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The strategy of manipulating joint decision-making

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HIGHLIGHTS

- We consider how a better-informed agent manipulates joint decision-making.
- We extend the analysis of Che et al. (2013) to multiple decision-makers.
- We study how the heterogeneity of the outside option value affects communication.
- Only the decision-maker with better outside option is critical in equilibrium.

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ABSTRACT

We study a model of strategic persuasion based on the theory of cheap talk, in which a better-informed agent manipulates two decision-makers' joint decision on alternative proposals. With the heterogeneity of two decision-makers' value of the outside option, *only* the decision-maker with the better outside option is critical in determining whether communication is truthful, overselling, or ineffective.

1. Introduction

We study a model of strategic communication by a better-informed agent manipulating two decision-makers' joint decision on alternative proposals when the decision-maker's value of the outside option differs. In our model, the agent strategically oversells a conditionally better-looking proposal by recommending it even when ex post better proposals are present. Che et al. (2013) refer to this strategic communication as "pandering". Whereas Che et al. (2013) consider the strategic persuasion of a single decision-maker, we extend the model to multiple decision-makers and study how the heterogeneity of the outside option value changes the agent's communication. We find that only the decision-maker with higher value of the outside option is critical in determining equilibrium outcome.

Our model is suitable for situations in which the agent has a significant information advantage over the decision-makers and has a strong incentive to exaggerate in order to get a proposal implemented, such as pre-trial hearings and settlement negotiations by legal consultants between disputing parties. Other applications include labor attorneys mediating disputes between firms and unions, interest groups seeking mutual ratification by multiple political parties, and international organizations attempting to influence international treaties on the provision of global public goods.

2. The model

We study perfect Bayesian equilibria of a cheap talk game with one sender and two receivers. There are three players: an agent ("fact-finder"[1]) and two decision-makers ("DMs") denoted

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[1] A fact-finder is a neutral party who possesses "disputed material facts … for fact finding, analysis, and recommendation" according to 45 C.F.R. Section 1641.21

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as $j \in \{H, L\}$. The DMs simultaneously choose from the set $\{0, 1, 2\}$, where we interpret 0 as the outside option and $\{1, 2\}$ as the set of alternative proposals 1 and 2. If the DMs jointly agree to implement proposal $i \in \{1, 2\}$, all players enjoy a common payoff θ_i drawn from a distribution F_i, where the payoff is private information of the fact-finder. Otherwise, if the outside option is chosen, the fact-finder's payoff is zero, whereas H and L's payoffs are θ_0^H and θ_0^L, respectively, such that $\theta_0^H > \theta_0^L$, where the payoffs from the outside option are common knowledge.[2] Payoffs refer to von Neumann–Morgenstern utilities, and the players are expected utility maximizers.

We maintain the following assumptions on θ_0^H, θ_0^L, and (F_1, F_2):

Assumption 1. For each $i \in \{1, 2\}$ and for each $j \in \{H, L\}$, $\text{support}(\theta_i) = [\underline{\theta}_i, \bar{\theta}_i]$ with $0 \le \underline{\theta}_i < \theta_0^j < \bar{\theta}_i \le \infty$.

Assumption 2. For each $i \in \{1, 2\}$ and for each $j \in \{H, L\}$, there exists $\gamma > 0$ such that $\mathbb{E}[\theta_i|\theta_i > \gamma\theta_{-i}] > \theta_0^j$.

Assumption 3. For each $i \in \{1, 2\}$, F_i is absolutely continuous with a density f_i which is strictly positive on $(\underline{\theta}_i, \bar{\theta}_i)$ with $\mathbb{E}[\theta_i] < \infty$.

Assumption 1 implies that each proposal has a positive probability of being better than the outside option for all DMs. Assumption 2 implies that the posterior expected payoff of any proposal is better than the outside option for all DMs if the proposal is sufficiently better than the other proposal. Assumption 3 is for technical convenience.

Observing $\boldsymbol{\theta} := (\theta_1, \theta_2) \in \Theta := \prod_{i=1}^{2}[\underline{\theta}_i, \bar{\theta}_i]$, the fact-finder sends a costless message $m \in M$, where M is a message space. We focus on equilibria where (i) the fact-finder chooses a message $i \in \{1, 2\}$, where message i corresponds to recommending proposal i; and (ii) given the recommendation i, the DMs randomize between the outside option and i.[3]

Then, for each $j \in \{H, L\}$, a strategy for j is an acceptance vector $\boldsymbol{q}^j = (q_1^j, q_2^j) \in [0, 1]^2$, where q_i^j denotes the probability that j accepts proposal i for each $i \in \{1, 2\}$. Given $i \in \{1, 2\}$ and $j \in \{H, L\}$, we use the notation $-i$ to denote proposal 2 if $i = 1$ and proposal 1 if $i = 2$; $-j$ to denote decision-maker L if $j = H$, and decision-maker H if $j = L$.

Given a pair of acceptance vectors $(\boldsymbol{q}^H, \boldsymbol{q}^L)$, the optimal strategy $\mu : \Theta \to \Delta(\{1, 2\})$ for the fact-finder is given by

$$\mu_i(\boldsymbol{\theta}) = 1 \quad \text{if } q_i^H q_i^L \theta_i > q_{-i}^H q_{-i}^L \theta_{-i}, \tag{1}$$

where $\mu_i(\boldsymbol{\theta})$ is the probability that the fact-finder with private information $\boldsymbol{\theta}$ recommends proposal i. For each j, the optimality of j's strategy conditional on the strategies of $-j$ and the fact-finder implies the following conditions for each i:

$$\begin{aligned} q_i^j > 0 &\Rightarrow \mathbb{E}[\theta_i|q_i^j q_i^{-j}\theta_i > q_{-i}^j q_{-i}^{-j}\theta_{-i}] \\ &\ge \max\left\{\theta_0^j, \mathbb{E}[\theta_{-i}|q_i^j q_i^{-j}\theta_i > q_{-i}^j q_{-i}^{-j}\theta_{-i}]\right\}, \end{aligned} \tag{2}$$

$$\begin{aligned} q_i^j = 1 &\Leftarrow \mathbb{E}[\theta_i|q_i^j q_i^{-j}\theta_i > q_{-i}^j q_{-i}^{-j}\theta_{-i}] \\ &> \max\left\{\theta_0^j, \mathbb{E}[\theta_{-i}|q_i^j q_i^{-j}\theta_i > q_{-i}^j q_{-i}^{-j}\theta_{-i}]\right\}. \end{aligned} \tag{3}$$

These conditions (1), (2), and (3), together with $\Pr\{\boldsymbol{\theta} : q_i^H q_i^L \theta_i \ge q_{-i}^H q_{-i}^L \theta_{-i}\} > 0$, are necessary and sufficient in any equilibrium. We omit the proof as it follows from the proof of Lemma 2 in Che et al. (2013).

3. Results

Analogous to Che et al. (2013), an equilibrium with $q_i^H q_i^L = 0, \forall i$, is called a zero equilibrium. We regard communication in zero equilibrium as ineffective. If both DMs accept any recommendation with probability one, then it is optimal for the fact-finder to be truthful in the sense that he always recommends the better proposal. An equilibrium with $q_i^j = 1, \forall i, \forall j$, is called a truthful equilibrium. If $\min\{q_1^H q_1^L, q_2^H q_2^L\} > 0$ and the probability of implementing proposal i is higher than that of implementing proposal $-i$ such that $q_i^H q_i^L > q_{-i}^H q_{-i}^L > 0$, then such an equilibrium is called an *overselling* equilibrium. In an overselling equilibrium, the fact-finder distorts his recommendation toward i even when the payoff of the other proposal $-i$ is ex post higher. Finally, an equilibrium with $(\boldsymbol{q}^H, \boldsymbol{q}^L)$ is the largest when $(q_1^H q_1^L, q_2^H q_2^L) > (q_1^{H\prime} q_1^{L\prime}, q_2^{H\prime} q_2^{L\prime})$ for any other equilibrium with $(\boldsymbol{q}^{H\prime}, \boldsymbol{q}^{L\prime}) \ne (\boldsymbol{q}^H, \boldsymbol{q}^L)$. An equilibrium with $(\boldsymbol{q}^H, \boldsymbol{q}^L)$ is the best if $(\boldsymbol{q}^H, \boldsymbol{q}^L)$ Pareto dominates any other equilibrium when the fact-finder learns $\boldsymbol{\theta}$ but the DMs do not.

Our analysis requires an appropriate stochastic ordering of the proposals' value, and we borrow Definition 1 from Che et al. (2013):

Definition. Proposal 1 is strongly ordered relative to proposal 2 if

$$\mathbb{E}[\theta_1|\theta_1 > \theta_2] > \mathbb{E}[\theta_2|\theta_2 > \theta_1], \tag{4}$$

and for any $i \in \{1, 2\}$,

$$\mathbb{E}[\theta_i|\theta_i > \gamma\theta_{-i}] \text{ is nondecreasing in } \gamma \text{ for } \gamma \in (0, \bar{\theta}_i/\underline{\theta}_{-i}). \tag{5}$$

We call proposal 1 the conditionally better-looking proposal, because it yields a higher posterior expected payoff if the fact-finder makes a truthful recommendation of the better proposal.

Given the strong ordering assumption, we obtain a characterization of the best equilibrium with respect to different values of the outside option as follows:

Proposition 1. *Assume that proposal* 1 *is strongly ordered relative to proposal* 2*.*

(1) *If* $\boldsymbol{q} = (\boldsymbol{q}^H, \boldsymbol{q}^L)$ *is an equilibrium with* $q_1^H q_1^L > 0$*, then* $q_1^H q_1^L \ge q_2^H q_2^L$*; if, in addition,* $q_2^H q_2^L < 1$*, then* $q_1^H q_1^L > q_2^H q_2^L$*.*
(2) *There is a largest equilibrium* $(\boldsymbol{q}^{H*}, \boldsymbol{q}^{L*})$ *which is the best equilibrium. There exist* $\theta_0^* = \mathbb{E}[\theta_2|\theta_2 > \theta_1]$ *and* $\theta_0^{**} \ge \theta_0^*$ *such that*
   (a) *If* $\theta_0^H \le \theta_0^*$*, the best equilibrium is the truthful equilibrium,* $(\boldsymbol{q}^{H*}, \boldsymbol{q}^{L*}) = ((1, 1), (1, 1))$*.*
   (b) *If* $\theta_0^H \in (\theta_0^*, \theta_0^{**})$*, the best equilibrium is an overselling equilibrium such that* $\boldsymbol{q}^{H*} = (1, q_2^*)$ *and* $\boldsymbol{q}^{L*} = (1, 1)$ *for some* $q_2^* \in (0, 1)$*.*
   (c) *If* $\theta_0^H > \theta_0^{**}$*, only the zero equilibrium exists such that* $(\boldsymbol{q}^{H*}, \boldsymbol{q}^{L*}) = ((0, 0), (0, 0))$*.*

Part 1 of Proposition 1 implies that if the conditionally better-looking proposal is recommended on equilibrium path, either the equilibrium is truthful or the fact-finder "oversells" proposal 1 by recommending it even when it is ex post worse. While Part 1 conforms to the result in Che et al. (2013), our innovation over theirs is in Part 2; it implies that, in the largest equilibrium, H's value of the outside option is the only determining factor whether an equilibrium is truthful, overselling, or zero. Notice that, in an overselling equilibrium, L always accepts proposal 2 with probability one.

In particular, Part 2(a) says that if the outside option is sufficiently bad for H, then the best equilibrium is the truthful

(d) (2010). In our contexts, as information provision, a fact-finder is endowed with independent knowledge of the private information about available settlement proposals' benefits.

[2] The case with $\theta_H = \theta_L$ is analogous to Che et al. (2013).

[3] This can be justified by Lemmas 1 and 8 of Che et al. (2013).