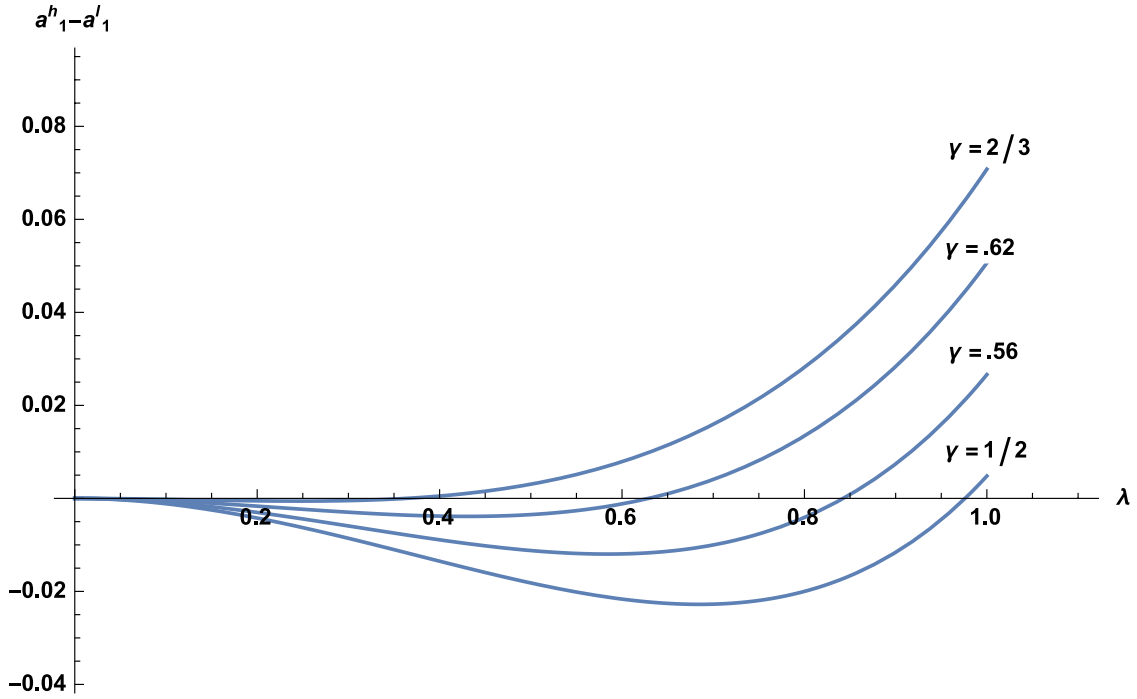


Figure A.2: **The Principal's Choice with One Agent**

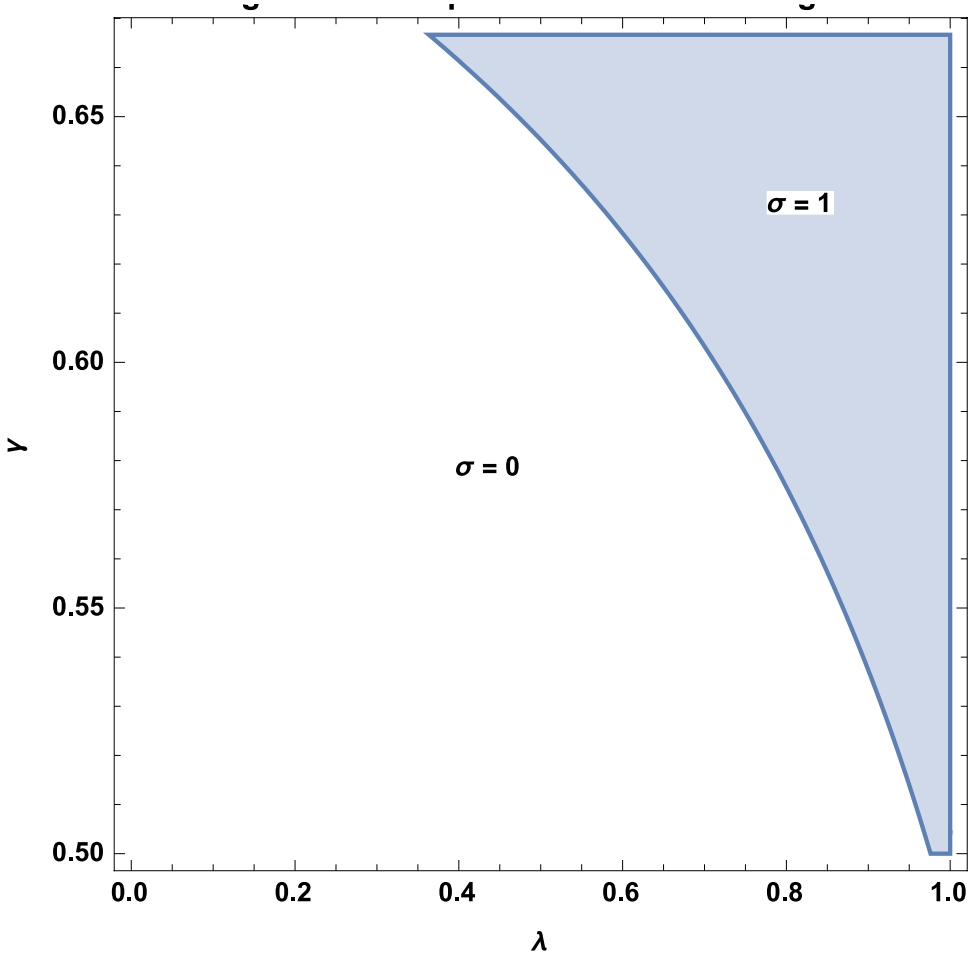


Figure A.3: **The Effect of High-powered Incentives with Two-Agent**

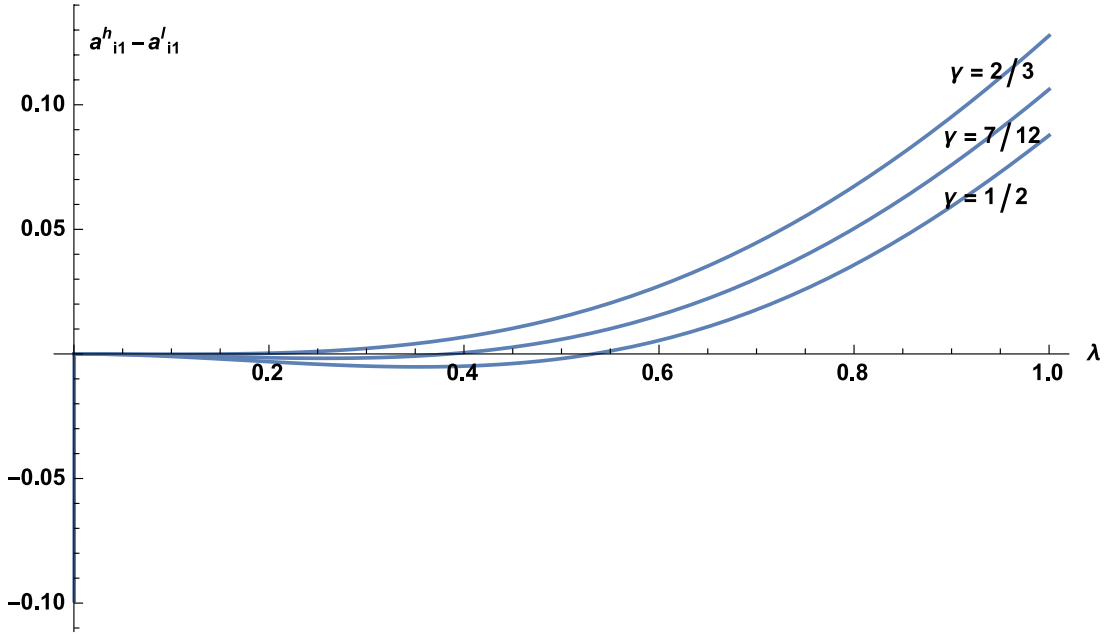


Figure A.4: **The Principal's Choice with Two-Agent**

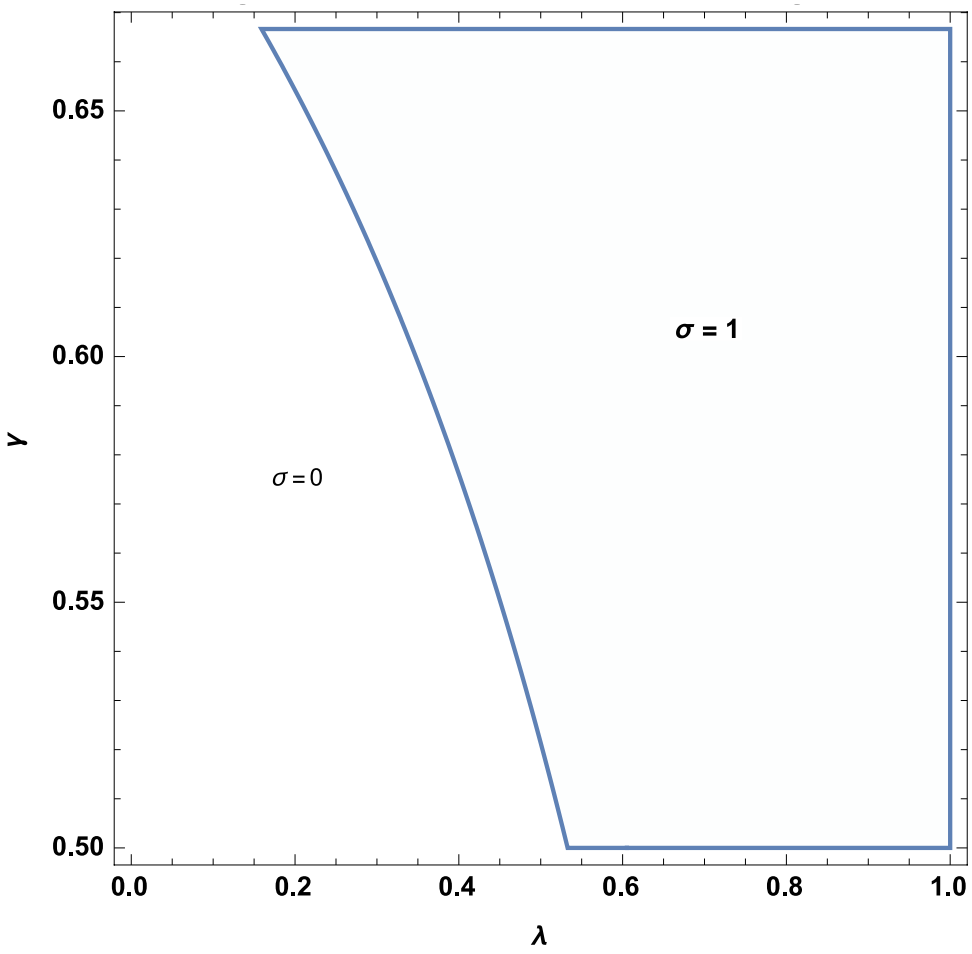
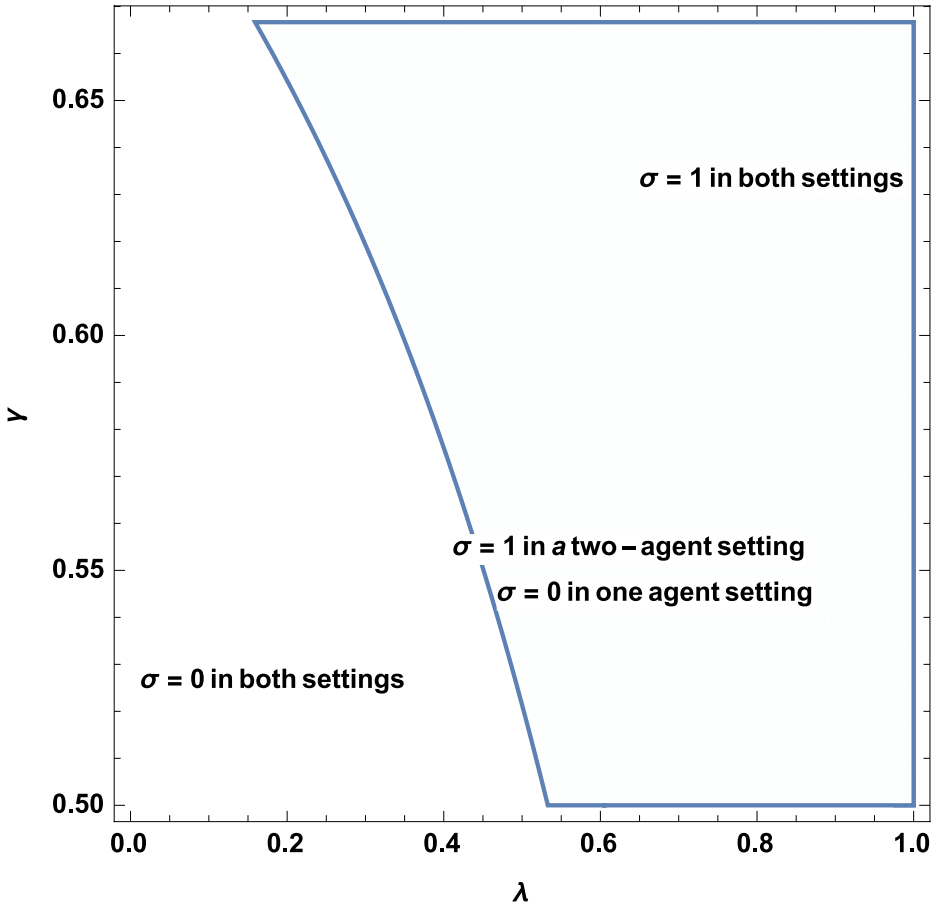


Figure A.5: **Comparison of Incentive Structures**



A.2 Proofs

Proof. **Remark 1** Solving Equation (5) gives the result in remark 1. Given the range of λ and γ, the minimum value of a_1^l is 0 and its maximum value is $\frac{11}{16}$. Thus, $a_1^l \in [0,1]$. □

Proof. **Remark 2** Solving Equation (6) gives the result in remark 2. The minimum value of a_1^h is 0 and its maximum value is $\frac{22}{31}$. Thus, $a_1^h \in [0,1]$.

□

Proof. **Proposition 1** Solving the following equation system gives the results in proposition 1.

$$\frac{1}{2}\lambda\left(\frac{(1+\frac{\lambda}{2}\gamma^2)}{1-\frac{\lambda^2}{2}\frac{1}{2}(1-\gamma^2)} - (1+(1-\gamma^2)\frac{\lambda}{2})\right) \geq 0$$

$$0 < \lambda < 1$$

$$\frac{1}{2} < \gamma < \frac{2}{3}$$

□

Proof. **Remark 3** Solving equation system (7) gives the result in remark 3. The minimum value of a_i^l is 0 and its maximum value is $\frac{11}{19}$. Thus, $a_i^l \in [0,1]$.

□

Proof. **Remark 4** Solving equation system (8) gives the result in remark 4. The minimum value of a_i^h is 0 and its maximum value is $\frac{1}{20}(-57+\sqrt{5009})$. Thus, $a_i^h \in [0,1]$.

□

Proof. **Proposition 2** Solving the following equation system gives the results in proposition 2.

$$\frac{-(1-\frac{3}{8}\lambda^2(1-\gamma^2)) + \sqrt{(1-\frac{3}{8}\lambda^2(1-\gamma^2))^2 + \lambda^2(1-\gamma^2)\frac{1}{2}\lambda(1+\frac{\lambda}{2}\gamma^2)}}{\frac{\lambda^2}{2}(1-\gamma^2)}$$

$$-\frac{1}{2}\lambda(1+(1-\gamma^2)\frac{\lambda}{2})) \geq 0$$

$$0 < \lambda < 1$$

$$\frac{1}{2} < \gamma < \frac{2}{3}$$

□

Proof. **Off Equilibrium Beliefs**

A observes her own action. It is reasonable to suppose that A updates belief about the experimental policy according to Bayes' rule. Now consider P's off-equilibrium beliefs. I prove that to sustain Perfect Bayesian Equilibrium derived in the main section no restriction on P's off-equilibrium beliefs is required. In other words, given any belief that P might hold off-equilibrium, A has no incentive to deviate from his equilibrium action.

Low-Powered Office Incentives

Consider the subgame where low-powered incentives are introduced.

Suppose A deviates to a_1. Following a failure and a success, A forms correct beliefs using Bayes' rule as follows.

$$\rho_{1A}^f = \frac{.5(1-a_1)}{.5(1-a_1)+.5} < \gamma$$

$$\rho_{1A}^s = 1 > \gamma$$

If P forms correct beliefs, she chooses $p_2 = 0$ following a failure and $p_2 = 1$ following a success. A makes a payoff of $\frac{(\lambda\gamma)^2}{2}$ in period 2 if the experimental fails and a payoff of $\frac{\lambda^2}{2}$ if it succeeds.

Now, consider the off-equilibrium beliefs for P. If a failure is observed, P's off-equilibrium belief is denoted by ρ_{1P}^f, and a success ρ_{1P}^s. To break ties, I assume that P adopts status quo policy if her expected payoff of status quo policy equals to that of the experimental policy. So, P chooses $p_2 = 1$ only if her belief that the probability of the experimental policy being effective is greater than γ. Given P's decision rule in period 2, I classify P's off-equilibrium beliefs into four cases.

1. $\rho_{1P}^f \leq \gamma$ and $\rho_{1P}^s > \gamma$. P makes the same policy decision as she would have if her beliefs are correct. Thus, A receives the same payoff in this case as the payoff he could have received when the principal forms correct beliefs.

2. $\rho_{1P}^f \leq \gamma$ and $\rho_{1P}^s \leq \gamma$. If the experiment fails, P makes the same policy decision as she would have if her beliefs are correct. If the experiment succeeds, given the off-equilibrium belief, P adopts the status quo policy in period 2. A knows that the experimental policy is effective. But his judgement won't matter because the experimental policy won't be adopted. A puts an effort of $\lambda\gamma$ and makes a payoff of $\frac{(\lambda\gamma)^2}{2}$. It is less than what he could have made when the principal forms correct beliefs.

3. $\rho_{1P}^f > \gamma$ and $\rho_{1P}^s > \gamma$. If the experiment succeeds, P makes the same policy decision as she would have if her beliefs are correct. If the experiment fails, given the off-equilibrium belief, P adopts the experimental policy in period 2. A knows that the experimental policy is effective with probability ρ_{1A}^f, so he exerts an effort of $\lambda\rho_{1A}^f$ and makes a payoff of $\frac{(\lambda\rho_{1A}^f)^2}{2}$. A thus makes less than than what he could

have when the principal forms correct beliefs.

4. $\rho_{1P}^{f} > \gamma$ and $\rho_{1P}^{s} \leq \gamma$. P makes the opposite policy decision from what she would have made if her beliefs are correct. It is clear that A makes less than than the payoff he could have received when the principal forms correct belief.

I have shown that for any effort deviating from the equilibrium effort, $a_1 \neq a_1^l$, under any beliefs that P might hold off-equilibrium, A doesn't make a higher payoff than the payoff he receives in the situation where P forms correct beliefs. Thus, I prove that given any off-equilibrium belief of P's, A doesn't receive higher payoff than she would have received in equilibrium.

High-Powered Office Incentives

Now consider the subgame where high-powered office incentives are chosen. Use the same proof strategy as the one in the low-powered office incentives subgame. It could be proved that given any belief that P might hold off-equilibrium A has no incentives to deviate. Two things are worth mentioning. First, if the experiment fails, A makes a payoff of 0 regardless of P's belief. Second, if the experiment succeeds, given A's effort a_1, the probability that A staying office and receiving office value is $\frac{1}{2}a_1$ regardless of P's belief. P's off-equilibrium belief affects A's payoff only by affecting A's office value in period 2, which has been discussed in subgame with low-powered office incentives.

□

Appendix B

Appendix to Chapter 2

B.1 Figures

Figure B.1: **Elite Division and Transparency**

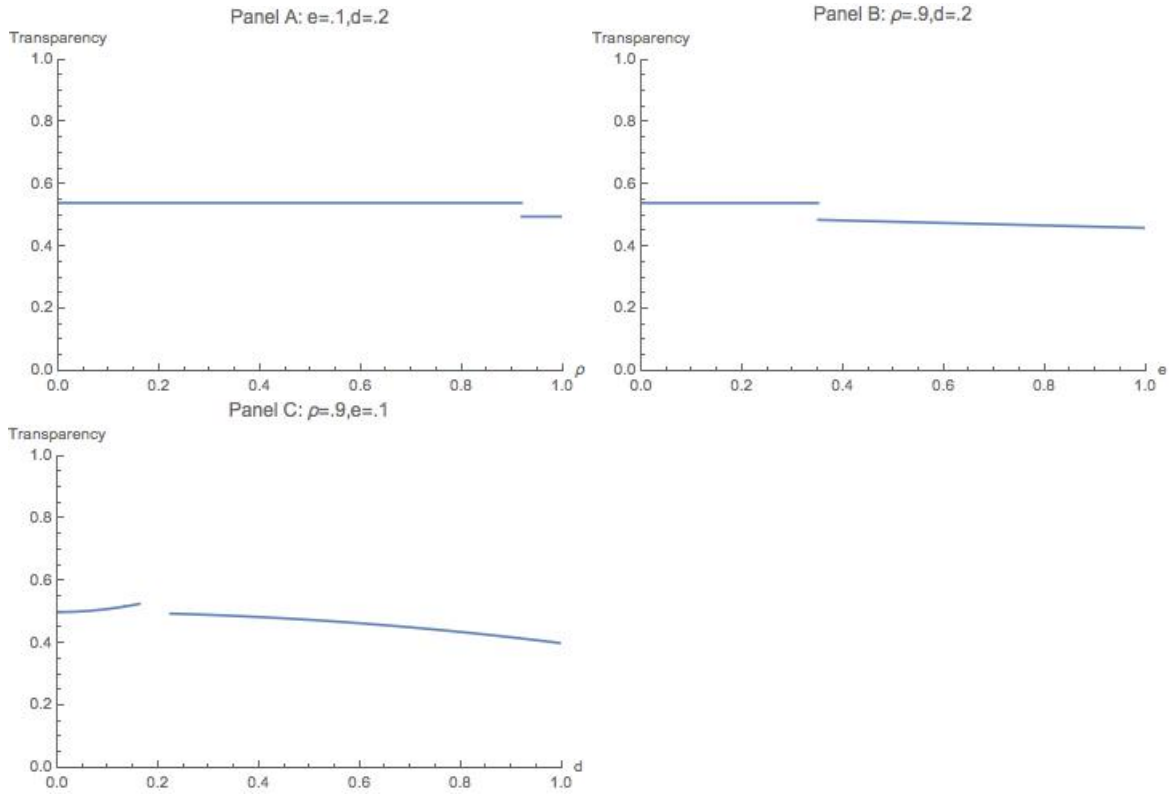


Figure B.2: **Elite Division and Bureaucratic Competence**

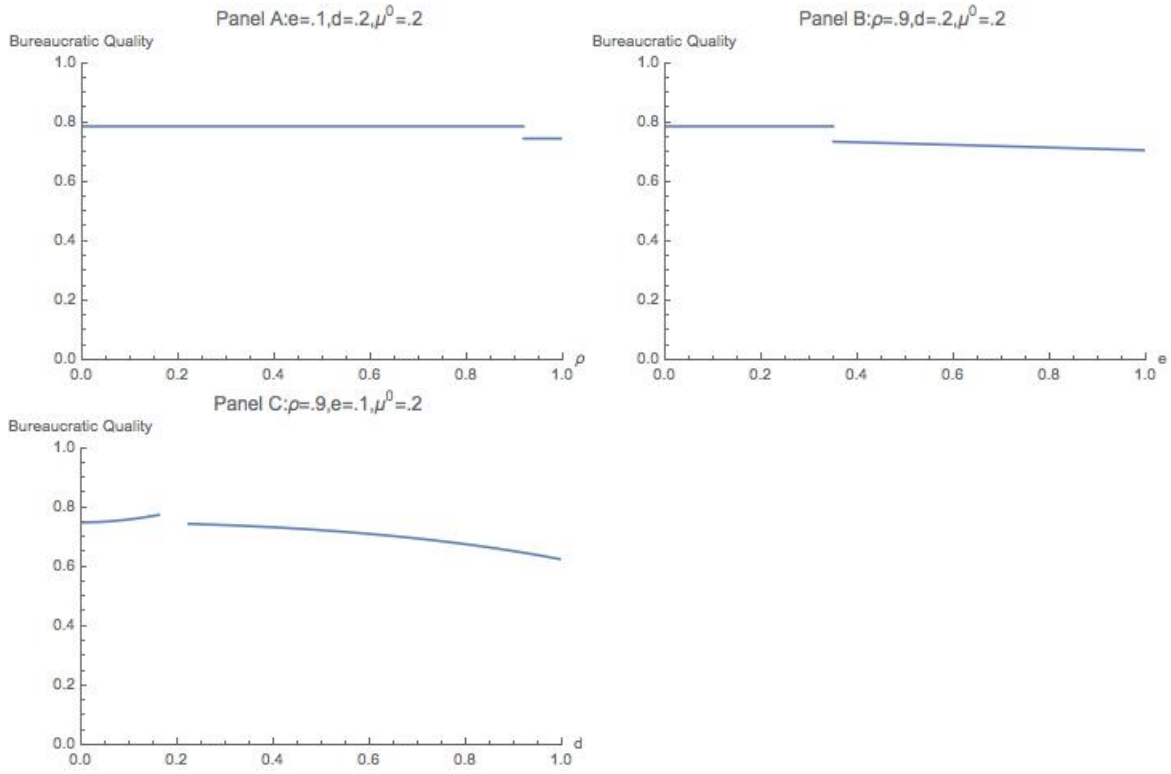


Figure B.3: **Design of Optimal Signal** $\frac{\rho(1)}{\mu_R} > \frac{1}{\mu_O}$

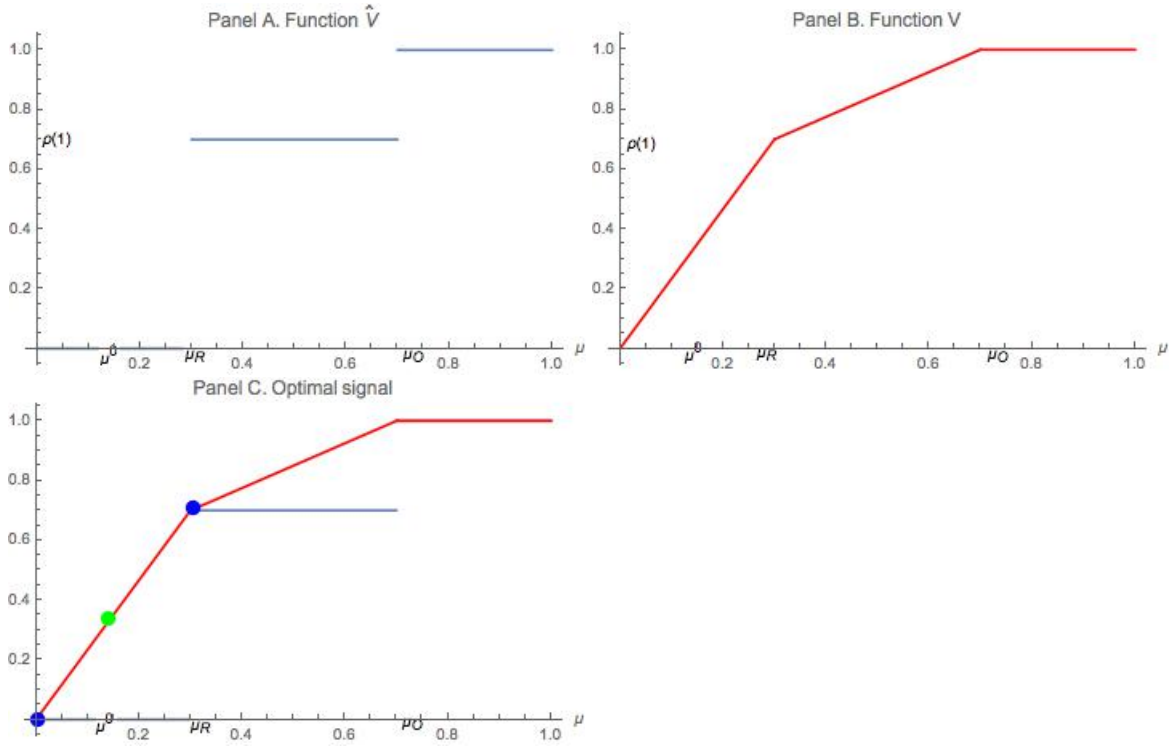
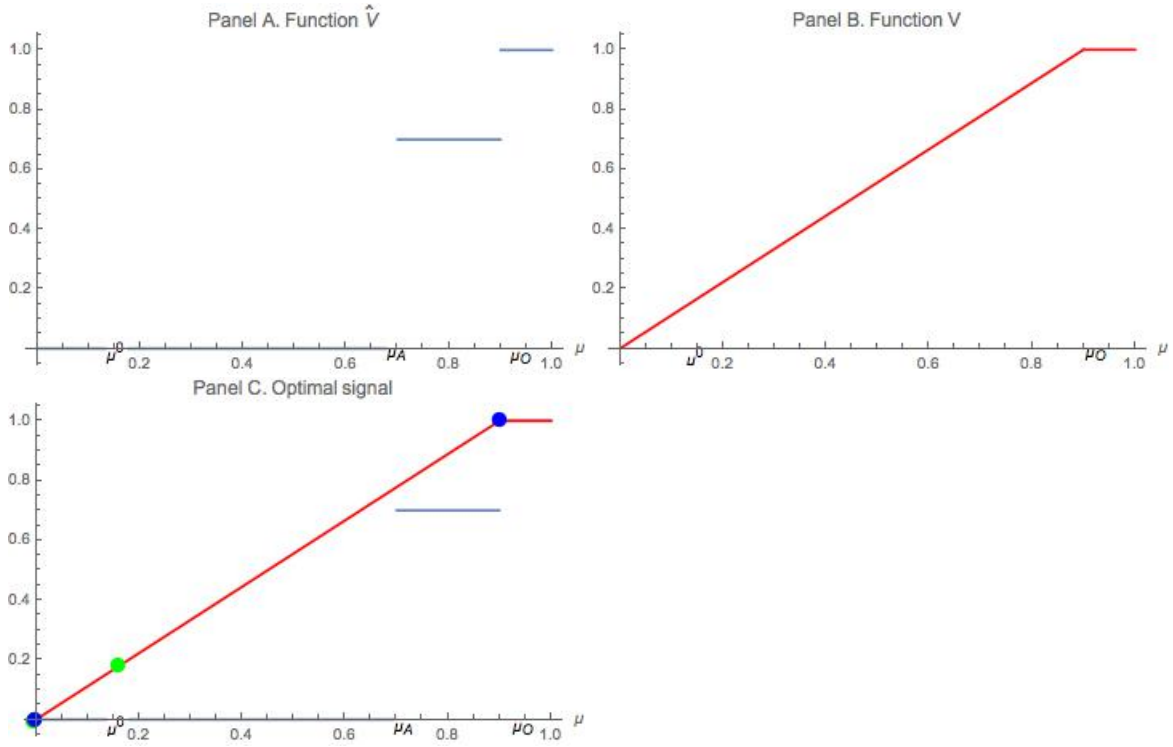


Figure B.4: **Design of Optimal Signal** $\frac{\rho(1)}{\mu_R} \leq \frac{1}{\mu_O}$



B.2 Proofs

Proof. **Proposition 1** When the elite E holds some belief μ, it takes action $\sigma_E(\mu)$ according to their optimal decision derived in equation (1) and lead to an expected payoff for the incumbent, denoted by $\hat{v}(\mu)$. An information disclosure π induces a distribution of posterior beliefs, denoted by $\tau(\mu)$. The incumbent's payoff from any information disclosure is thus the expectation of $\hat{v}$ under τ. Because the elite updates belief following a bayesian rule, the expected posterior belief must equals the prior. L's problem is thus equivalent to choose $\tau(\mu)$ to solve the following optimization problem.

$$\begin{aligned} \max_{\tau} \quad & E_\tau \hat{v}(\mu) \\ \text{s.t.} \quad & \sum_{Supp(\tau)} \mu d\tau(\mu) = \mu_0 \end{aligned}$$

To solve the above problem, first we derive $\hat{v}(\mu)$, i.e. the expected payoff for the incumbent leader given some belief μ. When $\mu < \mu_E$, the elite replaces the incumbent. When $\mu \geq \mu_E$, the ruling faction keeps the incumbent and the incumbent stays in office. In summary, we have

$$\hat{v}(\mu) = \begin{cases} 0 & \text{if } \mu < \mu_E \\ 1 & \text{if } \mu \geq \mu_E \end{cases} \tag{B.1}$$

where $\mu_E \equiv \frac{1}{2}$.

I follow the concave-closure approach developed by Kamenica and Gentzkow 2011 to solve the optimization problem. Let V be the concave closure of $\hat{v}$:

$$V(\mu) \equiv sup\{z|(\mu, z) \in co(\hat{v})\}$$

where $co(\hat{v})$ denotes the convex hull of the graph of v.

$V(\mu)$ is the largest payoff L can achieve with any format of information disclosure when the prior is μ. If $(\mu', z) \in co(\hat{v})$, then there exits a distribution of posteriors τ such that $E_\tau \mu = \mu'$ and $E_\tau \hat{v}(\mu) = z$. Thus, $co(\hat{v})$ is the set of (μ, z) such that if the prior is μ, there exits an information disclosure with value z. Hence, $V(\mu)$ is the largest payoff L can achieve with any signal when the prior is μ.

The elite updates belief of the competence following bayesian rationality which requires that the expectation of the posteriors must equal to the prior. We must have

$$(1 - \alpha) \times 0 + \alpha \times \mu_E = \mu^0.$$

This implies that $\alpha = \frac{\mu^0}{\mu_E}$. Hence, the optimal τ is that with probability $\alpha = \frac{\mu^0}{\mu_E}$ the

posterior belief is μ_E and with probability $1-\alpha = 1-\frac{\mu^0}{\mu_E}$ the posterior belief is 0. α is the probability that the incumbent stays in office.

Now, we could compute the optimal information disclosure π^* which leads to the above distributions of posteriors. Let $\pi_\theta^- = \Pr[s^-|\theta]$, i.e. the probability that the realization is s^- given the competence θ and $\pi_\theta^+ = \Pr[s^+|\theta]$, i.e. the probability that the realization is s^+ given the competence θ. After observing s^-, the elite's perception of the ruler's competence is 0. This implies that $\pi_1^- = 0$ and consequently $\pi_1^+ = 1$, i.e. given high competence the internal information system always generates a relatively favorable message. After observing s^+, the elite's posterior belief is p. The elite updates belief of the competence follows Bayes rule:

$$p = \frac{\mu^0}{\mu^0 + (1-\mu^0)\pi_0^+},$$

which implies that $\pi_0^+ = \frac{\mu^0(1-p)}{(1-\mu^0)p}$.

□

Proof. **Proposition 2** When faction i holds some belief μ, it takes action $\sigma_i(\mu)$ according to their optimal decision derived in equation (1) and (2) and lead to an expected payoff for the incumbent, denoted by $\hat{v}(\mu)$. An information disclosure π induces a distribution of posterior beliefs, denoted by $\tau(\mu)$. The incumbent's payoff from any information disclosure is thus the expectation of $\hat{v}$ under τ. Because the factions update beliefs following a bayesian rule, the expected posterior belief must equals the prior. L's problem is thus equivalent to choose $\tau(\mu)$ to solve the following optimization problem.

$$\begin{aligned} \max_{\tau} \quad & E_\tau \hat{v}(\mu) \\ \text{s.t.} \quad & \sum_{Supp(\tau)} \mu d\tau(\mu) = \mu_0 \end{aligned}$$

To solve the above problem, first we derive $\hat{v}(\mu)$, i.e. the expected payoff for the incumbent given some belief μ. When $\mu < \mu_R$, the ruling faction replaces the incumbent and so does the opposition if it has a chance to. The incumbent is ousted for sure. When $\mu \in [\mu_R, \mu_O)$, the ruling faction keeps the incumbent and the opposition ousts the incumbent if it has a chance to. The ruling faction's decision determines the leadership if there is no political shock. The incumbent thus stays in office with probability ρ. That is, the greater political entrenchment of ruling faction with the incumbent in power, the higher probability that the ruling faction's leadership decision will be the society's decision. When $\mu \geq \mu_O$, the ruling faction keeps the incumbent and so does the opposition faction. The incumbent stays in office with certainty. In summary, we have

$$\hat{v}(\mu) = \begin{cases} 0 & \text{if } \mu < \mu_R \\ \rho & \text{if } \mu \in [\mu_R, \mu_O) \\ 1 & \text{if } \mu \geq \mu_O \end{cases} \tag{B.2}$$

where $\mu_R \equiv -ed^2 + \frac{1}{2}$ and $\mu_O \equiv d^2 + \frac{1}{2}$.

I follow the concave-closure approach developed by Kamenica and Gentzkow 2011 to solve the optimization problem. Let V be the concave closure of $\hat{v}$:

$$V(\mu) \equiv sup\{z|(\mu, z) \in co(\hat{v})\}$$

where $co(\hat{v})$ denotes the convex hull of the graph of v.

$V(\mu)$ is the largest payoff L can achieve with any format of information disclosure when the prior is μ. If $(\mu', z) \in co(\hat{v})$, then there exits a distribution of posteriors τ such that $E_\tau \mu = \mu'$ and $E_\tau \hat{v}(\mu) = z$. Thus, $co(\hat{v})$ is the set of (μ, z) such that if the prior is μ, there exits an information disclosure with value z. Hence, $V(\mu)$ is the largest payoff L can achieve with any signal when the prior is μ. The concave-closure approach shows that there are two formats of optimal information disclosure. When certain condition is satisfied, the incumbent ruler chooses one as oppose to the other.

Figure B. 3 shows the function $\hat{v}$, the concave closure V , and the information disclosure when $\frac{\rho}{\mu_R} > \frac{1}{\mu_O}$. Figure B.4 shows the function $\hat{v}$, the concave closure, and the optimal information disclosure when $\frac{\rho}{\mu_R} \leq \frac{1}{\mu_O}$. In the figures, μ denotes the probability that $\theta = 1$. $\hat{v}$ is a step function: the incumbent leader's expected payoff is 0 whenever $\mu < \mu_R$, ρ whenever $\mu_R \leq \mu < \mu_O$, and 1 whenever $\mu \geq \mu_O$. As panel C in Figure B.3 shows, the signal induces two posterior values: $\mu^l = 0$ and $\mu^h = \mu_R$.

Let the probability that the realized signal induces a belief of μ_R be α. Because the distribution τ is Bayes plausible, we must have

$$(1 - \alpha) \times 0 + \alpha \times \mu_R = \mu^0.$$

This implies that $\alpha = \frac{\mu^0}{\mu_R}$. Hence, the optimal τ is that with probability $\alpha = \frac{\mu^0}{\mu_R}$ the posterior belief is μ_R and with probability $1 - \alpha = 1 - \frac{\mu^0}{\mu_R}$ the posterior belief is 0. Now, we compute the signal that induces the optimal τ. Denote the optimal information disclosure with a realization space $\{s^-, s^+\}$ by π^*. If the realization is s^-, the ruling faction replaces the incumbent, $\sigma_R = 0$. If the realization is s^+, the ruling faction retains the incumbent, $\sigma_R = 1$, while the opposition faction replaces the incumbent given the chance, $\sigma_O = 0$. Let $\pi^+_\theta = \Pr[s^+|\theta]$, i.e. the probability that the realized signal is s^+given the state of the world θ and $\pi^-_\theta = \Pr[s^-|\theta]$,

i.e. the probability that the realized signal is s^-given the state of the world θ. We have

$$\pi_\theta^+ = \begin{cases} 1 & \text{if } \theta = 1 \\ \frac{\mu^0}{1-\mu^0}\frac{1-\mu_R}{\mu_R} & \text{if } \theta = 0 \end{cases} \tag{B.3}$$

and $\pi_\theta^- = 1 - \pi_\theta^+$.

Similarly, we could derive the optimal information disclosure in panel C Figure B.4. Notice that when $\frac{\rho}{\mu_R} = \frac{1}{\mu_O}$. L is indifferent to the following information disclosures. The information disclosure induces posteriors which are 0, μ_R, and μ_O. The probability combination $(1 - \alpha_R - \alpha_O, \alpha_R, \alpha_O)$ over the above posterior combination must satisfy the following Bayesian plausible requirement

$$(1 - \alpha_A - \alpha_O) \times 0 + \alpha_R \times \mu_R + \alpha_O \times \mu_O = \mu^0$$

where $\alpha_R \in [0, 1]$ and $\alpha_O \in [0, 1]$. To simplify the discussion without loss of generality, we assume that among all the indifferent information disclosure, the incumbent chooses the one which assign 0 probability to the posterior α_O. Denote the optimal information disclosure with a realization space $\{s^-, s^{++}\}$ by π^{**} . If the signal realization is s^-, the ruling faction replaces the incumbent, $\sigma_R = 0$. If the signal realization is s^{++}, the ruling faction retains the incumbent, $\sigma_R = 1$, and the opposition faction retains the incumbent given the chance, $\sigma_O = 1$. Let $\pi_\theta^{++} = \Pr[s^{++}|\theta]$ and $\pi_\theta^- = \Pr[s^-|\theta]$. We have

$$\pi_\theta^{++} = \begin{cases} 1 & \text{if } \theta = 1 \\ \frac{\mu^0}{1-\mu^0}\frac{1-\mu_O}{\mu_O} & \text{if } \theta = 0 \end{cases} \tag{B.4}$$

and $\pi_\theta^- = 1 - \pi_\theta^{++}$. □

Appendix C

Appendix to Chapter 3

C.1 Proofs

Proof. **Lemma 1** If both types follow the signal, according to Bayes' rule, we have
$\overline{\mu} = \frac{\pi\kappa}{\pi\kappa+(\pi\rho+(1-\pi)(1-\rho))(1-\kappa)}$
$\underline{\mu} = \frac{(1-\pi)\kappa}{(1-\pi)\kappa+((1-\pi)\rho+\pi(1-\rho))(1-\kappa)}$
It is clear that $\overline{\mu} > \kappa > \underline{\mu}$. □

Proof. **Proposition 1** For each probabilty of pandering p, the associated equlibrium beliefs upon observing policy A and policy B are as follows.
$\mu_A = \frac{\pi\kappa}{\pi\kappa+\pi'(1-\kappa)}$
$\mu_B = \frac{(1-\pi)\kappa}{(1-\pi)\kappa+(1-\pi')(1-k)}$
we have $\pi'(p;\rho) = \pi(\rho + (1-\rho)p) + (1-\pi)((1-\rho)+\rho p)$.
The incumbent chooses p^* such that $\mu_B = \kappa - d$.
The equilibrium belief upon observing policy A and belief upon observing policy B
$\mu_A^* = \frac{\pi\kappa}{\pi\kappa+\pi'(1-\kappa)}$,
$\mu_B^* = \frac{(1-\pi)\kappa}{(1-\pi)\kappa+(1-\pi')(1-k)}$,
where $\pi'(p^*;\rho) = \pi(\rho + (1-\rho)p^*) + (1-\pi)((1-\rho)+\rho p^*)$.
The majority group votes for the incumbent regardless of the policy observation. □

Proof. **Proposition 2** In incumbent chooses p^{**}such that $\mu_A = \kappa + d$. The associated beliefs upon observing policy A and policy B
$\mu_A^{**} = \frac{\pi\kappa}{\pi\kappa+\pi'(1-\kappa)}$,
$\mu_B^{**} = \frac{(1-\pi)\kappa}{(1-\pi)\kappa+(1-\pi')(1-k)}$,
where $\pi'(p^{**};\rho) = \pi(\rho + (1-\rho)p^{**}) + (1-\pi)((1-\rho)+\rho p^{**})$.

The majority group votes for the incumbent regardless of the policy observation. □

Proof. **Lemma 2** We could derive the following

$\overline{\mu} = \frac{\pi\kappa}{\pi\kappa+(\pi\rho+(1-\pi)(1-\rho))(1-\kappa)}$

$\underline{\mu} = \frac{(1-\pi)\kappa}{(1-\pi)\kappa+(1-(\pi\rho+(1-\pi)(1-\rho)))(1-k)}$

It is easy to show that $\overline{\mu} - \kappa < \kappa - \underline{\mu}$. □

Proof. **Proposition 3** $\mu_A = \frac{\pi\kappa}{\pi\kappa+\pi'(1-\kappa)}$

where $\pi'(p;\rho) = \pi(\rho + (1-\rho)p) + (1-\pi)((1-\rho) + \rho p)$

μ_A is decreasing in p, i.e. the voter discount the fact that policy A might come more from low type that pander.

$\mu_B = \frac{(1-\pi)\kappa}{(1-\pi)\kappa+(1-\pi')(1-k)}$

When $d < \overline{\mu} - \kappa$, two possible pandering strategies. First, the incumbent could choose the likelihood of pandering p_h such that $\mu_B = \kappa - d$. Only the partisan voter vote for the incumbent. Let $p_h(d;\kappa,\rho,\pi)$ be the p_h that solves the following equation.

$\pi(\rho + (1-\rho)p_h) + (1-\pi)((1-\rho) + \rho p_h) = \pi\kappa(\frac{1}{\kappa-d} - 1)$

Receiving signal b, a low type incumbent who adopts the above strategy expects to get elected with probility $\frac{1}{2}$. This is because regardless which policy choice they observe, her partisan voter votes for her while the opponent voter doesn't vote for her.

Second, the incumbent could choose the likelihood of pandering p_l such that $\mu_A = \kappa + d$. Both the opponenent and the partisan vote for the incumbent. Let $p_l = p_l(d;\kappa,\rho,\pi)$ be the p_l that solves the following equation.

$\pi(\rho + (1-\rho)p_l) + (1-\pi)((1-\rho) + \rho p_l) = \pi\kappa(\frac{1}{\kappa+d} - 1)$.

Similar to the lemma 2, we could prove that $\kappa - \mu_B > \mu_A - \kappa = d$. The opponent won't vote for the incumbent observing an unpopular policy choice. Receiving signal b, a low type incumbent who adopts the above strategy expects to get elected with p_l. p_l is the frequence of pandering to the opponent and hence the frequency of the opponent voting for the incumbent. If the incumbent panders to the opponent, as the polarization decreases, the incumbent panders more frequently and the probability that the opponent voter votes for her is higher.

When the incumbent receives a signal suggesting an unpopular policy, the benefit of being elected is greater than the benefit from informative decision making. So the incumbent chooses the pandering strategy that maximizes her electoral probability. if the incumbent The incumbent hence chooses to pander to the opponent if $p_l \geq 1/2$.

This condition satifies when

$d \leq \hat{d}(\pi,\kappa,\rho)$

where $\hat{d}(\pi,\kappa,\rho) = (\frac{\pi}{\frac{1}{2}(\pi(1-\rho)+(1-\pi)\rho)+\pi\rho+(1-\pi)(1-\rho)+\pi\kappa} - 1)\kappa$.

At the threshold $\hat{d}$, if the incumbent panders to the partisan voter, $\mu_A^p - \kappa < \kappa - \mu_B^p = d$. If she panders to the opponent, $d = \mu_A^o - \kappa < \kappa - \mu_B^o$. Thus we have $\mu_A^p < \mu_A^o$. In other words, the incumbent's policy choice as signal for her competence is less informative when the incumbent panders to the partisan voter than to the opponent. As a result, at the threshold, the incumbent is more likely to pander if she targets the partisan than she targets the opponent.

We could also show that $p_h(\hat{d};\kappa,\rho,\pi) > p_l(\hat{d};\kappa,\rho,\pi)$. The value $p_h(\hat{d};\kappa,\rho,\pi)$ and $p_l(\hat{d};\kappa,\rho,\pi)$ are pinned down by the following equations.

$\pi(\rho + (1-\rho)p_h) + (1-\pi)((1-\rho) + \rho p_h) = \pi\kappa(\frac{1}{\kappa-\hat{d}} - 1)$

$\pi(\rho + (1-\rho)p_l) + (1-\pi)((1-\rho) + \rho p_l) = \pi\kappa(\frac{1}{\kappa+\hat{d}} - 1)$.

Based on the fact that $\pi(\rho + (1-\rho)p) + (1-\pi)((1-\rho) + \rho p)$ is increasing in p and that $\pi\kappa(\frac{1}{\kappa-\hat{d}} - 1) > \pi\kappa(\frac{1}{\kappa+\hat{d}} - 1)$, we have $p_h(\hat{d};\kappa,\rho,\pi) > p_l(\hat{d};\kappa,\rho,\pi)$. □