

Hybrid Platform Competition

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Introduction

Platforms increasingly act as both **marketplaces** and **sellers of their own products**:

- **E-commerce:** Amazon vs. Walmart Marketplace. Both host third-party merchants while selling own-brand products.
- **Game Consoles:** PlayStation vs. Xbox vs. Nintendo Switch. Each hosts third-party games while funding exclusive first-party titles.
- **Streaming:** Netflix vs. Amazon Prime Video vs. Disney+. All license third-party content while investing in original programming.
- **Operating Systems:** iOS App Store vs. Google Play. Both host third-party developers while offering proprietary apps.

Regulators worry that platforms acting as both **“referees”** and **“players”** may foreclose third-party sellers and harm consumers.

Research Questions

The markets above share three features:

1. **These are competitive markets, not monopolies.** Buyers choose which platform to join, and platforms fight hard for that choice.
2. **First-party and third-party products are not always substitutes.** The degree of overlap varies widely across categories.
3. **Product variety generates strong cross-group network effects.** More variety attracts more users, who attract more sellers, creating positive feedback.

Yet existing research focuses almost exclusively on **monopoly platforms** with **perfect substitutes** and **no network effects**. This paper builds a model around these three features and asks:

Q1. What motivates competing platforms to go hybrid, and do they actually benefit?

Q2. Should regulators ban the hybrid model on competing platforms, and if so, under what conditions?

Model

- Two competing platforms, **Platform 1** and **Platform 2**, located at the endpoints of a unit Hotelling line.
- Two groups of agents: **buyers** and **sellers**, linked by cross-group network externalities.
- **Buyers single-home**: each buyer joins exactly one platform.
- **Sellers multi-home**: sellers join any platform where participation is profitable.
- Platforms charge buyers an **access fee** P_i and collect a **per-transaction commission** τ from sellers.
- **Key feature**: platforms can also offer **first-party product categories** $v_i \geq 0$, competing directly with third-party sellers.

- Buyers are uniformly distributed on $[0, 1]$ with unit transportation cost t
- A buyer at location x derives utility:

$$U_1^B(x) = \theta v_1 + \alpha m_1 - tx - P_1$$

$$U_2^B(x) = \theta v_2 + \alpha m_2 - t(1 - x) - P_2$$

- v_i : first-party product categories on Platform i
- $\theta > 0$: buyer valuation per first-party category
- m_i : mass of third-party sellers on Platform i
- $\alpha > 0$: marginal utility from an additional third-party seller

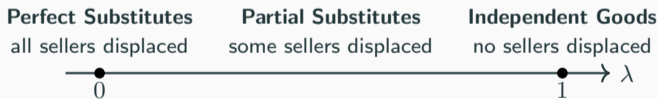
Sellers

- Sellers have heterogeneous participation costs $y \sim U[0, 1]$
- Seller y joins Platform i whenever:

$$U_i^S(y) = (1 - \tau)\beta n_i - y \geq 0$$

where $\beta > 0$ is gross profit per buyer interaction, n_i is mass of buyers on Platform i

- **The Displacement Effect** ($\lambda \in [0, 1]$): first-party categories crowd out a fraction $(1 - \lambda)$ of potential sellers

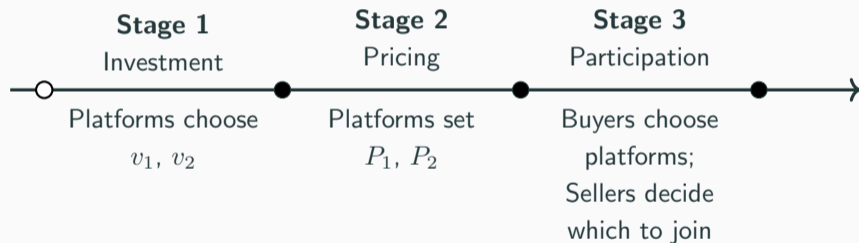


- **Active sellers:** $m_i = (1 - \tau)\lambda\beta n_i$

- Platform i incurs marginal cost c per buyer.
- Expanding first-party product categories is increasingly costly: $C(v_i) = \frac{1}{2}\rho v_i^2$.
- Platform profit combines revenue from **both sides** of the market:

$$\pi_i = \underbrace{(P_i - c)n_i}_{\text{buyer-side access fee}} + \underbrace{\tau\beta n_i m_i}_{\text{seller-side commissions}} - \underbrace{\frac{1}{2}\rho v_i^2}_{\text{investment cost}}$$

Timing



Stage 3: Market Shares and Key Parameters

Step 1. Solving the buyer indifference condition and substituting $m_i = (1 - \tau)\lambda\beta \cdot n_i$ gives buyer market share:

$$n_i = \frac{1}{2} + \frac{\theta(v_i - v_j) + P_j - P_i}{2\Phi}$$

$$\Phi \equiv t - (1 - \tau)\lambda\alpha\beta \quad \text{effective differentiation parameter}$$

Step 2. Active seller mass:

$$m_i = (1 - \tau)\lambda\beta \cdot n_i$$

Step 3. Substituting m_i into the profit function:

$$\pi_i = (P_i - c)n_i + Kn_i^2 - \frac{1}{2}\rho v_i^2$$

$$K \equiv \tau(1 - \tau)\lambda\beta^2 \quad \text{seller-side revenue parameter}$$

Competitive Equilibrium

Lemma (Strategic Nature of Price Competition)

- 1) If $\Phi \geq K$: prices are **strategic complements**: $\frac{\partial P_i}{\partial P_j} \geq 0$ and $\frac{\partial P_i}{\partial v_i} \geq 0$
- 2) If $\Phi < K$: prices are **strategic substitutes**: $\frac{\partial P_i}{\partial P_j} < 0$ and $\frac{\partial P_i}{\partial v_i} < 0$

The two-sided structure can flip the nature of price competition.

Intuition:

Both $\uparrow P_j$ and $\uparrow v_i \Rightarrow \uparrow n_i \Rightarrow \uparrow m_i$. Two opposing effects:

- **Effect 1 (Buyer-side gain)**: larger buyer base \Rightarrow incentive to raise P_i
- **Effect 2 (Seller-side loss)**: raising P_i causes a sharp drop in transaction volume $n_i \cdot m_i \Rightarrow$ large loss in commission income \Rightarrow incentive to lower P_i

When competition is fierce and seller-side revenue is high ($K > \Phi$): Effect 2 dominates \Rightarrow **strategic substitutes**

Equilibrium Prices and Cross-Subsidization

Solving the two best-response functions simultaneously gives:

Proposition 1 (Equilibrium Prices and Cross-Subsidization)

$$P_i^*(v_i, v_j) = c + 2(\Phi - K) \cdot n_i^*(v_i, v_j)$$

- If $\Phi \geq K$: $P_i^* \geq c$ and $\frac{\partial P_i^*}{\partial v_i} \geq 0$, more first-party categories support even higher equilibrium price.
- If $\Phi < K$: $P_i^* < c$ and $\frac{\partial P_i^*}{\partial v_i} < 0$. More first-party categories drive the equilibrium price even lower.

When $\Phi < K$, more first-party categories and lower prices become two **complementary weapons** for competing for buyers.

Proposition 2 (Equilibrium Market Shares and Profits)

For any given (v_i, v_j) :

$$n_i^*(v_i, v_j) = \frac{1}{2} + \frac{\theta(v_i - v_j)}{2(3\Phi - 2K)}$$

$$\pi_i^*(v_i, v_j) = (2\Phi - K) [n_i^*(v_i, v_j)]^2 - \frac{1}{2}\rho v_i^2$$

- Platform profit is proportional to the **square** of buyer market share.
- First-party categories are a tool to **compete for buyers**, not to displace third-party sellers.
- This is fundamentally different from a monopoly platform, which faces no such competitive pressure.

Proposition 3 (Equilibrium First-Party Categories)

$$v^* = \underbrace{\frac{\theta}{3\rho}}_{\text{buyer valuation motive}} + \underbrace{\frac{\theta K}{6\rho(3\Phi - 2K)}}_{\text{seller-side revenue motive}}$$

Comparative statics: $\frac{\partial v^*}{\partial t} \leq 0$, $\frac{\partial v^*}{\partial \alpha} \geq 0$, $\frac{\partial v^*}{\partial \beta} \geq 0$, $\frac{\partial v^*}{\partial \lambda} \geq 0$

- More intense competition (lower t , higher α , β , higher $\lambda \Rightarrow$ lower Φ) \Rightarrow first-party categories become more effective at attracting buyers.
- Stronger seller-side revenue (higher β , higher $\lambda \Rightarrow$ higher K) \Rightarrow each additional buyer generates more commission income \Rightarrow stronger incentive to invest

The Prisoner's Dilemma

Does going hybrid pay off? We set $\lambda = 1$ (independent goods) and compare the pure marketplace with the hybrid equilibrium:

| | Pure Marketplace | Hybrid Equilibrium |
|-----------------|----------------------------------|---|
| Access fee | $c + \Phi - K$ | $c + \Phi - K$ |
| Buyer share | $\frac{1}{2}$ | $\frac{1}{2}$ |
| Seller share | $\frac{1}{2}(1 - \tau)\beta$ | $\frac{1}{2}(1 - \tau)\beta$ |
| Platform profit | $\frac{1}{2}\Phi - \frac{1}{4}K$ | $\frac{1}{2}\Phi - \frac{1}{4}K - C(v^*)$ |

Proposition 4 (The Prisoner's Dilemma)

Prices, market shares and seller participation are unchanged: $P^I = P^N$, $n^I = n^N = \frac{1}{2}$, $m^I = m^N$. Platform profits are strictly lower: $\pi^I = \pi^N - C(v^*) < \pi^N$

The hybrid strategy is **individually rational** but **collectively destructive**. The dilemma deepens as competition intensifies and cross-group externalities strengthen.

The Mitigating Role of Substitution

We now consider what happens when first-party products displaces a fraction $(1 - \lambda)$ of third-party sellers.

Proposition 5 (The Mitigating Role of Substitution)

As first-party products become stronger substitutes (lower λ):

$$\frac{\partial v^*(\lambda)}{\partial \lambda} > 0, \quad \frac{\partial P^*(\lambda)}{\partial \lambda} < 0, \quad \frac{\partial \pi^*(\lambda)}{\partial \lambda} < 0$$

Offering substitutable products softens competition between platforms.

$\downarrow \lambda \Rightarrow$ Displacing more sellers \Rightarrow weakens both the seller-side revenue ($\downarrow K$) and the positive feedback loop ($\uparrow \Phi$) \Rightarrow reduce the incentive to fight aggressively for buyers ($\downarrow v^*$) \Rightarrow profits recover ($\uparrow \pi^*$)

Welfare Analysis

Socially Optimal Provision

Maximizing total welfare gives the first-best level of first-party categories $v^{FB} = \frac{\theta}{2\rho}$.

Proposition 6 (Provision Efficiency)

- 1) If $\Phi > K$: competing platforms **under-invest**: $v^* < v^{FB}$
- 2) If $\Phi = K$: the decentralized equilibrium is **efficient**: $v^* = v^{FB}$
- 3) If $\Phi < K$: competing platforms **over-invest**: $v^* > v^{FB}$

Two effects drive the wedge between v^* and v^{FB} :

- **Pricing effect** (dominates when $\Phi > K$): platforms capture only part of the social value through higher access fees \Rightarrow under-investment
- **Transaction effect** (dominates when $\Phi < K$): platforms have a much stronger incentive to steal market share and capture more commission income \Rightarrow over-investment

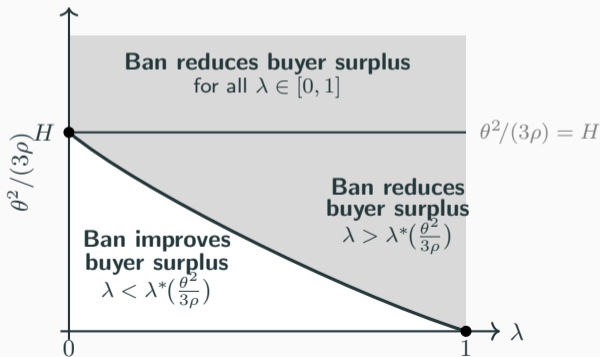
What about a regulatory ban on first-party products?

- A ban unambiguously benefits **platforms** (resolves the prisoner's dilemma) and **third-party sellers** (eliminates displacement).
- But its effect on buyers is ambiguous: they lose first-party product value but gain from a richer third-party ecosystem.

Policy Implication: The Right Criterion

Proposition 7 (Ban and Buyer Surplus)

- 1) If $\frac{\theta^2}{3\rho} \geq \frac{3}{2}(1-\tau)\alpha\beta + \tau(1-\tau)\beta^2$: a ban reduces buyer surplus for all $\lambda \in [0, 1]$
- 2) If $\frac{\theta^2}{3\rho} < \frac{3}{2}(1-\tau)\alpha\beta + \tau(1-\tau)\beta^2$: there exists $\lambda^* < 1$ such that a ban improves buyer surplus for all $\lambda \in [0, \lambda^*]$



Extensions

Extension 1: Profitable First-party Products

We extend the baseline by allowing first-party products to generate a direct unit profit $\gamma \geq 0$.

Platform i 's profit function becomes: $\pi_i = (P_i - c + \gamma v_i)n_i + Kn_i^2 - \frac{1}{2}\rho v_i^2$

The symmetric equilibrium is:

$$v^*(\gamma) = v^* + \frac{\theta\gamma}{3\rho} \left(2 + \frac{5K}{2(3\Phi - 2K)} \right), \quad n^*(\gamma) = \frac{1}{2}$$

$$P^*(\gamma) = P^* - \gamma v^*(\gamma), \quad \pi^*(\gamma) = \frac{1}{2}\Phi - \frac{1}{4}K - C(v^*(\gamma))$$

- $\uparrow \gamma \Rightarrow \uparrow v^*(\gamma)$ and $\downarrow P^*(\gamma)$: platforms invest more and subsidize buyers more aggressively
- $\frac{\partial \pi^*(\gamma)}{\partial \gamma} < 0$: **Paradoxically, greater profitability deepens the prisoner's dilemma.**

Platforms compete even harder for buyers, invest more, cut price further, but end up worn off.

Extension 2: Endogenous Product Selection

We extend the baseline by allowing platforms to choose $\lambda_i \in [0, 1]$. The timing is:

- **Stage 1.** Platforms choose how substitutable their first-party products are, λ_1 and λ_2
- **Stage 2.** Observing (λ_1, λ_2) , platforms simultaneously choose v_1 and v_2
- **Stage 3.** Platforms set buyer access fees P_1 and P_2
- **Stage 4.** Buyers and sellers make participation decisions

Extension 2: Equilibrium

Platform i chooses λ_i to maximize profit. The FOC decomposes into two effects:

$$\frac{d\pi_i}{d\lambda_i} = \underbrace{\frac{\partial(\Phi_i + \Phi_j - K_i)}{\partial\lambda_i} n_i^2}_{\text{Direct Effect} < 0} + \underbrace{\frac{\partial\pi_i}{\partial v_j} \cdot \frac{\partial v_j}{\partial\lambda_i}}_{\text{Strategic Effect}}$$

- **Direct Effect (negative):** higher λ_i intensifies price competition, reducing profits. Each platform has a unilateral incentive to lower λ_i
- **Strategic Effect (ambiguous):** if $\frac{\partial v_j}{\partial\lambda_i} \geq 0$, both effects reinforce each other $\Rightarrow \lambda^* = 0$.
If $\frac{\partial v_j}{\partial\lambda_i} < 0$ and sufficiently strong \Rightarrow interior equilibrium $\lambda^* \in (0, 1]$

Platforms choose low λ not to foreclose third-party sellers, but to **soften competition** between platforms. Seller displacement is the mechanism, not the objective.

Conclusion

- Competing platforms go hybrid to attract buyers, not to displace third-party sellers and this leads to a prisoner's dilemma.
- Greater profitability deepens the trap, while greater substitutability paradoxically helps platforms escape it.
- For regulators, the right criterion is product efficiency, not substitutability.

Comments are welcome!

Thank you!