Payments and the D(ata) N(etwork) A(ctivities) of BigTech Platforms

by

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Main Idea

2 -sided Platforms offer 2 products

- Platform product
- 'Screening for Price discrimination' services (Info)

Here: Complementarity

- Platform product directly creates value to users
- Platform is Screening device: Price discrimination due to platform usage reduces value to users (self-inflicted)

Usage of Platform product *creates* Price Discrim. product

Examples

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- Google, Facebook, Amazon
- In Finance: Private Banks, VISA, Libra

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- Google, Facebook, Amazon
- In Finance: Private Banks, VISA, Libra
- Potentially: *Central Banks* once CBDC issued

Set-Up

Why do sellers need Platforms?

- Agents: buyers and sellers
- 3 Goods: Special goods $\{q_0, q_1\}$, generic good $\{q\}$
- Buyers
  - Buyer consumes only one of the three goods
  - Buyer preferences private, not observable by seller
  - Obervable buyers' demand: $\varepsilon \sim G[\underline{\varepsilon}, \overline{\varepsilon}]$
- Seller
  - Can produce either a special or generic good
  - Production Cost: $c'_s = 1$ (special), $c'_g = 1 + \overline{c}$ (generic),

Trading

- Buyers and Sellers are randomly matched
- Seller observes buyer's demand ε but not preference
  $\Rightarrow$ Asymm Information + Uncertainty on Trade

Set-up

Under Uncertainty on Buyer's preference:

Seller has 3 options

- Produce a special good, charge price $\overline{u}$
- Produce generic good, charge price $\overline{u}$
- Produce generic good, charge price $\underline{u}$ (always sell)

Result Under **certain** assumptions on primitives and valuation distribution:

- $\overline{u} > \underline{u} > 1 + \overline{c} > 1$
- $\underline{u} > 0.5(\overline{u} + 1) + \overline{c}$

Then the Seller always produces generic good for low price $\underline{u}$
$\Rightarrow$ Pooling: Buyer's surplus $0.5(\overline{u} - \underline{u})$

$\Rightarrow$ Seller has demand for platform **screening** which enables him to **price discriminate**

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Under other assumptions: Seller has no demand for platform. Which?

Platform Screening How?

- 4th good: Platform activity, price p per unit
- Buyer's platform demand a_i
- Buyer's platform valuation v per unit
- Screening via platform activity: $D(a_i) = \min(\delta a_i, 1)$
  probab. of learning buyer's type
- demand for seller's goods ε (not observable by platform)

Buyer maximizes expected value

$$V(\varepsilon) = \max_{a_i} \left[(v-p)a_i - \frac{a_i^2}{2} + \eta \quad \underbrace{(1 - D(a_i))}_{\substack{\text{prop. of} \\ \text{staying opaque}}} \quad \mathcal{S}_B\, \varepsilon \right]$$

$\Rightarrow$ Buyer's price for platform activity: $(p, D(a_i))$
cash and certain loss of privacy

Platform Screening

- Equ. Platform demand for $D(a_i) < 1$ (B's type uncertain)

$$a_i^*(p, \varepsilon) = (v - p) - \delta\eta\mathcal{S}_B\,\varepsilon$$

  $\Rightarrow$ demand for platform's & seller's product are neg. corr. (incentive to protect privacy)

- Data sales price: $f = \eta\mathcal{S}_S\ \delta\mathbb{E}[a_i(p, \varepsilon)\varepsilon]$
  $\Rightarrow$ value to seller increases in activity a_i (screening precis)
  $\Rightarrow$ But as demand ε increas. $\Rightarrow$ $a_i(\varepsilon)$ drops

Q: Self-selection & voluntary participation: What ε-type buyers use platform intensly? Seller has no interest in low ε types. If platform building was costly and only low $\varepsilon-$ buyers are active, platform not profitable

Platform Revenue Maximization

Platform revenue is result of two complementary products

$$\pi = \max_p \int \Big(\underbrace{\mathbf{p}\, a_i(\mathbf{p}, \varepsilon)}_{\substack{\text{revenue from buyers} \\ \text{on platfrom}}} + \underbrace{\delta\eta a_i(\mathbf{p}, \varepsilon)\mathcal{S}_S\varepsilon}_{\substack{\text{revenue from selling} \\ \text{info to sellers}}} \Big) G(\varepsilon) \tag{1}$$

Equilibrium platform demand and price

$$a_i^*(p, \varepsilon) = v - p - \delta\eta\mathcal{S}_B\,\varepsilon, \quad p^* = \frac{v - \delta\eta(\mathcal{S}_b + \mathcal{S}_S)\mathbb{E}[e]}{2}$$

- If p high $\Rightarrow$ revenue per unit of platform activity increases but activity a drops $\Rightarrow$ revenue from selling info drops
- $\Rightarrow$ Maximize activity and thus revenue from seller by setting $p = 0$ ('the GOOGLE approach') or even $p < 0$

Comment

What is the paper about?

Many key words

- Two-sided Platforms
- Privacy
- Data Mining
- Payments and Money
- Payment Adoption

Comment

Instead

- Two-sided Platforms
- Screening = potential revelation of private information ['Privacy']: privacy as alternative means of payment
- Multiproduct pricing
- Price Discrimination
- Application: Market Design ?
- ~~Data Mining~~
- ~~Payments and Money~~
- ~~Payment Adoption~~

Each of these fields has large literature: Marginal Contribution?

Comment: Contribution to the Literature?

Monopolistic two-sided platforms (How to cater to both sides?)

- Baye M., and J. Morgan (2001).“Information Gatekeepers on the Internet and the Competitiveness of Homogenous Product Markets.”American Economic Review”
- Schmalensee, R. (2002). “Payment Systems and Interchange Fees. ”Journal of IndustrialEconomics
- Rochet, Jean-Charles, and Jean Tirole. ”Cooperation among competitors: Some economics of payment card associations.” Rand Journal of economics (2002)
- Parker, Geoffrey, and Marshall W. Van Alstyne. ”Information complements, substitutes, and strategic product design.” Substitutes, and Strategic Product Design (2000).

Comment: Contribution to the Literature II?

Screening and Price Discrimination

- Mussa, Michael, and Sherwin Rosen. "Monopoly and product quality." Journal of Economic theory 18.2 (1978): 301-317.
- Maskin, Eric, and John Riley. "Monopoly with incomplete information." The RAND Journal of Economics 15.2 (1984): 171-196.
- Mirman, Leonard J., and David Sibley. "Optimal nonlinear prices for multiproduct monopolies." The Bell Journal of Economics (1980): 659-670.
- Stiglitz, Joseph E. "Monopoly, non-linear pricing and imperfect information: The insurance market." The Review of Economic Studies 44.3 (1977): 407-430.

The End

Trading Stage with Uncertainty

Surplus under Common Knlowledge of Buyer's Pref:

- Seller knows what special good the buyer likes at value $\overline{u}$ **[high valuation for special good!]**
- produce that special good at cost 1
- Seller surplus: $\overline{u} - 1$
- Buyer surplus: 0
- Total surplus under common knowledge: $\overline{u} - 1$

$$\underbrace{0.5(\overline{\mathbf{u}} + \underline{u}) - (1 + \overline{c})}_{\text{generic}} > \underbrace{\overline{\mathbf{u}} - 1}_{\text{special}}, \quad \textbf{Careful!} \tag{2}$$

Issue with Platform Screening

Additional Surplus

$$\mathcal{S} = \overline{u}_s - \frac{1}{2}(\overline{u}_g + \underline{u}_g) + \overline{c} \tag{3}$$

Additional Seller Surplus

$$\mathcal{S}_S = \overline{u}_s - \underline{u}_g + \overline{c} > \mathcal{S} \tag{4}$$

$\Rightarrow$ all surplus generated from screening goes to seller *and* buyer loses surplus by **price discrimination**

$$\mathcal{S}_B = \frac{1}{2}(\overline{u}_g + \underline{u}_g) \tag{5}$$

$\Rightarrow$ Buyer has privacy concerns if the platform can screen for his type

Platform Screening

$$V(\varepsilon) = \max_{a_i} \left[(v-p)a_i - \frac{a_i^2}{2} + \eta \quad \underbrace{(1 - D(a_i))}_{\substack{\text{prop. of} \\ \text{staying opaque}}} \quad \mathcal{S}_B\, \varepsilon \right]$$

Platform demand for $D(a_i) < 1$, $(a_i < \frac{1}{\delta})$

$$a_i(\varepsilon) = v - p - \delta\eta\mathcal{S}_B\, \varepsilon$$

$\Rightarrow$ Likelihood to stay opaque $(1 - D(a_1))$ endog. depends on p

Platform TIOLI offer to seller (data package)

$$f = \eta\mathcal{S}_S\ \delta\mathbb{E}[a_i(\varepsilon)\varepsilon] \tag{6}$$

$\Rightarrow$ demand for platform's & seller's product are neg. corr.

What about optimal a for $D(a_i) = 1$, e.g. $a_i \geq \frac{1}{\delta}$?