Discriminatory Information Disclosure

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Releasing different amounts of additional information to different buyer types dominates full disclosure in terms of seller revenue.

Discriminatory information disclosure

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Settings and Notation

- Consumer(buyer) Valuation: $\omega \in \Omega \equiv [\underline{\omega}, \bar{\omega}]$
- Consumer ex ante type: $\theta \in \Theta \equiv [\underline{\theta}, \bar{\theta}]$
- $F(\cdot \mid \theta)$ be the conditional distribution function over Ω

Assumption:

We say that θ is "higher" than $\tilde{\theta}$ if $F(\omega \mid \theta) \leq F(\omega \mid \tilde{\theta})$ for all $\omega \in [\underline{\omega}, \bar{\omega}]$, with strict inequality for a positive measure of ω. (first-order stochastic dominance)

Timing

- Seller commits a disclosure policy together with a selling mechanism.
- Buyer decides whether to participate; if he does, the buyer reports his ex ante type to the seller.
- Buyer privately receives new information about his valuation
- The seller' s mechanism is then implemented, which concludes the game.

Disclosure Policy

$\langle S, \rho \rangle$ is a signal space S and a mapping $\rho : \Omega \to \Delta S$
Full disclosure: $S = \Omega$,

$$\rho(s \mid \omega) = \begin{cases} 1 & \text{if } s = \omega \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

Binary Partition:

$$\rho(s \mid \omega) = \begin{cases} 1 & \text{if } s = s_{-} \text{and } \omega < \kappa \\ 1 & \text{if } s = s_{+} \text{and } \omega \geq \kappa \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

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Discrete Type

$\Theta = \{\theta_1, \ldots, \theta_n\}$, with $i > j$ implying that θ_i is higher than θ_j,
ϕ_i denote the probability of the type being θ_i, and let $\Phi_i = \sum_{j=1}^{i} \phi_j$

For full disclosure, any mechanism can be represented as a menu of (a_i, p_i), where a_i is the nonrefundable advance payment in period 1 and p_i is the strike price in period 2.

$$\begin{aligned} (\mathrm{IR}_i) \quad & -a_i + \int_{p_i}^{\bar{\omega}} (\omega - p_i)\, dF(\omega \mid \theta_i) \geq 0, \quad \forall i \\ (\mathrm{IC}_{ij}) \quad & -a_i + \int_{p_i}^{\bar{\omega}} (\omega - p_i)\, dF(\omega \mid \theta_i) \geq -a_j + \int_{p_j}^{\bar{\omega}} (\omega - p_j)\, dF(\omega \mid \theta_i), \quad \forall i, j \end{aligned} \tag{3}$$

Discrete Type

Proposition 1

For any contracts satisfy IC and IR under full disclosure. And satisfy $p_1 < \bar{\omega}$ and $F(p_1 \mid \theta_2) < F(p_1 \mid \theta_1)$. there exists an alternative menu with partial and discriminatory disclosure that yields a strictly greater revenue.

Proof:

$$\begin{aligned}
&\hat{p}_1 = p_1 + \delta, \quad \hat{a}_1 = a_1 - \delta\left(1 - F(p_1 \mid \theta_1)\right) \\
&\hat{p}_i = p_i, \quad \hat{a}_i = a_i + \delta\left(F(p_1 \mid \theta_1) - F(p_1 \mid \theta_2)\right), \quad \forall i \geq 2
\end{aligned}$$

where δ satisfies

$$0 < \delta \leq \min_j \int_{p_1}^{\bar{\omega}} \frac{\omega dF(\omega \mid \theta_j)}{1 - F(\omega \mid \theta_j)} - p_1.$$

Proposition 2

Suppose that ex ante types are ordered in hazard rate dominance. If a menu of option contracts $(a(\theta), p(\theta))_{\theta \in \Theta}$ with differentiable $p(\theta)$ is incentive compatible and individually rational under full disclosure, the set $\{\theta : \partial F(p(\theta) \mid \theta)/\partial\theta < 0\}$ has a positive measure and $p(\theta) < \bar{\omega}$ for all θ, then there exists a binary-partition direct disclosure policy that strictly increases the seller's revenue.

Continuous Type

$$
\begin{aligned}
\hat{p}(\theta) &= p(\theta) + \delta \\
\hat{a}(\theta) &= \int_{p(\theta)}^{\bar{w}} (1 - F(\omega \mid \theta))d\omega - (1 - F(p(\theta) \mid \theta))\delta \\
&\quad - U(\underline{\theta}) - \int_{\underline{\theta}}^{\theta} \left(\int_{p(t)}^{\bar{\omega}} \left(-\frac{\partial F(\omega \mid t)}{\partial t} \right) d\omega + \frac{\partial F(p(t) \mid t)}{\partial t} \delta \right) dt
\end{aligned}
$$

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Insights

$$\frac{d\hat{U}(\theta)}{d\theta} = \frac{dU(\theta)}{d\theta} + \frac{\partial F(p(\theta) \mid \theta)}{\partial \theta}\delta < \frac{dU(\theta)}{d\theta} \tag{4}$$

The total surplus remain unchanged and the "information rent" decrease strictly.

Related Literature

[1] Dong Wei, Brett Green:Reverse Price Discrimination with Information Design

Thank you!