Consumer Control and Privacy Policies

S. Nageeb Ali
Penn State

Greg Lewis
Amazon

Shoshana Vasserman
Stanford GSB

The world is awash in consumer data. Firms use this to:

- Assess consumer willingness to pay
- Target particular consumers for marketing campaigns
- Offer discounts (i.e. personalized pricing)

Current Ecosystem

Policies and rhetoric emphasize consumer control of data.

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"Privacy is not the opposite of sharing—rather, it is control over sharing."

The Economics of Privacy[†]

ALESSANDRO ACQUISTI, CURTIS TAYLOR, AND LIAD WAGMAN[*]

I control my data, send a verifiable message to firm

Firm responds with a personalized offer

Generate Data

Strategic framework necessary to understand implications of consumer control for markets.

Can consumers benefit from personalized pricing relative to uniform pricing?

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We model consumer control as a game of voluntary disclosure / "persuasion game":

- Consumer has characteristics that she can verifiably and voluntarily disclose to market.
- Firms draw inferences based on both what is said and what is left unsaid.
- Study both monopolistic and competitive markets.

Classical intuition: Voluntary disclosure $\Rightarrow$ Unraveling?

Is consumer control self-defeating?

If consumers interact with a monopolist:

- The ability to merely opt in and opt out does not result in consumer gains relative to uniform pricing: no consumer type is better off in any equilibrium.

- With rich forms of evidence, every consumer type may be better off.
  Key idea: Unraveling need not happen in all equilibria. Pooling $\to$ Discounts.

If consumers interact with competitive firms:

- The ability to opt in and opt out with each individual firm does result in consumer gains relative to uniform pricing. Disclosure amplifies competition.

- Consumers may be better off even in the worst equilibrium with disclosure possibilities.

Classical Pricing Problem

A single consumer ("she") has unit demand, and value v for a product.

Interacts with a monopolist who incurs no cost of production.

The value v is drawn from $[\underline{v}, \overline{v}]$ according to distribution F; for talk, $U[0, 1]$.

Consumer observes v, firm does not.

Consumer purchases product at price p only if $v > p$.

Therefore, "quantity" sold at price p is $Q(p) = 1 - F(p)$.

$$\overline{p} \equiv \arg\max_{p \in [0,1]} p Q(p).$$

Interim consumer surplus is $\max\{v - \overline{p}, 0\}$.

Static Monopolist Problem + Verifiable Disclosure.

Consumer observes valuation v.

Sends message $m \in M(v)$: $M(v)$ is set of messages available for type v.

Monopolist observes message m and sets a price $p(m)$.

Consumer chooses whether to buy product.

Neither party can commit: Perfect Bayesian Equilibria.

Suppose $M(v) = \Big\{ \{v\}, [0,1] \Big\}$ for every v.

- Message $\{v\}$ can be sent only by type v. Hence it is fully revealing.
- Message $[0,1]$ can be sent by any type. Hence it is fully concealing.
- Stylized model for track / do-not-track dichotomy.

Setting has multiple equilibria:

- Consumer always opts in & seller charges $p = v$; if she opts out, seller assumes $v = 1$.
- Consumer always opts out & seller charges $\overline{p}$; if she opts in, seller charges $p = v$.

Across all equilibria, consumer is never better off than uniform pricing.

Claim. For every equilibrium, and for every v, the interim consumer surplus is no more than $\max\left\{v - \frac{1}{2}, 0\right\}$, which is its payoff with no-personalized-pricing.

Prohibiting price discrimination is better than allowing it with an opt-out clause.

Benefits of Partial Disclosure

Consider the disclosure of evidence that one's value is below the uniform price.

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In these cases, disclosing evidence results in a price discount without hurting other consumers.

Benefits of Partial Disclosure

Let $V(M)$ be the set of types that can send message M.

Defn. An evidence technology enables group pricing if $\exists$ message M such that the seller's optimal price for $V(M) < \overline{p}$, and the optimal price for $[0,1]\setminus V(M)$ is no more than $\overline{p}$.

One example are the kinds of disclosures described earlier.

Claim. If an evidence technology enables group pricing, then there is a Pareto-improving equilibrium.
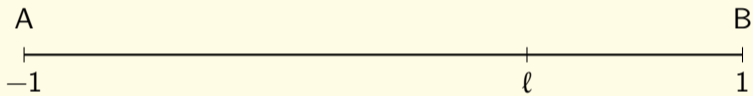
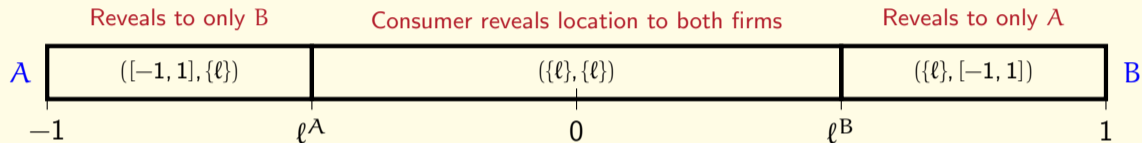Paper studies competition with $n \geqslant 2$ firms and general product differentiation.

But the economic point emerges already in Bertrand duopoly with horizontal differentiation.

Key Force: voluntary disclosure amplifies competitive forces.

Suppose consumer can opt in or opt out to each firm separately.

Consumer always reveals location to distant firm, for a price of 0.

Central consumers also reveal location to closer firm.

Extreme consumers pool with type ℓ^i; firm i charges optimal local monopoly price, assuming firm j charges 0.
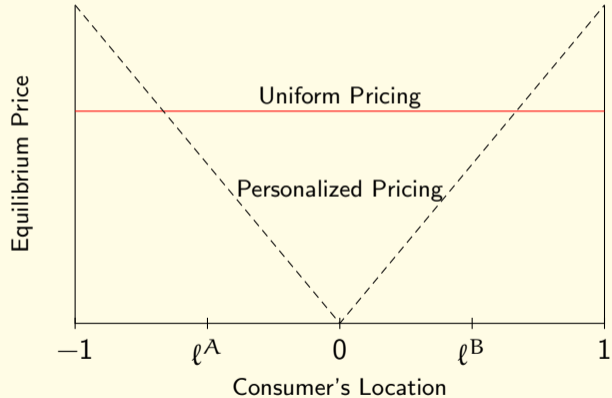
Uniform Pricing vs. Personalized Pricing

No Consumer Control

Central types benefit from
strong price competition.

Extreme types worse off if
distribution is single-peaked
and log-concave.

Thisse & Vives'88 intuition
fails for extreme types.

Equilibrium Price

Uniform Pricing

Personalized Pricing

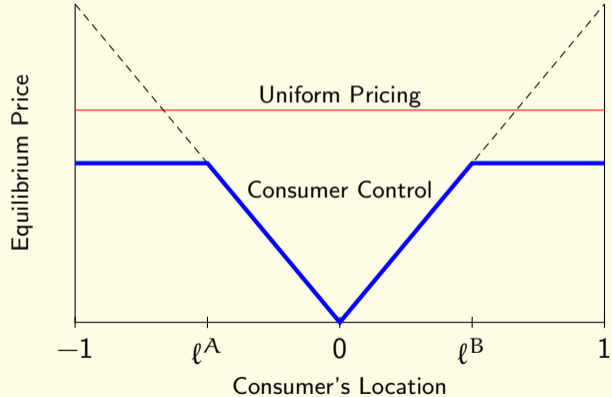-1 $\quad\ell^{A}$ $\quad 0$ $\quad\ell^{B}$ $\quad 1$

Consumer's Location

Uniform Pricing vs. Personalized Pricing

Consumer control pools extreme with central types.

All types enjoy lower prices relative to uniform pricing.

Since consumer buys from closer firm in each case, all types are better off.

Privacy Paradox: Why do consumers claim to value privacy but cede it so easily?

New extension resolves paradox through lens of optimal pricing and disclosure choices.

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Suppose cost of sending message m for type v is $c(m, v) \geqslant 0$.

Assumptions

- Full revelation is costless: $c(\{v\}, v) = 0$.
- Concealment is slightly costly: $\exists \underline{c} > 0$ such that for every type v and message $m \in M(v)\backslash\{v\}$, $c(m, v) \geqslant \underline{c}$.

Claim. The consumer fully reveals her type in every equilibrium.

Logic: Suppose otherwise, and that some other message m is sent by more than one type.

Let $\tilde{v}$ be the lowest (infimum) type that sends this message.

Upon receiving this message, monopolist charges at least $\tilde{v}$.

$\implies$ all types v in $[\tilde{v}, \tilde{v} + \underline{c})$ have a profitable deviation to the fully revealing message.

Even slight costs can lead to full unraveling.

Result has implications for default options in app tracking.

Would be interesting to study intrinsic value of privacy (in a Bayesian framework).

Framework for modeling strategic implications of consumer control.

Price discrimination can be beneficial when consumers control their data:

- Unraveling need not happen, and consumers can benefit from pooling.

- Disclosure amplifies competition.

- However, opt-in / opt-out policies insufficient with a monopolist

Framework may be useful for other questions:

- Privacy paradox.

- Set of achievable payoffs (BBM) compatible with consumer control.