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Federal Trade Commission Microeconomics Conference

October 16th, 2014

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Data brokerage: demographics, household nancial means.

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Data management platforms (BlueKai, eXelate, Krux, Lotame):

- use cookies to track consumers' behavior online;
- compile segments based on \intent" or \purchase history."
- Data point = (browser ID, user characteristics).


Step 1 Review
Boston - Logan Intl (BOS)
US Domestic Flyers
1 2

Cookie data used to target online advertising.

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Buying data about a segment $\sim$ adding a targeting category.

E.g., \Overome Tours" may buy the IDs of:

- 25,000 consumers who *have bought* a ticket to Rome;
- 50,000 consumers who *intend to purchase* a ticket.

It *tailors* bids, budgets, messages, volumes to each segment.

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I a a Da a V

Monopolist data provider knows individual users' characteristics i.

Suppose rm j wants to identify all users with match value v.

Firm j requests IDs of all users with characteristics $i : v(i, j) = v$.

\Firm j buys cookie v"

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Data about individual users sold at a constant linear price,

$$p(A_j) \triangleq p \cdot \mu(A_j).$$

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Selling Cookies (today's paper):

- Unit of sale: individual queries (realizations of a r.v.).
- Linear price per query.
- More elaborate market environment.

Selling Experiments (tomorrow's paper):

- Unit of sale: arbitrary information structures.
- Menu pricing of information.
- Abstracts from source of value.

Advertisers generate value by choosing **match intensity** q:

$$\pi(v, q) = v \cdot q - c \cdot m(q).$$

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Matching cost function $m(q)$ strictly increasing and convex.

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Suppose rm j buys cookies in the *targeted set* A.

Complete-information action $q^*(v)$ for each $v \in A$.

Constant action $q^*(A^C)$ for all $v \notin A$.

Each rm chooses a *targeted set* A to maximize

$$\int_A (\pi(v, q^*(v)) - p)\, \mathrm{d}F(v) + \int_{A^C} \pi(v, q^*(A^C))\mathrm{d}F(v).$$

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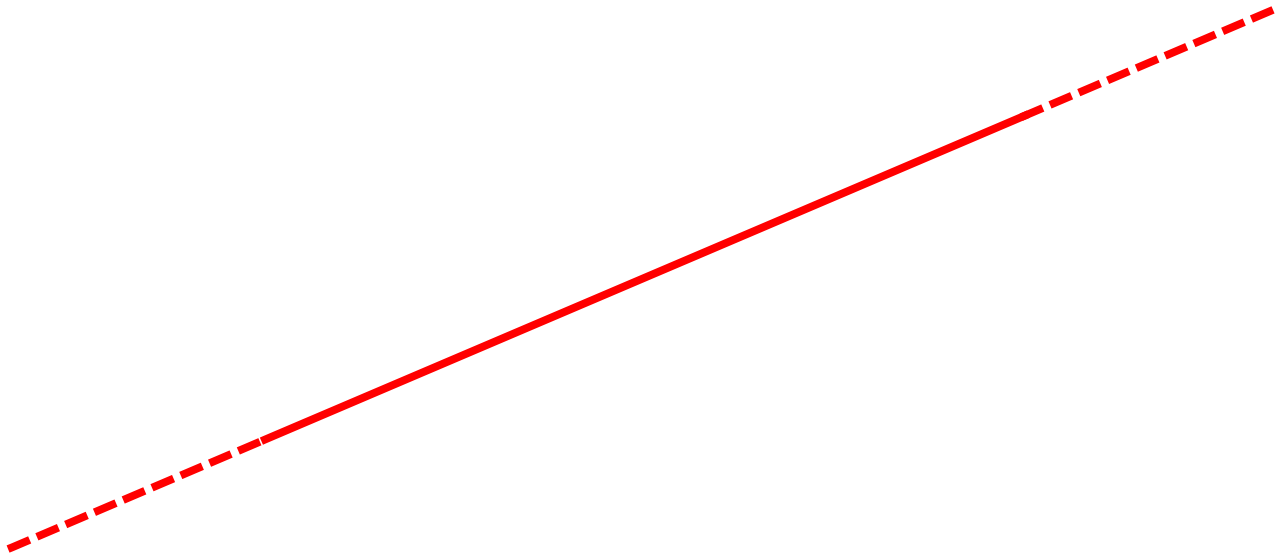
Optimal *targeted set* trades o :

- gains from adaptation to values v;
- likelihood of each realization v.

Optimal set

For any $c, p \geq 0$, *the optimal residual set* $A^C(c,p)$ *is a non-emp.ua-.Td(*

D a D y (V)



Optimal targeted set is an interval, $A = [v^*(c, p), \bar{v}]$.

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Positive vs. negative targeting vs. both depends on:

- advertising (matching) technology;
- distribution of consumers characteristics.

I.e. properties of complete-information pro ts alone.

Demand for advertising:

- Di erential spending levels within targeted set.
- Uniform (positive) spending level on residual set.

The Data Broker's Tradeoff

Assume *positive targeting* is optimal, $A(c,p) = [v^*, \bar{v}]$.

A monopolist seller chooses the threshold v^* to maximize

$$\underbrace{\left(\pi\left(v, q^*\left(v\right)\right) - \pi\left(v, q^*\left(\mathsf{E}\left[\tilde{v} \mid \tilde{v} \leq v\right]\right)\right)\right)}_{\text{price}} \underbrace{\left(1 - F\left(v\right)\right)}_{\text{quantity}}.$$

The Data vs. The Staff

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Effects of expanding supply (lowering v^*):

1. Lower marginal value of information (*i.e.* price) at $v = v^*$.
2. Lower match intensity with residual set $A^{\mathsf{C}} = [\underline{v}, v^*]$.

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and sets the price of the corresponding cookie.

Analogous to selling your own data, or data exchange.

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(D [illegible] E [illegible])

The symmetric equilibrium price with a continuum of data sellers $\bar{p}$ exceeds the monopoly price p^*.

Result extends to n independent and exclusive data sellers.

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Willingness to pay for *targeted* users depends on the *residual set*.

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Willingness to pay for *targeted* users depends on the *residual set*.

Data provider can in uence the *composition* of the residual set.

Composition e ect provides incentive to *lower* price.

Lower prices imply e ciency gains (matching).

Market structure or data availability may limit composition e ect.

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- speci c information structures;
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Extensions:

- Cross-market externalities: availability of data may increase equilibrium price of advertising space.
- Consumer surplus: advertising as matching (+) vs. division of total surplus (?).
- Value of privacy and endogenous data availability.