Platform Competition under Asymmetric Information

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Motivation

When platforms adopt a new technology, users may not know their valuations from the new technology until they join:

- Operating systems for smartphones (Apple's iOS and Google's Android)
- Videogame consoles (Microsoft's Xbox, Sony's PlayStation, and Nintendo's Wii)
- Tablets and E-books (Amazon's Kindle and Apple's iPad)

We consider platform competition in a two-sided market when agents (buyers and sellers) privately learn their valuations from joining the platforms only after they do so.
Main research question: Can the market implement the welfare-maximizing outcome?

Main results:
1. Platform competition may yield lower social welfare than a monopoly platform
   - Direct consequence of the network effects (the coordination problem among the two sides) and the informational problem
2. Under multi-homing, the market is efficient, but platforms have an incentive to impose exclusive dealing
Literature


- Undifferentiated platforms and dominant firm equilibrium as in Caillaud and Jullien

- Contribution: informational problem
  - Market inefficiency
  - Multi-homing and exclusive dealing
Model

The market:

- Cost: \( t - C(q, c) \)
  - \( c \) – seller’s cost

Incumbent platform

Entrant platform

Seller

Buyer

Utility: \( V(q, \theta) - t \):
- \( q \) – quantity/quality
- \( t \) – payment
- \( \theta \) – buyer’s valuation

Social welfare: \( \arg\max_{q} [V(q, \theta) - C(q, c)] \Rightarrow q^*(\theta, c) \)
Initially, all players do not know $\theta$ and $c$, and share a common prior that $\theta \sim [\theta_0, \theta_1]$ according to $K(\theta)$ and $c \sim [c_0, c_1]$ according to $G(c)$.

Platforms offer contracts: \{(F_B, F_S), (t_B(\theta, c), t_S(\theta, c), q(\theta, c))\}

The buyer and the seller choose simultaneously and non-cooperatively to which platform to join and pay the access fees.

If the buyer and the seller join the same platform they privately learn their WTP ($\theta$) and marginal costs ($c$).

The buyer and the seller choose a contract from the menu and trade takes place.
Monopoly benchmark

Given that the two sides joined a platform and observed \( \theta \) and \( c \), the monopoly provides the two sides with *ex-post* information rents:

\[
U_B(q, \theta) \equiv E_c \left[ \int_{\theta_0}^{\theta} V_\theta(q(\hat{\theta}, c), \hat{\theta})d\hat{\theta} \right], \quad U_S(q, c) \equiv E_\theta \left[ \int_c^{c_1} C_c(q(\theta, \hat{c}), \hat{c})d\hat{c} \right]
\]

If there is no coordination problem, the monopoly can charge *ex-ante*:

\[
F_B = E_{\theta c}[U_B(q, \theta)], \quad F_S = E_{\theta c}[U_S(q, c)]
\]

The monopoly earns:

\[
E_{\theta c} [V(q, \theta) - C(q, c)] \downarrow q^*
\]

Without coordination problem among the two sides the market is efficient
Competition

Consider two platforms: incumbent and entrant
No product differentiation
Dominant firm equilibria
The incumbent moves first
Coordination problem:

The incumbent benefits from “favorable beliefs”: each side believes that the other side will join the incumbent
The entrant’s best response – “divide and conquer”

1. Attract the buyer:

\[ E_{\theta_c}[U_S(q^E, c)] - F_S^E \geq -\min\{F_S^I, 0\} \]

\[ -F_B^E \geq E_{\theta_c}[U_B(q^I, \theta)] - F_B^I \]

The entrant’s profit:

\[ \Pi^E(B \mid q^I) = E_{\theta_c}[V(q^E, \theta) - C(q^E, c) - U_B(q^E, \theta)] + F_B^I - E_{\theta_c}[U_B(q^I, \theta)] + \min\{F_S^I, 0\} \]

\[ \tilde{q}_B < q^* \]

Strategic terms
2. Attract the seller:

The entrant earns:

\[ \Pi^E(S \mid q^I) = E_{0c}[V(q^E, \theta) - C(q^E, c) - U_S(q^E, c)] + F_S^I - E_{0c}[U_S(q^I, c)] + \min\{F_B^I, 0\} \]

\[ \tilde{q}_S < q^* \]

In both options, the entrant distorts the quantity downward.
Incumbent’s problem:

$$\max_{q^I, F_B^l, F_S^l} E_{\theta c} \left[ V(q^I, \theta) - C(q^I, c) - U_B(q^I, \theta) - U_S(q^I, c) \right] + F_B^l + F_S^l$$

s.t

1) $\Pi^E(B \mid q^I) < 0$

2) $\Pi^E(S \mid q^I) < 0$

3) $E_{\theta c}[U_B(q^I, \theta)] - F_B^l \geq 0$

4) $E_{\theta c}[U_S(q^I, c)] - F_S^l \geq 0$
Δ: measures the gap between the seller’s and buyer’s information rents
- If Δ > 0: the informational problem is more significant on the seller’s side
- If Δ < 0: the informational problem is more significant on the buyer’s side

**Proposition 1:** Suppose that Δ > 0 (the case of Δ < 0 is symmetric):

- Both platforms charge a high access fees from the seller and compete on attracting the buyer
- The incumbent wins and sets the **efficient** \( q^I = q^* \)

- The incumbent attracts the buyer while the entrant attracts the seller
- The incumbent wins but **distorts** \( q^I = \tilde{q}_B < q^* \)
Multi-homing and exclusive contracts

- Suppose that the seller can join both platforms:
  - Developers can develop applications for both Android and iOS
  - Users can only carry one handset
- For all $\Delta$, both platforms compete on the buyer
- The incumbent sets the efficient $q^I = q^*$ for all $\Delta$

**If platforms can impose exclusive dealing:**
- If $\Delta$ is low, the entrant can attract the seller and impose exclusive dealing
- In equilibrium:
  - The incumbent *distorts* $q_I = \tilde{q}_I < q^*$
  - At least one platform imposes exclusive dealing
The paper considers platform competition in a two-sided market when agents are ex-ante uninformed and ex-post privately informed

Main results:
1. A monopoly platform implements the first-best level of trade
2. Competition may create a market failure
3. Under multi-homing, competition is efficient, but platforms will impose exclusive dealing if they can do so