

Discussion on “Information Revelation and Consumer Privacy” by R. Argenziano, A. Bonatti, and G. Cisternas

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Introduction

- Scope for online firms to use individual-level data on consumers' online behavior is huge.
- Individual-level data (e.g., past purchases, browsing choices, etc) allows firms to tailor their offerings. \Rightarrow Good and bad consequences.
- This paper considers 2 kinds of firms—sellers and content providers—interacting with one consumer.
- Investigates consequences of allowing these firms to use past purchasing behavior or past browsing behavior.

Model

- 2-period model. Same consumer but different firms across periods. Private persistent type $\theta \sim N\left(\theta_0, \frac{1}{\tau_0}\right)$.
- Seller: consumer chooses nbr of units q to buy at price p .
- Website: consumer chooses action z .
- Per-period payoff:

$$U = (\theta - p)q - \frac{q^2}{2} - (z - w)^2 - (z - \theta)^2.$$

- Seller chooses p to maximize pq .
- Website chooses w to maximize $-(w - \theta)^2$.

Period 2 and Information

- q_1 determines $s_q \sim N\left(q_1, \frac{1}{\tau_q}\right)$. z_1 determines $s_z \sim N\left(z_1, \frac{1}{\tau_z}\right)$.
- Period-2 firm j observes $I_j \subseteq \{s_q, s_z\}$, where $j = S, W$.
- Focus on equilibria with “linear” strategies:

$$q_1 = \alpha_q \theta + \beta_q(p, w)$$

$$z_1 = \alpha_z \theta + \beta_z(p, w)$$

- Through α , consumer chooses how much info. to reveal about θ .
- Given period-2 firms' beliefs m_S and m_W , continuation payoff:

$$V_2 = \frac{1}{2} \left(\theta - \frac{m_S}{2} \right)^2 - \frac{1}{2} (x - m_W)^2$$

- Consumer prefers seller to under-estimate θ and website to correctly estimate θ .

Period 2 and Information

- For given information structures I_W and I_S , consumers chooses q_1 and z_1 to maximize:

$$V_1 = U_1(q_1, z_1, p_1, w_1) + \mathbb{E} \left[\frac{1}{2} \left(\theta - \frac{m_S}{2} \right)^2 - \frac{1}{2} (x - m_W)^2 \mid q_1, z_1 \right]$$

- Trade-off between maximizing flow-utility and affecting period-2 firms' beliefs.

Main results: Private Signals

- Period-2 Seller observes τ_q and period-2 website observes τ_z .
- **Prop 1:** Consumer puts weight α_q lower than myopic level. The higher τ_q , the lower α_q , and the lower p_1 . The weight α_z is inversely-U shaped, but everywhere above myopic level.
- **Prop 2:** Consumer surplus is increasing in τ_z , and inversely U-shaped in τ_q (if τ_x suff. large). Total surplus is decreasing in τ_q .

Main results: Public Signals

- **Prop 3:** Suppose $I_S = I_W = \{\tau_q\}$. The equilibrium weight α_q is inversely-U shaped in τ_q and below the myopic level for large enough τ_q . The first-period equilibrium price is decreasing in τ_q , and consumer surplus is inversely U-shaped in τ_q .
- **Prop 4:** Suppose $I_S = I_W = \{\tau_z\}$. The equilibrium weight α_z is inversely-U shaped in τ_z , and below its myopic level if τ_z suff. large. Consumer surplus is inversely U-shaped in τ_z .
- **Prop 5:**
 - ① Suppose $\tau_q = 0$. Consumer surplus is higher when browsing signal remains private.
 - ② Suppose $\tau_z = 0$. If τ_q is sufficiently large, consumer surplus is higher with public purchase signal.

Comments

Justifying the Price Discrimination Assumption

- Can firms charge different prices for an identical product based on acquired individual-level data?
- Authors invoke quality heterogeneity and search discrimination in the background.
- Other possible justification: Targeted discounts/promotions (e.g., Freshdirect).
- \Rightarrow Same list price for all consumers, but heterogeneous prices de facto.
- Other possibility: assume same firms across time.

Comments

Signals

- Currently, $s_q \sim N\left(q_1, \frac{1}{\tau_q}\right)$ and $s_z \sim N\left(z_1, \frac{1}{\tau_z}\right)$.
- If model taken literally, hard to see what could prevent q and z from being recorded accurately (esp. if same firms across time).

Different assumption:

- What if q is observed accurately, but:

$$(\theta + \varepsilon - p)q - \frac{q^2}{2}$$

where ε is a random variable. Same for z .

Comments

Comparative Statics on Welfare

- Some consumers benefit but others are hurt when τ_q changes. How does this work?

Market for Information:

- Interesting extension.
- Allow consumer to pay for privacy?
- To limit the number of possible transactions, assume same firm across periods.