# Strategic Abuse and Accuser Credibility

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# Motivation

Many crimes/abuses are hard to verify with smoking-gun evidence:

↪ workplace bullying, discrimination, sexual assault, etc.

Prevalent way to assess innocence:

↪ using potential victims' unverifiable reports.

**Research Questions:**

1. How informative are these reports?

   How does the number of potential reports affect informativeness?

2. How do unverifiable reports affect the incentives to commit crimes?

3. How to improve informativeness and reduce crime?

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# Overview

Model: Endogenous incentives to commit and report crimes.

↪ A potential offender decides who to commit crimes against.

↪ Potential victims decide whether to file report or not, may have private benefits/costs from accusations.

↪ Convict/Acquit depends on prob of guilty after observing all reports.

Takeaway messages:

1. Multiple potential victims + large punishment to the convicted.

⇒ Uninformative reports & significant prob of crime.

Contrasts to single potential victim benchmark: Large punishment

⇒ Informative reports & vanishing prob of crime.

2. Reducing punishment.

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# Roadmap

1. Baseline model.

2. Main results & intuition.

3. Restore informativeness & reduce crime.

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# Baseline Model

A game between:

- ↪ 1 potential abuser (principal, *e.g. supervisor*);
- ↪ $n$ potential victims (agents, *e.g. subordinates*),

  indexed by $i \in \{1, 2, ..., n\}$ with $n \geq 1$;
- ↪ 1 Bayesian judge;

that unfolds in three stages.

# Stage 1

Principal chooses $\theta \equiv \{\theta_1, ..., \theta_n\} \in \{0,1\}^n$.

$\hookrightarrow$ $\theta_i = 1$: Commit a crime against agent $i$.

$\hookrightarrow$ $\theta_i = 0$: Does not commit a crime against agent $i$.

# Stage 2

Agent $i$ observes two pieces of private info:

1. the principal's choice of $\theta_i$
2. realization of a payoff shock $\omega_i \sim N(\mu, \sigma^2)$, i.i.d.

Agents simultaneously choose $\{a_1, a_2, ...a_n\} \in \{0,1\}^n$:

↪ $a_i = 1$: Agent $i$ files a report against the principal.

↪ $a_i = 0$: Agent $i$ does not file a report against the principal.

Agent $i$ can file a report regardless of $\theta_i$.

↪ The informativeness of his report is endogenous.

Minor technical detail (for refinement):

↪ With small but positive prob, an agent is *mechanical* and files a report with exogenous prob $\alpha \in (0,1)$. Details

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# Stage 3

The judge observes $\mathbf{a} \equiv \{a_1, a_2, \ldots, a_n\}$ and updates his belief about the prob with which the principal is guilty:

$$\Pr\Big( \underbrace{\sum_{i=1}^{n} \theta_i \geq 1}_{\text{event that principal is guilty}} \;\Big|\; \mathbf{a} \Big)$$

Then the judge decides whether to *convict* or *acquit* the principal.

- ↪ Convict: principal loses his job or removed from power.
- ↪ Acquit: principal stays in power.

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Then the judge decides whether to *convict* or *acquit* the principal.

↪ Convict: principal loses his job or removed from power.

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# Payoffs

Principal's payoff: $\sum_{i=1}^{n} \theta_i - L \cdot \mathbf{1}\{\text{Principal is convicted}\}$.

Agent $i$'s payoff:

- $\hookrightarrow$ $0$ if the principal is convicted,
- $\hookrightarrow$ $\omega_i - b\theta_i - ca_i$ if the principal is acquitted.

Judge has a quadratic payoff function, s.t.

- $\hookrightarrow$ If $\Pr\left(\sum_{i=1}^{n} \theta_i \geq 1 \middle| \mathbf{a}\right) > \pi^*$, then strictly prefer to convict.
- $\hookrightarrow$ If $\Pr\left(\sum_{i=1}^{n} \theta_i \geq 1 \middle| \mathbf{a}\right) < \pi^*$, then strictly prefer to acquit.
- $\hookrightarrow$ If $\Pr\left(\sum_{i=1}^{n} \theta_i \geq 1 \middle| \mathbf{a}\right) = \pi^*$, then indifferent.

where $\pi^* \in (0,1)$ is an exogenous cutoff.

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# Interpretation of Parameters

- $L > 0$: Punishment of conviction relative to the marginal benefit of committing a crime.
- $b > 0$: An agent's loss from failing to convict his abuser.
- $c > 0$: An agent's loss from the principal's retaliation.
- $\pi^* \in (0, 1)$: Conviction threshold, captures the society's/judge's ideology towards the two types of errors.

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# Roadmap

1. Baseline model.

2. Main results & intuition.
   - Equilibrium refinement.
   - Single-agent vs two-agent.
   - Comparative statics w.r.t. number of agents.

3. Restore informativeness & reduce crime.

# Refinement: Monotone-Responsive Equilibrium

## Sequential Equilibrium + Two Additional Requirements

$q : \{0,1\}^n \to [0,1]$, mapping from report profiles to prob of conviction.

1. Responsiveness: $q(0,0,...,0) = 0$.
2. Monotonicity: If $\mathbf{a} \succeq \mathbf{a}'$, then $q(\mathbf{a}) \geq q(\mathbf{a}')$.

Role of responsiveness: Rules out trivial equilibria s.t.

↪ the principal chooses $\theta_1 = ... = \theta_n = 1$ with prob 1,

↪ the principal is convicted no matter what.

(uses the mechanical type perturbation)

Role of monotonicity: Endow reports with meanings.

↪ Satisfied when principal can optimally commit to *retaliation plans* (privately) against each agent.

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# Existence & Properties

**Lemma**

*For every $(n, b, c, \pi^*)$, there exists $\overline{L} > 0$ such that when $L > \overline{L}$, a monotone-responsive equilibrium exists.*

In what follows, focus on environments with large $L$,

↪ common properties of *all* monotone-responsive equilibria.

**Preliminary observation:** Crime happens with interior probability.

**Lemma**

*In every equilibrium that satisfies responsiveness,* $\Pr(\sum_{i=1}^{n} \theta_i \geq 1) \in (0,1)$.

1. If prob of crime is 0, then conviction will never happen,

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# Benchmark: Single-Agent

**Proposition (Single Agent)**

*When $n = 1$ and $L \to \infty$, the informativeness of report, measured by:*

$$I_s \equiv \frac{\Pr(\textit{agent reports} \mid \theta = 1)}{\Pr(\textit{agent reports} \mid \theta = 0)}$$

*converges to $+\infty$ and the equilibrium prob of crime converges to 0.*

Takeaway: One potential victim & severe punishment of conviction

↪ Arbitrarily informative report.

↪ Vanishing prob of crime.

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# Result: Two-Agent Scenario

**Theorem**

*When $n = 2$ and $L \to \infty$, the aggregate informativeness of agents' reports, measured by*

$$I_m \equiv \frac{\Pr(\textit{both agents report} \mid \sum_{i=1}^{2} \theta_i \geq 1)}{\Pr(\textit{both agents report} \mid \sum_{i=1}^{2} \theta_i = 0)}$$

*converges to 1 and the equilibrium prob of crime converges to $\pi^*$.*

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# Intuition: Single-Agent Benchmark

Agent's equilibrium strategy is characterized by two cutoffs $(\omega^*, \omega^{**})$,

- ↪ When $\theta_i = 1$, report iff $\omega_i \leq \omega^*$.
- ↪ When $\theta_i = 0$, report iff $\omega_i \leq \omega^{**}$.

Important property of single-agent benchmark: $\omega^* - \omega^{**} = b$.

As $L \to +\infty$, we have $\omega^*, \omega^{**} \to -\infty$.

Tail property of normal distributions: $\forall\, b > 0$,

$$\lim_{\omega \to -\infty} \Phi(\omega)/\Phi(\omega - b) = \infty,$$

- ↪ applies to all *thin-tail* distributions.
- ↪ agent's report becomes arbitrarily informative in the limit.

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# Intuition: Two-Agent Scenario

When $L$ is very large, two reports are required to convict the principal.

↪ Otherwise, principal has strict incentive not to commit any crime.

Principal's decisions to commit crimes are strategic substitutes.

In equilibrium, principal will choose three actions with positive prob:

↪ $(\theta_1, \theta_2) = (0, 0)$,

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# Two-Agent Scenario (continued...)

From agent $i$'s perspective:

$\hookrightarrow$ Incentive to coordinate report with agent $j$ to avoid retaliation cost $c$.

What does this coordination motive imply?

$\hookrightarrow$ If $\theta_i = 1$, then he knew $\theta_j = 0$ for sure
$\Rightarrow$ discourages agent $i$ to report.

$\hookrightarrow$ If $\theta_i = 0$, then he knew that $\theta_j = 1$ with significant prob
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Every agent's equilibrium strategy is still summarized by $(\omega^*, \omega^{**})$,

$\hookrightarrow$ but unlike the single-agent benchmark, $\omega^* - \omega^{**} < b$.

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Every agent's equilibrium strategy is still summarized by $(\omega^*, \omega^{**})$,

↪ but unlike the single-agent benchmark, $\omega^* - \omega^{**} < b$.

# Two-Agent Scenario (continued...)

From agent $i$'s perspective:

$\hookrightarrow$ Incentive to coordinate report with agent $j$ to avoid retaliation cost $c$.

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# Two-Agent Scenario: Summary

What's going on...

1. Large $L$

   $\Rightarrow$ Endogenous negative correlation between $\theta_1$ and $\theta_2$.

2. Retaliation cost $c$ & large $L$

   $\Rightarrow$ Endogenous coordination motive among agents.

Effect on informativeness of reports & prob of crime:

$\Rightarrow$ Decrease agent $i$'s incentive to report when $\theta_i = 1$.

Increase agent $i$'s incentive to report when $\theta_i = 0$.

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# Comparative Statics w.r.t. Number of Agents

Aggregate informativeness when there are $n$ agents:

$$I_n \equiv \frac{\Pr(n \text{ agents report} \mid \sum_{i=1}^{n} \theta_i \geq 1)}{\Pr(n \text{ agents report} \mid \sum_{i=1}^{n} \theta_i = 0)}$$

**Theorem**

*For every $n, k \in \mathbb{N}$ with $n > k$, if we increase the number of agents from $k$ to $n$ under a large enough $L$, then*

1. *The aggregate informativeness of reports decreases.*
2. *The equilibrium prob of crime increases.*
3. *Prob with which each agent reports increases.* Why?

**Takeaway:** Lack of informativeness is not caused by the scarcity of reports.

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# Roadmap

1. Baseline model.
2. Main results & intuition.
3. Restore informativeness & reduce crime.

# Ways to restore informativeness

1. Offset the negative correlation of agents' private info.

2. Offset the coordination motive among agents.

# Offset the negative correlation of agents' private info

**Solution:** Chooses an intermediate $L$.

$\Rightarrow$ Principal's incentives to commit crimes are complements.

$\Rightarrow$ Positive correlation between agents' private info.

$\Rightarrow$ Coordination improves informativeness & decreases prob of crime.

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# Offset the coordination motive among agents

**Solution:** Transfer $c$ to agent $i$ iff he is the lone accuser.

$\Rightarrow$ Constant distance between the two reporting cutoffs.

$\Rightarrow$ Arbitrarily informative as $L \to \infty$.

# Summary

What we do:

- $\hookrightarrow$ interaction between incentives to commit and report crimes,
- $\hookrightarrow$ endogenously assess the informativeness of reports.

What we show: with multiple agents & large punishment of conviction:

- $\hookrightarrow$ Endogenous negative correlation between agents' private info,
- $\hookrightarrow$ Endogenous coordination motive among agents.
- $\Rightarrow$ Uninformative reports & significant prob of crime.
- $\hookrightarrow$ Reducing punishment or rewarding lone accuser improves informativeness and decreases crime.

Flag:

- $\hookrightarrow$ Equilibrium analysis $\Rightarrow$ people's behavior in the *steady state*.

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# Extensions

Endogenous negative correlation & coordination motives reduce informativeness & increase crime extends when:

- ↪ Principal has private info about cost/benefit of committing crimes.

  e.g. with small prob, the principal hates committing crimes,

  e.g. with small prob, the principal is a serial assaulter.
- ↪ Principal's marginal benefit from committing crimes is decreasing.
- ↪ Punishment for committing multiple crimes is harsher.
- ↪ After conviction, evidence arrives with positive prob that falsifies a false accusation, then agent who submitted false report is punished.
- ↪ Alternative specifications of mechanical types' strategies.
- ↪ Cost of accusation is positive when the principal is convicted.
- ↪ Sequential reporting.

# Related Literature

1. **Failure of info aggregation:** Scharfstein and Stein (90), Banerjee (92), Austen-Smith and Banks (96), Morgan and Stocken (08).

   **Difference:** Negatively correlated private info, arises endogenously.

2. **Voting:** Feddersen and Pesendorfer (96,97,98), Ali et al.(18).

   **Difference:** Endogenous voting rule & info structure.

3. **Global games:** Carlson and Van Damme (93), Morris and Shin (98), Baliga and Sjöström (04), Chassang and Padró i Miquel (10)

   **Difference:** State orthogonal to normal signal & negative correlation.

4. **Law and econ:** Lee and Suen (18), Silva (18), Baliga et al.(18)

   **Difference:** Incentives to commit crimes are endogenous, interaction between committing crimes and reporting crimes.

5. **Inspection games:** Dresher (62).

   **Difference:** Judge cannot inspect, elicit info from biased agents.

# Normal *vs* Mechanical Types

Each agent is

- ↪ *Normal* with probability $\delta$.
- ↪ *Mechanical* with probability $1-\delta$.

Independent across agents and independent of $\{\omega_1, ..., \omega_n\}$.

How does it affect behavior?

- ↪ Normal agent flexibly chooses $a_i$ to maximize his payoff.
- ↪ Mechanical agent automatically reports with prob $\alpha \in (0,1)$.

$\delta \in (0,1)$ is close to 1, i.e. mechanical types are perturbations. Back

# More on Mechanical Types

Why need a small prob of mechanical types?

$\hookrightarrow$ Strengthens equilibrium refinement.

$\hookrightarrow$ Guarantees existence after refinement.

Robust against mechanical types' strategies:

$\hookrightarrow$ Mechanical type's strategy $\Theta_i \times \mathbb{R} \to \Delta\{0,1\}$.

$\hookrightarrow$ Our results extend as long as

$$1 > \Pr(\text{mechanical type reports } | \theta_i = 1)$$

$$\geq \Pr(\text{mechanical type reports } | \theta_i = 0) > 0.$$

Back

# Why prob of report increases when $n$ increases?

Single agent: Let $q_s$ be prob of conviction after 1 report.

↪ Threshold when $\theta_i = 1$: $\omega_s^* = c - \frac{c}{q_s}$.

↪ Principal's indifference condition:

$$\frac{1}{\delta L} = q_s\Big(\Phi(\omega_s^*) - \Phi(\omega_s^{**})\Big)$$

Two agents: Let $q_m$ be prob of conviction after 2 reports.

↪ Threshold when $\theta_i = 1$: $\omega_m^* = c - \frac{c}{q_m Q_0}$,

where $Q_0$ is the prob of agent $j$ reports conditional on $\theta_i = 1$.

↪ Principal's indifference condition:

$$\frac{1}{\delta L} = q_m\Big(\Phi(\omega_m^*) - \Phi(\omega_m^{**})\Big)Q_0$$

Back

# Show $\omega_m^* > \omega_s^*$

Suppose towards a contradiction that $\omega_m^* \leq \omega_s^*$, then

$\hookrightarrow$ $\omega_s^* = c - \frac{c}{q_s}$ and $\omega_m^* = c - \frac{c}{q_m Q_0}$ imply that $q_m Q_0 \leq q_s$.

From the principal's indifference conditions:

$$q_m Q_0 \left( \Phi(\omega_s^*) - \Phi(\omega_s^{**}) \right) \leq q_s \left( \Phi(\omega_s^*) - \Phi(\omega_s^{**}) \right)$$

$$= 1/\delta L = q_m Q_0 \left( \Phi(\omega_m^*) - \Phi(\omega_m^{**}) \right).$$

Therefore,

$$\Phi(\omega_s^*) - \Phi(\omega_s^{**}) \leq \Phi(\omega_m^*) - \Phi(\omega_m^{**}).$$

On the other hand, since $\omega_s^* \geq \omega_m^*$ and $\omega_s^* - \omega_s^{**} = b > \omega_m^* - \omega_m^{**}$,

$$\Phi(\omega_s^*) - \Phi(\omega_s^{**}) > \Phi(\omega_m^*) - \Phi(\omega_m^{**}).$$

We have a contradiction. Back

# Show $\omega_m^{**} > \omega_s^{**}$

Since we have shown that $\omega_m^* > \omega_s^*$,

$\hookrightarrow$ moreover, $\omega_s^* - \omega_s^{**} = b > \omega_m^* - \omega_m^{**}$

$\hookrightarrow$ therefore, $\omega_m^{**} > \omega_s^{**}$.

In general, an individual agent is more likely to report when there are more potential victims, regardless of the value of his $\theta_i$.

Back