Verifiable Advice from a Conservative Agency

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Substantive setting of special interest: strategic communications between policymakers (elected officials) **and bureaucratic agencies**

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$\rightarrow$ Higher degree of preference misalignment can lead to **more informative** communication

Related Literature

- Full disclosure in games of verifiable advice: seminal papers by **Milgrom** (1981), **Grossman** (1981); for review see **Milgrom** (2008)
- Partial disclosure in games of verifiable advice
  - uninformed sender **Dye** (1985), **Jung and Kwon** (1988)
  - uncertainty about sender's preferences **Wolinsky** (2003), **Dziuda** (2011), **Seidmann and Winter** (1997)
  - multidimensional advice **Callander, Lambert and Matouschek** (2021)
- Games of communication within hierarchy (cheap talk)
  - divergence in preferences $\rightarrow$ worse communication: seminal paper by **Crawford and Sobel** (1982), **Gilligan and Kreihbiel** (1987), **Austen-Smith** (1990, 1993)
  - except **Callander** (2008)

Road Map

1. Introduction
2. Model
   - Game Structure
   - Equilibrium Characterization
   - Effects of Agency's Policy Preferences
   - Belief-Stable Equilibria
3. Generalization
4. Summary

Actors and Timing

There are two strategic players: the Agency (it) and the Policymaker (she).

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2	The Agency observes the state (ω)	ω
3	The Agency chooses which message (m) to send to the Policymaker	$m(\omega) \in \{\omega, \varnothing\}$
4	The Policymaker observes message (m) and chooses policy (p) to implement	$\mathrm{p(m)} \in \mathbb{R}$

Payoffs and Solution Concept

- Agency:

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- Policymaker:

$$u_P(p) = -(p - \omega)^2.$$

Solution Concept: Sequential Equilibrium.

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Equilibrium Characterization

When Policymaker observes $m \neq \varnothing$, she implements $p^*(m = \omega) = \omega$.

Otherwise, the Policymaker chooses $p^*(\varnothing) = x^* \equiv E[\omega | m = \varnothing; m^*(\omega)]$.

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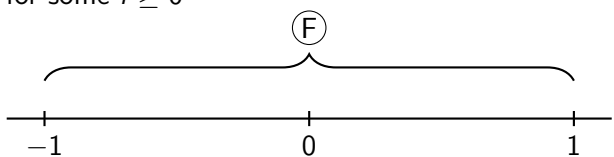
$\omega \in [x^*, 2 \cdot i - x^*] \cap [-1, 1]$ and conceals otherwise.

Equilibrium Outcomes

There can be a *maximum* of three disclosure strategies supported in equilibrium

1. **Full disclosure strategy**;

Disclosure intervals for some $i \geq 0$



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2. **Partial disclosure strategy:**
   - **Guarded disclosure (G);**
   - **Expansive disclosure (E).**

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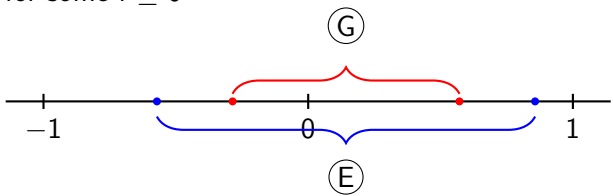

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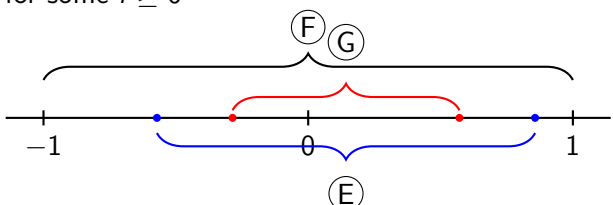

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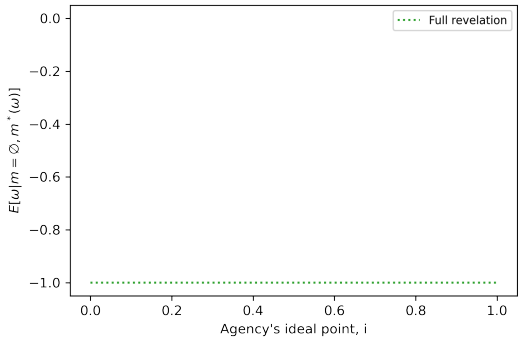
Effects of A's Policy Preferences (i) on Policy Absent Disclosure

Prop.1 Increasing i, the difference between the Agency's ideal point and the Policymaker's ex-ante expected ideal point,

1. has no effect on x^* in the fully revealing equilibrium;



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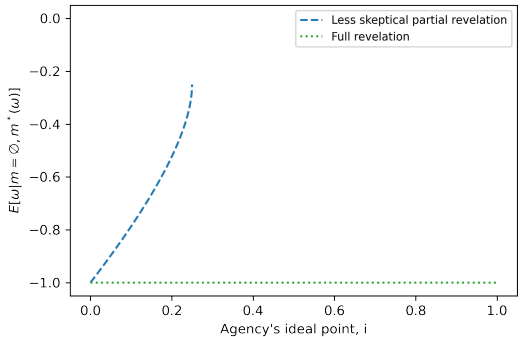

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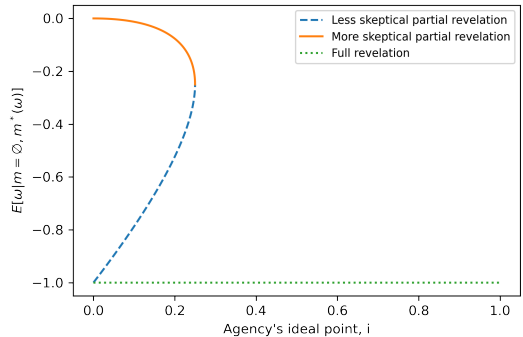
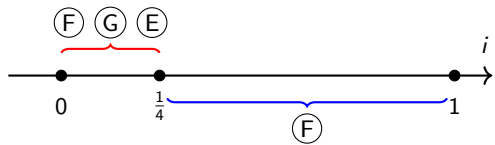
3. decreases x^* in the guarded equilibrium.



Effects of Policy A's Preference (i) on Equilibria

Prop.

1. If $i \in [0, 1/4]$, there are three equilibria: fully-revealing, guarded, and expansive;
2. If $i > 1/4$, there is a unique equilibrium – fully revealing equilibrium.



Effect of A's Policy Preferences (i) on Equilibrium Disclosure

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$$\omega \in [x, 2 \cdot i - x] \cap [-1, 1],$$

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- Indirect effect
  - $\rightarrow$ Improves communication in the **guarded** equilibrium

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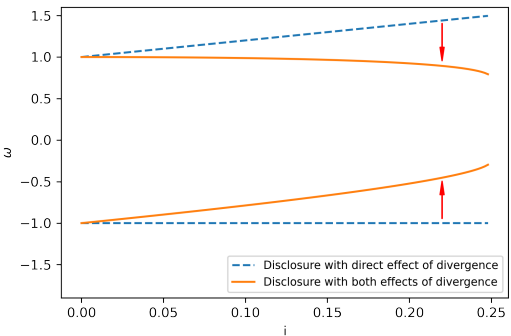

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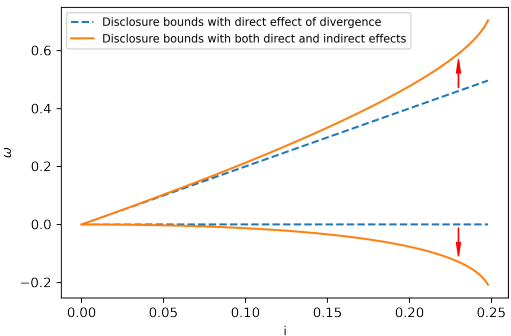

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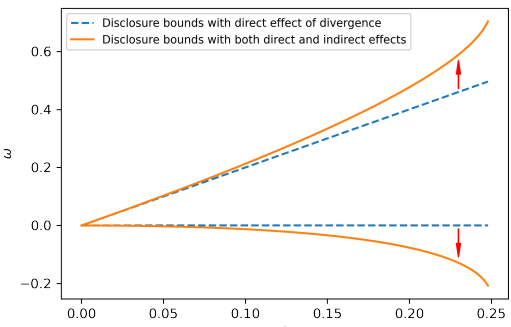

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- $\rightarrow$ *deteriorate* in i in expansive equilibrium;
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- $\rightarrow$ *not affected* by i in the equilibrium with full disclosure.

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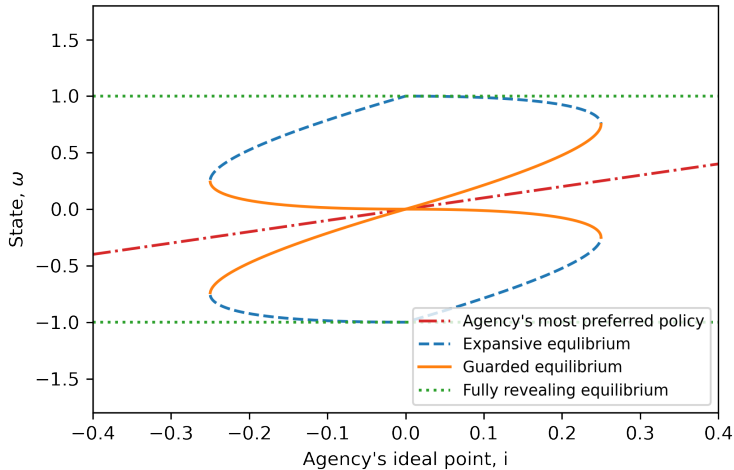

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Belief-Stable Equilibria

When $i \geq 0$, the lower bound of the Agency's disclosure must coincide with Policymaker's belief about state absent disclosure.

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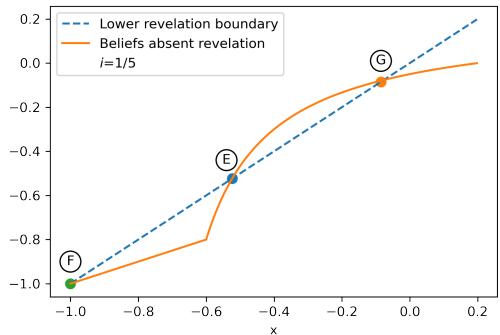

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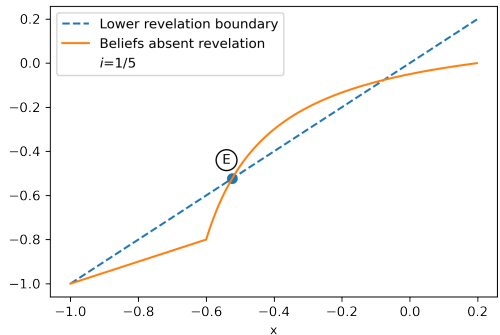

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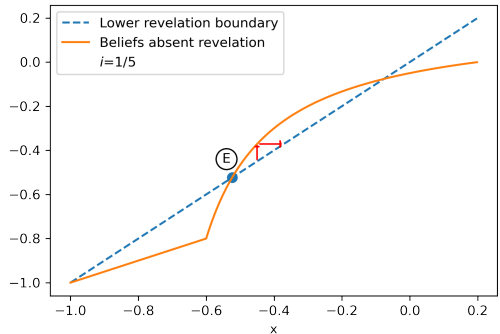
Imagine, there is slight perturbation to the Policymaker's beliefs in **expansive** equilibrium.



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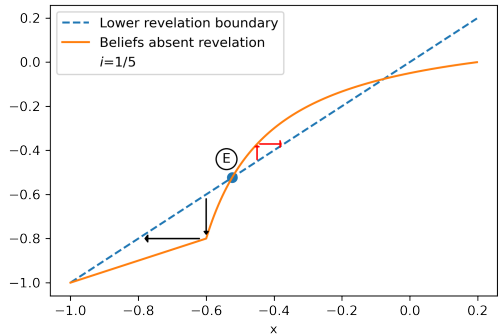
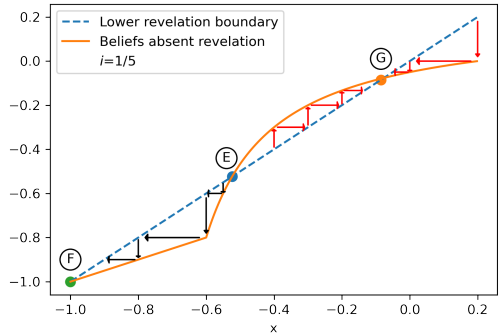
Regardless of the direction of perturbation, this equilibrium will 'collapse.'



Belief-Stable Equilibria

Def.1 Consider a sequential equilibrium (σ, μ) and a perturbed system of beliefs μ_i^ε. Let σ^ε be sequentially rational given the beliefs $(\mu_i^\varepsilon, \mu_{-i})$, and let $\hat{\mu}_i^\varepsilon$ be consistent with σ^ε. If there exists an $\varepsilon > 0$ such that, for every μ_i^ε that satisfies $|\mu_i^\varepsilon(x) - \mu_i(x)| < \varepsilon$, condition $|\hat{\mu_i^\varepsilon}(x) - \mu_i(x)| \leq |\mu_i^\varepsilon(x) - \mu_i(x)|$ is satisfied for all decision nodes x assigned to i, then we say that equilibrium (σ, μ) is **belief-stable for player i**. If equilibrium (σ, μ) is belief-stable for every player i, then we say it is **belief-stable**.



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Prop.

1. Fully revealing equilibrium is belief-stable when $i > 0$;
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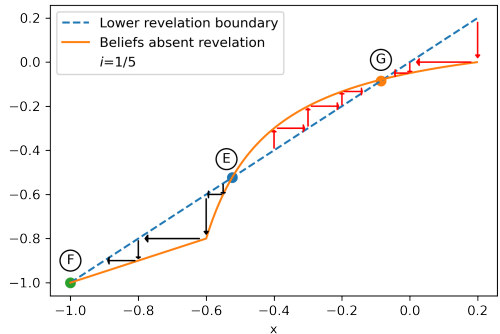
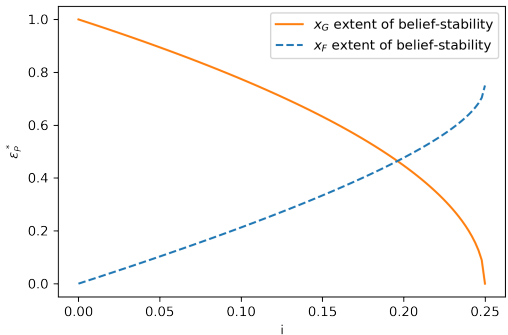
3. Expansive equilibrium is never belief-stable.



Extent of Belief-Stability

Prop. As i **decreases**, $i \in [0, \frac{1}{4}]$,

1. the extent of belief stability of the fully revealing SE **decreases**; and
2. the extent of belief stability of the guarded SE **increases**.



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2. Model
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General Model: Actors and Timing

There are two strategic players: the Agency (it) and the Policymaker (she).

1	Nature determines the state of the world ($\omega \in [\underline{\Omega}, \overline{\Omega}]$)	$\omega \sim F(\cdot)$ such that $\int_{\underline{\Omega}}^{\overline{\Omega}} x \cdot f(x)dx = 0$
2	The Agency observes the state ω	ω
3	The Agency chooses which message (m) to send to the Policymaker	$m \in \{\omega, \varnothing\}$
4	The Policymaker observes message (m) and chooses policy ($p(\omega)$) to implement	$p \in \mathbb{R}$

General Model: Characterization

Prop. In all sequential equilibria in this game

$$p^* = \begin{cases} m \text{ if } m \neq \varnothing, \\ x^* \text{ if } m = \varnothing \end{cases} \quad ; \quad m^* = \begin{cases} m = \omega \text{ if } \omega \in [i - \sqrt{(i - x^*)^2}, i + \sqrt{(i - x^*)^2}], \\ m = \varnothing \quad \textit{else}, \end{cases}$$

where $x^* \equiv E[\omega | m = \varnothing, m^*]$.

Full Disclosure: Uniqueness

Prop. There exists an interval $I^* \subseteq (\underline{\Omega}/2, \overline{\Omega}/2)$ such that, for $i \notin I^*$, the unique equilibrium is full-disclosure, and for $i \in I^*$, there **exist** multiple equilibria, including those with partial disclosure.

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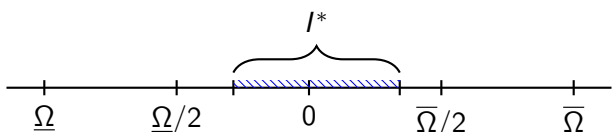

*stylized image

Multiple Equilibria

Let X^* denote the set of all equilibrium policies selected by the Policymaker absent disclosure:

$$X^* \equiv \{x^* : x^* = E[\omega | m = \varnothing, m^*]\}.$$

Order the elements of the set X^* such that when $s > t$, $|x_s^*| > |x_t^*| : X^* = \{x_1^*, x_2^*, ...\}$.

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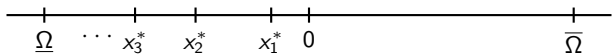

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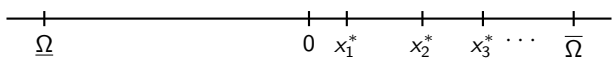

Multiple Equilibria: Analysis

Prop. All equilibrium disclosure intervals are nested:

$$\forall k > j,\ [i - \sqrt{(i - x_j^*)^2}, i + \sqrt{(i - x_j^*)^2}] \subset [i - \sqrt{(i - x_k^*)^2}, i + \sqrt{(i - x_k^*)^2}].$$

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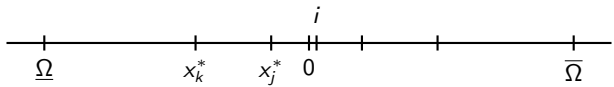

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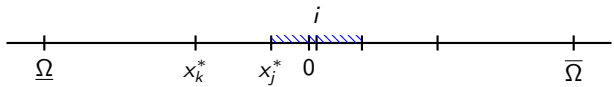

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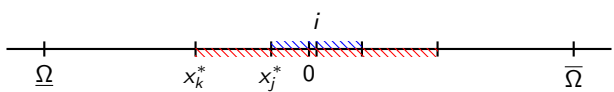

Multiple Equilibria: Comparative Statics

Prop. For all j, equilibrium policy selected absent disclosure x_j^*

1. weakly decreases in i when $j = 2 \cdot k - 1 : k \in \mathbf{N}$,
2. weakly increases in i when $j = 2 \cdot k : k \in \mathbf{N}$.

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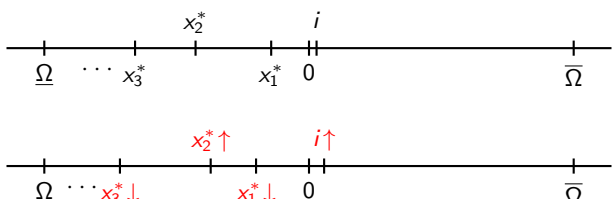

Effect of Preferences Divergence ($|i|$) on Equilibrium Disclosure

The Agency is disclosing state to the Policymaker when

$$\omega \in [i - \sqrt{(i - x^*)^2}, i + \sqrt{(i - x^*)^2}] \cap [-1, 1],$$

and conceals information otherwise.

The departure of the Agency's preferences from zero has direct and indirect effects on disclosure.

- Direct effect always (*weakly*) improves communication between the Agency and the Policymaker
- Indirect effect
  - $\rightarrow$ Improves communication in equilibria with **odd-indexed** policies absent disclosure
  - $\rightarrow$ Reduces communication in equilibria with **even-indexed** policies absent disclosure

Effect of Preferences Divergence ($|i|$) on Equilibrium Disclosure

Prop. The Agency's equilibrium disclosure

1. increases in divergence between the Agency's and the Policymaker's ex ante ideal points, $|i|$, in equilibria with odd-indexed policies absent disclosure;
2. decreases in divergence between the Agency's and the Policymaker's ex ante ideal points, $|i|$, in equilibria with even-indexed policies absent disclosure.

General Model: Belief Stability

Prop. Equilibria with odd-indexed policies absent disclosure are belief-stable. Equilibria with even-indexed policies absent disclosure are not belief-stable.

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$\Rightarrow$ **Corrolary.** Equilibria are belief-stable $\Leftrightarrow$ equilibrium communication **improves** in preference divergence. Equilibria are not belief-stable $\Leftrightarrow$ equilibrium communication **worsens** in preference divergence.

Road Map

1. Introduction
2. Model
3. Generalization
4. Summary

- Discrete Example
- Disclosure Reward
- Policymaker's bias
- Optimal Choice of Agency
- Perturbations to Agency's policy preferences **TBA**

Summary

A model of **verifiable communication** between a Policymaker and a Bureaucratic Agency

1. When Sender's optimal policy is close to the mean of the distribution, unraveling can stop before being complete;
2. Higher ex-ante preference divergences can encourages the Agency to disclose more information;
3. Equilibria where communication deteriorate in preference divergence are not belief-stable.

Thank you!

Example: Actors and Timing

There are two strategic players: the Agency (it) and the Policymaker (she).

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③	The Agency chooses which message (m) to send to the Policymaker	$m(\omega) \in \{\omega, \varnothing\}$

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③	The Agency chooses which message (m) to send to the Policymaker	$m(\omega) \in \{\omega, \varnothing\}$
④	The Policymaker observes message (m) and chooses policy (p) to implement	$\mathrm{p(m)} \in \mathbb{R}$

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Example: Payoffs and Solution Concept

- Agency:

$$u_A(p) = -(p - i)^2.$$

Example: Payoffs and Solution Concept

- Agency:

$$u_A(p) = -(p - i)^2.$$

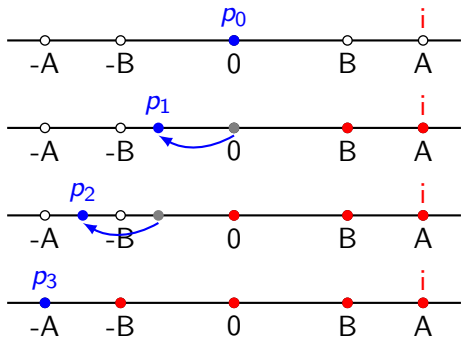
- Policymaker:

$$u_P(p) = -(p - \omega)^2.$$

Solution Concept: Sequential Equilibrium. Back to Road Map

Revelation Dynamics: Full Disclosure

- Let $i = A$
- The only equilibrium is one with full revelation



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Revelation Dynamics: Partial Disclosure

- Let $i = B$, $i \leq 3 \cdot A/7$
- When Policymaker observes $m = \omega$

$$p = \omega$$

Revelation Dynamics: Partial Disclosure

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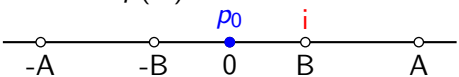

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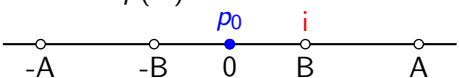
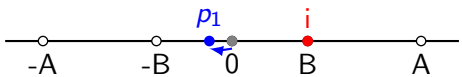


$\rightarrow$ The Agency discloses B; but then $p(\varnothing) = p_1 \rightarrow$ disclose $\omega = 0$



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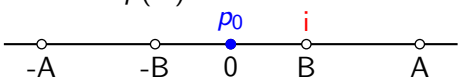

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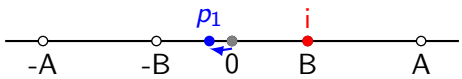
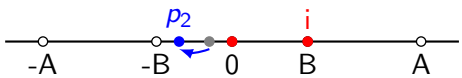


$\rightarrow$ Policymaker implements $p(\varnothing) = p_2$



Revelation Dynamics: Partial Disclosure

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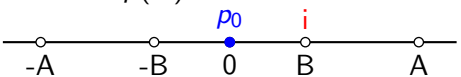

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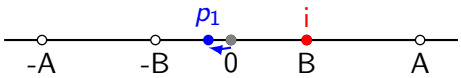

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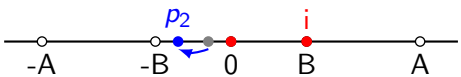
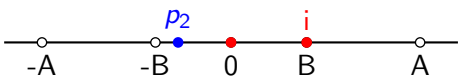


→ Equilibrium



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Introducing Disclosure Reward, R

The Agency receives a lump sum gain R when it shares information

$$u_A(p) = \begin{cases} -(p-i)^2 + R, & m \neq \varnothing; \\ -(x-i)^2, & m = \varnothing. \end{cases}$$

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Model with Reward: Equilibrium Characterization

The Policymaker implements $p^*(m) = m$, when she observes $m = \omega$.

She chooses a policy x^* otherwise.

The Agency discloses the state ω when $\omega \in [i - \sqrt{(i-x)^2 + R}, i + \sqrt{(i-x)^2 + R}]$, and conceals information otherwise.

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Model with Reward: Effects on Communication

Lemma. Holding fixed Policymaker's choice absent disclosure, informativeness of communication between actors improves in R.

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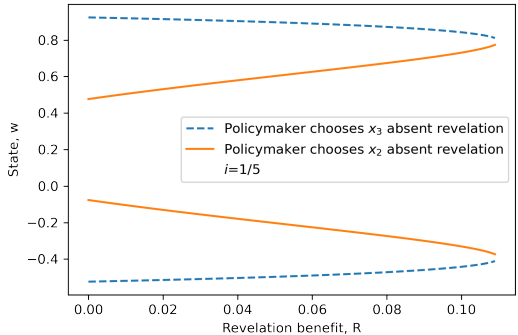
Proposition. Communication

- improves in R in guarded equilibrium;
- deteriorates in R in expansive equilibrium;



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Introducing Policymaker's Bias, b

The Policymaker wishes to implement policies co-aligned with her bias b

$$u_P(p) = -(p - \omega - b)^2,$$

we assume $b > 0$.

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Model with Policymaker's bias: Equilibrium Characterization

The Policymaker implements $p^*(m) = m + b$, when she observes $m \neq \varnothing$.

She chooses a policy $E[\omega|m = \varnothing] + b$ otherwise.

The Agency discloses the state ω when

$$\omega \in \begin{cases} [2 \cdot (i - b) - x, x] \cap [-1, 1], & i - b < 0; \\ [x, 2 \cdot (i - b) - x] \cap [-1, 1], & i - b > 0, \end{cases}$$

and conceals information otherwise.

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Model with Policymaker's bias: Equilibria

There can be a *maximum* of three equilibrium outcomes in this game

1. Full disclosure;
2. Partial disclosure:
   - *Guarded* disclosure strategy;
   - *Expansive* disclosure strategy.

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Model with Policymaker's bias: Comparative Statics

Communication between actors

1. is not affected by the Policymaker's bias in fully revealing equilibrium;
2. improves as Policymaker's bias departs from the Agency's ideal point in guarded equilibrium;
3. deteriorate as Policymaker's bias departs from the Agency's ideal point in expansive equilibrium.

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Model with Policymaker's bias: Belief Stability

1. Fully revealing equilibrium is belief stable when the Policymaker's bias is different from the Agency's ideal point and not belief stable otherwise;
2. Guarded equilibrium is always belief stable;
3. Expansive equilibrium is never belief stable.

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Agency's Competence: Game Modification

Companion paper: DHL 2024

1	Nature determines the state of the world (ω)	$\omega \sim N(0,1)$
2	The Agency of known competence (θ) observes private signal (s) about the state	$s = \omega + \varepsilon$, $\varepsilon \sim N(0, 1/\theta)$
3	The Agency chooses which message (m) to send to the Policymaker	$m \in \{s, \varnothing\}$
4	The Policymaker observes message (m) and chooses policy (p) to implement	$p \in \mathbb{R}$

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Agency's Competence: Agency's Disclosure Strategy

Policymaker implements policy $p = \frac{m}{1+1/\theta}$, when observes informative message m.

Agency of competence θ discloses its signal to the Policymaker if and only if

$$s \geq -\frac{\sqrt{R+d}\cdot(1+\theta)}{\theta} - b,$$

and

$$s \leq \frac{\sqrt{R+d}\cdot(1+\theta)}{\theta} - b.$$

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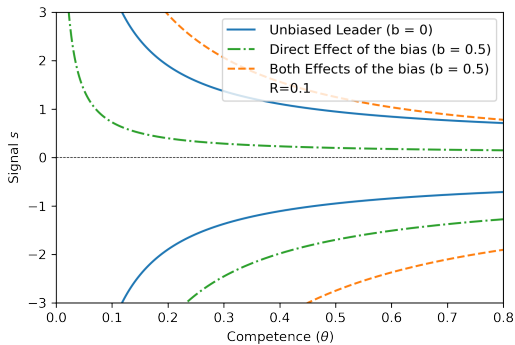

Sequential Rationality of Reward Scheme

Assume the Policymaker can choose whether to award R to the Agency.

- In the unique payoff-dominant (for the Policymaker) equilibrium, the Policymaker never awards less than R for disclosure;
- In the unique payoff-dominant (for the Policymaker) equilibrium, the Policymaker always awards disclosure and never awards lack thereof.

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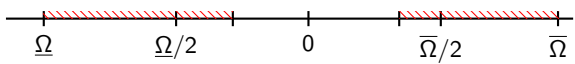
PM's Choice of the Agency

- Why pursue conformity?
  - Cheap-talk literature (seminal paper by **Crawford and Sobel**, 1982): more divergence $\rightarrow$ less communication;
  - "Ally principal" (see **Bendor and Meirowitz**, 2004): more divergence $\rightarrow$ less delegation.
- Why avoid conformity?
  - Incentives to acquire information (**Che and Kartik**, 2009);
  - Incentives to acquire expertise (**Gailmard and Patty**, 2007);
  - Incentives to exert effort (**Prendergast, 2007**).

This paper's contribution: preference divergence guarantee full-disclosure uniqueness.



In shaded areas of the stylized image, full disclosure is the unique equilibrium.

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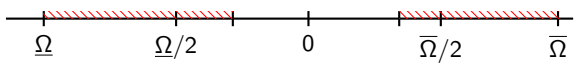

In shaded areas of the stylized image, full disclosure is the unique equilibrium.

Further, PM's utility is **weakly increasing** in the preference divergence in all belief-stable equilibria; It depends on preference divergence **non-monotonically** only in not belief-stable equilibria.