Mediation and Costly Evidence

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Introduction

Information asymmetry is at the heart of many inefficient resource allocations, leading to bargaining impasse.

Mediation is increasingly adopted to alleviate informational problem between the disputants

- Facilitative mediation: mediator *transmits* information (Myerson, 1991; Horner et al., 2015)
- Evaluative mediation: evidence-based recommendation-making $\Rightarrow$ mediator *acquires* information

This paper:

- Analyze any hybrid of the two prominent types of mediation
- What is the *efficient* mediation procedure?

Preview of Results

Facilitation is always involved in efficient mediation

Evaluation is required by efficient mediation if and only if efficiency demands all cases to be settled

In an efficient mediation plan,

- weak cases are settled by facilitative mediation;
- strong cases are settled by evaluative mediation if required;
- settlement for stronger case is based on more precise yet risky evidence

The Model: Primitives

State $\omega \in \Omega := [\underline{\omega}, \overline{\omega}]$ drawn from common prior $\mu^0(\omega)$.

Plaintiff *privately* observes ω, and sends a message $m_1 \in \mathcal{M}_1$ to Mediator.

Mediator commits whether to pay a cost $C \geqslant 0$ to acquire an evidence $D \subset \Omega$ and collects $\{t_1(m_1), t_2(m_1)\}$ if the parties reach an agreement, based on m_1. Evidence conclusive with prob. $\eta(D)$, otherwise inconclusive.

Mediator converts the message m_1 and the evidence to another message $m_2 \in \mathcal{M}_2$ according to a committed random mapping $\tilde{\pi}_D(m_2|m_1, \rho_D)$, and announces m_2 to both parties.

Based on $\{m_2, t_1, t_2\}$, the two parties decide upon a recommended allocation $(x - t_1, -x - t_2)$. Rejection leads to default allocation $(\omega - L_1, -\omega - L_2)$ (e.g. trial, strike, war).

The Model: Payoffs

Plaintiff:

$$u_1 = \begin{cases} x - t_1 & \text{if an agreement is reached,} \\ \omega - L_1 & \text{otherwise.} \end{cases}$$

Defendant:

$$u_2 = \begin{cases} -x - t_2 & \text{if an agreement is reached,} \\ -\omega - L_2 & \text{otherwise.} \end{cases}$$

Mediator maximizes $\mathbb{E}[u_1 + u_2]$,

- using allocation x, transfers t_1, t_2 as design variables
- subject to the players' incentive compatibility and obedience constraints

The Model: Roadmap

Given a direct mediation plan $\{\pi_0(x|\cdot), \pi_1(y|\cdot), I(\cdot), t_i(\cdot)\}$, define

$$p_\pi(\omega) = \int_{\underline{\omega}-L_1}^{\overline{\omega}+L_2} \pi_0(x|\omega)dx, \quad p_\pi(\omega)x_\pi(\omega) = \int_{\underline{\omega}-L_1}^{\overline{\omega}+L_2} x\pi_0(x|\omega)dx$$

$$q_\pi(\omega) = \int_{\underline{\omega}-L_1}^{\overline{\omega}+L_2} \pi_1(y|\omega)dy, \quad q_\pi(\omega)y_\pi(\omega) = \int_{\underline{\omega}-L_1}^{\overline{\omega}+L_2} y\pi_1(y|\omega)dy$$

The expected payoffs for the plaintiff:

$$X_1(\omega,\hat{\omega}) = p_\pi(\hat{\omega})[x_\pi(\hat{\omega}) - t_1(\hat{\omega})] + (1 - p_\pi(\hat{\omega}))(\omega - L_1)$$

$$Y_1(\omega,\hat{\omega}) = \begin{cases} q_\pi(\omega)[y_\pi(\omega) - t_1(\omega)] + (1 - q_\pi(\omega))(\omega - L_1) & \text{if } \hat{\omega} = \omega, \\ \omega - L_1 & \text{if } \hat{\omega} \neq \omega. \end{cases}$$

The Model: Costly Auditing

Mediation problem:

$$\max_{\substack{\pi_0(x|\cdot),\pi_1(y|\cdot),\\ I(\cdot),t_i(\cdot)}} \int_0^1 \left(I(\omega)\sum_i X_i(\omega) + (1-I(\omega))\sum_i Y_i(\omega)\right)\mu^0(\omega)\mathrm{d}\omega$$

$$\text{s.t.} \quad \int_0^1 \left(I(\omega)q_\pi(\omega)\sum_i t_i(\omega) + (1-I(\omega))\,p_\pi(\omega)\sum_i t_i(\omega)\right)\mu^0(\omega)\mathrm{d}\omega \leqslant C\int_0^1 I(\omega)\mu^0(\omega)\mathrm{d}\omega$$

$$X_1(\omega,\omega) + I(\omega)[Y_1(\omega,\omega) - X_1(\omega,\omega)] \geqslant \omega - L_1, \quad \forall\omega$$

$$X_2(\omega,\omega) + I(\omega)[Y_2(\omega,\omega) - X_2(\omega,\omega)] \geqslant -\mathbb{E}_{\mu^1}[\omega] - L_2, \quad \forall\omega$$

$$X_1(\omega,\omega) + I(\omega)[Y_1(\omega,\omega) - X_1(\omega,\omega)] \geqslant \max\{X_1(\omega,\hat\omega) + I(\hat\omega)[Y_1(\omega,\hat\omega) - X_1(\omega,\hat\omega)],\ \omega - L_1\}, \quad \forall\omega,\hat\omega$$

Facilitative Mediation: Extreme Point Theorem

Consider the following program

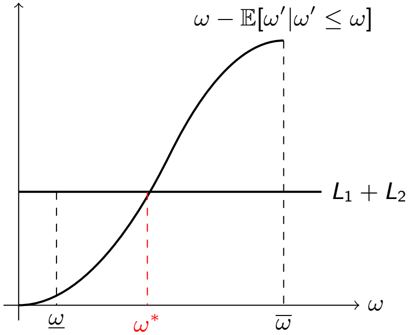
$$\min_{p_\pi(\omega)} \quad [L_1 + L_2] \int_0^1 [1 - I(\omega)][1 - p_\pi(\omega)]\mu^0(\omega)\mathrm{d}\omega$$
$$\text{s.t.} \quad p_\pi(\omega) \text{ is non-increasing}$$

Lemma

$p_\pi(\omega)$ solves the above program if there exists a ω^* such that

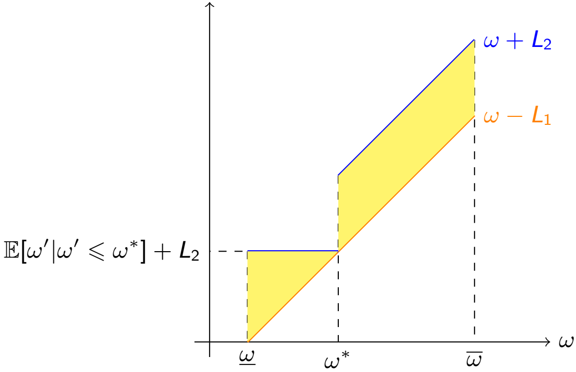
$$p_\pi(\omega) = \begin{cases} 1 & \text{if } \omega \leqslant \omega^*, \\ 0 & \text{if } \omega > \omega^*. \end{cases}$$

Facilitative Mediation



ω^* exists $\Leftrightarrow$ $\omega^* - L_1 \leq \mathbb{E}[\omega' | \omega' \leqslant \omega^*] + L_2$.

Evaluative Mediation



Lemma

$q_\pi(\omega) = 1$ for any $\omega \in \{\omega | I(\omega) = 1\}$ if $t_1(\omega) + t_2(\omega) \leqslant L_1 + L_2$ for $\omega > \omega^*$.

Efficient Mediation

Lemma

$\{\omega | I(\omega) = 1\}$ is a nonempty connected set if (i) $C \leqslant L_1 + L_2$, (ii) $q_\pi(\omega)$ is non-decreasing.

$$I(\omega) = \begin{cases} 1 & \text{if } q_\pi(\omega) - p_\pi(\omega) \geqslant \frac{C}{L_1 + L_2}, \\ 0 & \text{otherwise.} \end{cases}$$

Lemma

In any efficient mediation plan, (i) $t_1(\omega) = t_2(\omega) = 0$ whenever $I(\omega) = 0$, (ii) $t_1(\omega) + t_2(\omega) = C$ whenever $I(\omega) = 1$.

Efficient Mediation: Costly Auditing

Proposition

An efficient mediation plan with costly auditing is characterized by a threshold ω^* *such that:*

$$\omega^* = \sup\{\omega | \omega - \mathbb{E}[\omega' | \omega' \leq \omega] = L_1 + L_2\}.$$

(i) For any $\omega \leqslant \omega^*$, $I(\omega) = 0$, $t_1(\omega) = t_2(\omega) = 0$, $p_\pi(\omega) = 1$, *and* $x_\pi(\omega) = \omega^* - L_1$.

(ii) For any $\omega > \omega^*$*:*

- *If* $C \leq L_1 + L_2$, *then* $I(\omega) = 1$, $t_1(\omega) + t_2(\omega) = C$, $q_\pi(\omega) = 1$, $y_\pi(\omega) \in [\omega - L_1 + t_1(\omega), \omega + L_2 - t_2(\omega)]$;
- *If* $C > L_1 + L_2$, *then* $I(\omega) = 0$, $t_1(\omega) = t_2(\omega) = 0$, $p_\pi(\omega) = 0$.

Efficient Mediation: Costly Evidence

Theorem

An efficient mediation plan with costly evidence is characterized by two thresholds $\{\omega^*, \omega_I^*\}$ such that:

$$\begin{aligned} \omega^* &= \sup\{\omega | \omega - \mathbb{E}[\omega' | \omega' \leqslant \omega] = L_1 + L_2\}, \\ \omega_I^* &= \min\left\{\overline{\omega},\ \sup\{\omega | \omega - \mathbb{E}_\eta[\omega' | \omega' \in [\omega^*, \omega]] = L_1 + L_2 - C\}\right\}. \end{aligned}$$

(i) For any $\omega \leqslant \omega^*$, $D(\omega) = \emptyset$, $t_1(\omega) = t_2(\omega) = 0$, $p_\pi(\omega) = 1$, and $x_\pi(\omega) = \omega^* - L_1$;

(ii) For any $\omega > \omega^*$:

- *if $C > L_1 + L_2$, then $D(\omega) = \emptyset$, $t_1(\omega) = t_2(\omega) = 0$, $p_\pi(\omega) = 0$;*
- *if $C \leqslant L_1 + L_2$, then $D(\omega) = [\omega, \overline{\omega}]$, $t_1(\omega) + t_2(\omega) = C$, $q_\pi(\omega) = 1$, $y_\pi(\omega) \in [\omega - L_1 + t_1(\omega), \omega + L_2 - t_2(\omega)]$.*

(iii) For any $\omega \in [\omega^*, \omega_I^*]$, $r_\pi(\omega) = 1$, $z_\pi(\omega) = \omega_I^* - L_1$,

(iv) For any $\omega > \omega_I^*$, $r_\pi(\omega) = 0$.

Discussion and Conclusion

Unmediated negotiation

- cannot achieve the mediated outcome (Shavell, 1989; Sobel, 1989; Farmer and Pecorino, 2005; Horner et al., 2015)
- three reasons for silence: withholding evidence, evidence unavailable, evidence under-provision

Policy implications: mediation default

- no knowledge of L_1, L_2 is required: if some parties opt out, it must be efficient to do so ($C > L_1 + L_2$)
- advances in information technology keep driving C down