Hybrid Platform Competition

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Abstract

We study competing platforms in a two-sided market that simultaneously operate as marketplaces for third-party sellers and sell their own first-party products. We develop a game-theoretic model in which first-party products may range from perfect substitutes for third-party goods to fully independent offerings. We find that platforms introduce first-party products primarily to attract buyers rather than to displace third-party sellers, and that sufficiently strong network effects can reverse the nature of price competition from strategic complements to substitutes, leading platforms to simultaneously expand first-party offerings and lower buyer prices. This competitive motive is self-defeating: in equilibrium both platforms invest in first-party products yet profits are strictly lower than under a pure marketplace, with the prisoner's dilemma deepening as network effects strengthen; direct profitability of first-party products further deepens the dilemma. Paradoxically, greater substitutability between first-party and third-party products benefits platforms by endogenously weakening the network effects that fuel destructive price competition. A regulatory ban on first-party products unambiguously benefits platforms and third-party sellers; its effect on buyers depends on product efficiency rather than substitutability, and a ban may harm buyers even when first-party products fully displace third-party sellers. The relevant criterion for evaluating hybrid platform behavior is therefore whether first-party products create sufficient direct value for buyers, not whether they displace sellers.

1 Introduction

A growing number of firms that began as pure market intermediaries have expanded into selling their own products alongside those of third-party sellers — a business model known

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as the hybrid platform. Amazon and JD.com operate vast marketplaces for independent merchants while simultaneously retailing their own inventory across hundreds of product categories. Apple and Google manage open app ecosystems for third-party developers while offering proprietary applications. Netflix and Disney+ distribute third-party licensed content while investing billions in original programming. The prevalence of this model has attracted intense regulatory scrutiny: the European Union's Digital Markets Act, ongoing investigations by the U.S. Federal Trade Commission, and antitrust proceedings in multiple jurisdictions all single out self-preferencing by hybrid platforms as a potential source of competitive harm, reflecting the concern that platforms acting simultaneously as "referees" and "players" may distort competition at the expense of third-party sellers and consumers.

The academic literature has made substantial progress in understanding hybrid platform behavior, but almost exclusively through the lens of monopoly platforms. **?** establish that a monopoly platform always benefits from selling first-party products: doing so intensifies competition among third-party sellers, expands transaction volume, and raises commission revenue. This conclusion — and the regulatory concern it implicitly supports — rests on the assumption that the platform enjoys unchallenged control over buyer access. Yet most hybrid platforms operate in fiercely competitive markets. Amazon competes with Walmart, iOS with Android, Netflix with Disney+. Whether the strategic logic of hybrid behavior, and its welfare consequences, survive the introduction of platform competition is an open question. The existing literature faces a second limitation: models of hybrid platforms typically assume that first-party products are perfect substitutes for third-party offerings. In practice, the degree of overlap varies widely — from Amazon's private-label batteries that directly compete with branded third-party sellers, to Netflix's original series that complement rather than replace its licensed catalog. A general treatment of hybrid competition requires allowing for this full spectrum of substitutability.

This paper investigates three questions. First, what is the primary motivation for competing platforms to offer first-party products, and how do competition intensity and cross-side network effects shape the scale of this investment? Second, when both platforms adopt the hybrid model, does the strategy create competitive advantage or trap both platforms in mutually destructive over-investment, and how does the degree of substitutability between first-party and third-party products affect this outcome? Third, what are the welfare implications of hybrid platform competition for buyers, sellers, and platforms, and what is the correct criterion for evaluating a regulatory ban on first-party products?

We address these questions using a game-theoretic model of two competing platforms in a two-sided market, in which platforms choose both the range of first-party product categories they offer and the access fees charged to buyers, with buyers single-homing and sellers multi-homing. A key feature of the model is that first-party products may range from perfect substitutes for third-party goods to products that are entirely independent of them, allowing us to characterize equilibrium behavior across the full spectrum of hybrid strategies.

Our analysis delivers four results. First, the primary motivation for competing platforms to offer first-party products is to attract buyers, not to displace third-party sellers. The two-sided structure of the market is central to this finding: each additional buyer triggers a positive feedback loop in which more buyers attract more sellers and generate additional commission revenue, so the value of winning a marginal buyer is amplified far beyond the direct access fee. This amplification makes competition for buyers exceptionally fierce. When network effects are sufficiently strong, the nature of price competition itself is transformed: buyer access fees become strategic substitutes rather than complements, and platforms optimally respond to stronger competition by simultaneously expanding their first-party product range and *lowering* buyer prices. More first-party products and lower buyer prices are not two separate decisions but two instruments of the same competitive strategy. This regime has no counterpart in one-sided markets, where improved product offerings typically support rather than undercut buyer-side margins.

Second, this competitive logic is self-defeating. When first-party and third-party products are independent, both platforms invest in first-party categories in equilibrium, yet prices, market shares, and seller participation are identical to the pure marketplace benchmark. Platforms bear the full cost of their investment without gaining any competitive advantage. The hybrid strategy is individually rational but collectively destructive. Strikingly, the dilemma is most severe precisely when the competitive pressure to invest is greatest: stronger network effects amplify each platform's incentive to expand its first-party offering, but the symmetric response of the rival neutralizes every gain, leaving both platforms worse off by the cost of the arms race.

Third, we uncover two paradoxes that overturn conventional intuitions about hybrid platform behavior. When first-party products substitute for third-party goods, platforms are typically viewed with greater antitrust suspicion. Yet we find that greater substitutability actually *benefits* competing platforms. Seller displacement endogenously weakens the positive feedback effects that fuel the price war, softening competition and raising equilibrium profits. The feature of hybrid behavior that concerns regulators most turns out to be the mechanism through which platforms partially escape the competitive trap. The second paradox concerns profitability: when first-party products generate direct profit margins for the platform, profits fall *further* rather than rise. Higher direct profitability intensifies the incentive to compete for buyers, deepening the arms race and leaving both platforms strictly worse off than when first-party products generate no direct revenue. Strong product substitutability and high direct profitability are two conditions that appear favorable to platform profits, yet each pushes equilibrium profits in the opposite direction.

Finally, the welfare and policy implications challenge the logic underlying current regulatory frameworks. A ban on first-party products unambiguously benefits platforms, by resolving the prisoner's dilemma, and third-party sellers, by eliminating displacement. Its effect on buyers, however, is governed by product efficiency rather than substitutability, in that when first-party products generate high direct value for buyers, a ban reduces buyer surplus regardless of how substitutable they are for third-party goods. A ban can improve buyer surplus only when product efficiency is low and substitutability is high, the very combination that most concerns regulators. Yet even then the relevant criterion is not whether first-party products displace sellers but whether they create sufficient direct value for buyers. This distinction inverts the logic of antitrust frameworks such as the EU Digital Markets Act, which targets self-preferencing largely on the basis of seller displacement.

The remainder of the paper is organized as follows. Section 2 reviews the related literature. Section 3 presents the model. Section 4 characterizes the competition equilibrium, establishing the prisoner's dilemma and the mitigating role of product substitutability. Section 5 analyzes welfare and evaluates the effects of a regulatory ban. Section 6 presents two extensions: the case in which first-party products generate direct platform profits, and the case in which platforms choose the degree of product substitutability endogenously.

2 Literature Review

This paper contributes to three strands of the platform economics literature.

The first strand compares alternative platform business models: marketplace versus reseller (Hagiu and Wright, 2015a), platform versus vertically integrated firm (Hagiu and Wright, 2015b, 2019), and agency versus wholesale pricing (Johnson, 2017). In each case, the key distinction turns on which party holds control rights over factors that determine total demand. None of these papers considers the dual mode, in which a platform acts simultaneously as marketplace and direct seller.

A related strand asks the inverse question: should a firm selling its own products also host rivals as a platform? Hagiu, Jullien, and Wright (2020) show that hosting transforms a rival from a pure competitor into a complementor, raising consumer demand for the host firm's core product and making hosting jointly profitable. Hagiu, Teh, and Wright (2022) analyze a monopoly hybrid platform and find that self-entry always benefits the platform: first-party competition lowers third-party prices, stimulates transactions, and raises commission revenue. Our paper studies the competitive analogue of this setting and shows that this monopoly result reverses when platforms compete.

The most closely related strand examines whether a marketplace platform should also offer its own products. Hagiu and Spulber (2013) show that first-party content can resolve the chicken-and-egg problem in user participation. Farrell and Katz (2000) and Jiang, Jerath, and Srinivasan (2011) analyze the trade-off between rent extraction and incentivizing innovation by third-party complementors. Carlton and Waldman (2002), Peitz (2008), and Whinston (1990) show that platform owners can use bundling of first-party applications to foreclose complementors. All of these papers study a monopoly platform. The present paper departs from this literature by analyzing two competing platforms and examining how competition transforms the incentives and welfare effects of first-party entry.

Several empirical studies have examined the motivations for platform-owner entry, its impact on users and complementors, and the responses of third-party sellers. Zhu (2018) surveys this evidence and identifies open research questions.

Existing empirical work focuses largely on Amazon, treating the platform's products as perfect substitutes for third-party goods. Empirical evidence, however, shows that first-party products span a wide spectrum: from close substitutes (private-label goods) to entirely independent offerings (platform-exclusive content). This paper provides a theoretical framework that spans this spectrum, with the displacement parameter λ indexing the degree of substitutability between first-party and third-party products.

3 The Model

We consider a two-sided market consisting of two competing platforms, indexed by $i \in \{1, 2\}$, which facilitate interactions between a unit mass of buyers and a unit mass of third-party sellers.

3.1 Agents

Buyers. Buyers are uniformly distributed along a Hotelling line of length 1, with Platform 1 at $x = 0$ and Platform 2 at $x = 1$. The parameter t represents the unit transportation cost, capturing the degree of horizontal differentiation between platforms. Buyers single-home, choosing to join only one platform. This reflects market realities in which high switching costs and ecosystem lock-in prevent simultaneous engagement with competing platforms, as in mobile operating systems or gaming consoles.

A buyer at $x \in [0, 1]$ derives utility from the platform's first-party products and the variety of third-party sellers. The utility functions for joining Platform 1 and Platform 2 are, respectively:

$$U_1^B(x) = \theta v_1 + \alpha m_1 - tx - P_1, \tag{1}$$

$$U_2^B(x) = \theta v_2 + \alpha m_2 - t(1-x) - P_2. \tag{2}$$

Here $v_i \geq 0$ is the number of product categories in which Platform i supplies first-party products. The parameter $\theta > 0$ measures buyers' per-category valuation of first-party offerings. The mass of active third-party sellers on Platform i is m_i, and $\alpha > 0$ is the marginal utility a buyer gains from an additional third-party seller, capturing the cross-group externality from sellers to buyers. The term P_i is the fixed access fee charged to buyers, which may be negative. We impose no restriction on the relative magnitudes of θ and α.

Sellers. Third-party sellers multi-home, joining any platform where participation is profitable. This reflects the empirical regularity that merchants and developers distribute their products across all available channels to reach the widest customer base. Sellers are heterogeneous in their integration costs y, distributed uniformly on $[0, 1]$. The net payoff for a seller with cost y joining Platform i is:

$$U_i^S(y) = (1-\tau)\beta n_i - y, \tag{3}$$

where $\tau \in [0, 1)$ is the commission rate charged by the platform, $\beta > 0$ is the gross profit a seller generates per interaction with a buyer, and n_i is the mass of buyers on Platform i. Just as α measures how much buyers value sellers, β measures how much sellers value buyers; together they characterize the two-sided feedback loop central to platform competition. A seller joins Platform i whenever $U_i^S(y) \geq 0$, yielding a potential seller mass of $(1-\tau)\beta n_i$.

A key feature of the model is that first-party products may displace third-party sellers. We introduce $\lambda \in [0, 1]$ to capture the degree to which the platform's own products differentiate from third-party offerings. When $\lambda = 1$, first-party and third-party products are independent: the platform enters categories not served by existing sellers and no displacement occurs. As λ decreases toward 0, first-party products become closer substitutes for third-party goods, crowding out a fraction $(1-\lambda)$ of potential sellers. The realized mass of active sellers on Platform i is therefore:

$$m_i = (1-\tau)\lambda\beta n_i. \tag{4}$$

In the baseline model, λ is an exogenous structural parameter reflecting the nature of the product market; we endogenize it in Section 6.2.

3.2 Platforms

Platform i incurs a constant marginal cost c per buyer and a convex cost $C(v_i) = \frac{1}{2}\rho v_i^2$ to supply v_i categories of first-party products, where $\rho > 0$ reflects the marginal cost of expanding the first-party product range. The profit function for Platform i comprises revenues from buyer access fees and seller commissions, net of investment costs:

$$\pi_i = (P_i - c)n_i + \tau\beta n_i m_i - \frac{1}{2}\rho v_i^2. \tag{5}$$

3.3 Market Shares and Composite Parameters

The indifferent buyer between the two platforms satisfies $U_1^B(x^*) = U_2^B(x^*)$. Substituting (4) into the utility functions and solving yields the market share for Platform i:

$$n_i = \frac{1}{2} + \frac{\theta(v_i - v_j) + P_j - P_i}{2\Phi}, \tag{6}$$

where we define

$$\Phi \equiv t - (1-\tau)\lambda\alpha\beta.$$

The parameter Φ is the *effective differentiation parameter*: the transportation cost t net of the cross-side network force $(1-\tau)\lambda\alpha\beta$ that pulls buyers toward the larger platform. A smaller Φ implies that market shares are more sensitive to differences in v_i and P_i, reflecting more intense competition. The corresponding seller mass follows from (4) as $m_i = (1-\tau)\lambda\beta \cdot n_i$.

Substituting (4) into (5), the seller-side revenue term simplifies as follows:

$$\tau\beta n_i m_i = \tau\beta n_i \cdot (1-\tau)\lambda\beta n_i = \tau(1-\tau)\lambda\beta^2 n_i^2,$$

which is quadratic in n_i: more buyers attract more sellers, whose transactions generate commission revenue proportional to n_i^2. We define

$$K \equiv \tau(1-\tau)\lambda\beta^2$$

as the *marginal seller-side revenue per buyer*: the additional commission income the platform earns by attracting one more buyer through induced seller participation. Platform i's profit can then be written as:

$$\pi_i = \underbrace{(P_i - c)\,n_i}_{\text{buyer-side}} + \underbrace{Kn_i^2}_{\text{seller-side}} - \underbrace{\frac{1}{2}\rho v_i^2}_{\text{cost}}. \tag{7}$$

Equations (6) and (7) show that the equilibrium is governed by four parameters: Φ, K, θ, and ρ.

3.4 Timing

The strategic interaction unfolds in a three-stage game:

1. **Stage 1 (Investment):** Platforms simultaneously determine their investment levels in first-party products, v_1 and v_2.

2. **Stage 2 (Pricing):** Observing the first-party product levels, platforms simultaneously set the access fees for buyers, P_1 and P_2. The transaction fee rate τ is assumed to be exogenous and standard across the industry.

3. **Stage 3 (Participation):** Buyers and sellers simultaneously decide which platform(s) to join based on the observed product levels and prices.

We seek the subgame perfect Nash equilibrium and solve the game using backward induction.

3.5 Assumptions

To ensure the existence, uniqueness, and stability of the equilibrium, we impose the following technical assumptions.

Assumption 1 (Market Stability)**.** *The effective differentiation parameter* $\Phi \equiv t - (1-\tau)\lambda\alpha\beta$ *satisfies:*

$$\Phi \geq \frac{2}{3}K. \tag{8}$$

This assumption ensures that network effects are not strong enough to tip the market to a single winner: horizontal differentiation must dominate the agglomeration force of cross-side network effects, so that both platforms coexist in equilibrium.

Assumption 2 (Second-Order Condition)**.** *The cost parameter* ρ *satisfies:*

$$\frac{\theta^2}{\rho} \leq \frac{2(3\Phi - 2K)^2}{2\Phi - K}. \tag{9}$$

This condition ensures the convexity of the profit function with respect to v_i, guaranteeing that the first-order condition in Stage 1 yields a profit maximum rather than a minimum.

4 Competition Equilibrium

We characterize the subgame perfect Nash equilibrium of the three-stage game by backward induction. We first analyze how the two-sided structure of the market shapes the nature of price competition between platforms, then derive the equilibrium prices, market shares, and first-party investment levels. We establish that competing platforms are trapped in a prisoner's dilemma, and show that product substitutability partially mitigates this outcome.

4.1 Price Competition in Two-Sided Markets

In Stage 2, platforms simultaneously set access fees to maximize profits, taking the first-party investment levels as given. The first-order condition for Platform i can be decomposed as follows:

$$\underbrace{n_i + (P_i - c)\frac{\partial n_i}{\partial P_i}}_{\text{Direct Buyer Effect}} + \underbrace{2Kn_i\frac{\partial n_i}{\partial P_i}}_{\text{Indirect Seller Effect}} = 0. \tag{10}$$

The first term captures the standard one-sided pricing trade-off between margin and volume. The second term reflects the two-sided nature of the market: each additional buyer attracts more sellers through the cross-side externality, generating commission revenue that is quadratic in the buyer base. The platform therefore has an incentive to price more aggressively than a one-sided calculus would dictate, because the marginal buyer brings not only direct access-fee revenue but also an amplified stream of seller-side income. Solving the system of first-order conditions yields Platform i's best-response function:

$$P_i = R_i(P_j) = \left(\frac{\Phi - K}{2\Phi - K}\right)\left[\theta(v_i - v_j) + P_j\right] + \left(\frac{\Phi}{2\Phi - K}\right)(c + \Phi - K). \tag{11}$$

The slope of this reaction function, $(\Phi - K)/(2\Phi - K)$, determines whether price competition in this two-sided market resembles its one-sided counterpart or departs from it in a fundamental way, as summarized in the following lemma.

Lemma 1 (Strategic Nature of Price Competition)**.** *The strategic nature of price competition depends on the relative magnitude of the effective differentiation parameter Φ and the seller-side revenue potential K. If $\Phi \geq K$, buyer access fees are strategic complements: $\partial P_i/\partial P_j \geq 0$, and a platform that offers more first-party product categories raises its own equilibrium price, $\partial P_i^*/\partial v_i \geq 0$. If $\Phi < K$, buyer access fees are strategic substitutes: $\partial P_i/\partial P_j < 0$, and a platform that offers more first-party product categories lowers its own equilibrium price, $\partial P_i^*/\partial v_i < 0$.*

In a one-sided market, prices are strategic complements for a familiar reason. When the rival raises its price, buyers shift toward the focal platform, increasing n_i. A larger buyer base raises the marginal revenue from increasing P_i, since the platform now extracts a higher margin from a larger pool of buyers, while the demand loss from a given price increase remains unchanged. The optimal response is therefore to raise one's own price in turn.

In a two-sided market, this logic is complicated by the indirect seller effect. A larger buyer base n_i not only increases the direct return to raising P_i, but also amplifies the cost of doing so: a higher price reduces n_i, which in turn reduces seller participation and commission revenue, an effect that grows proportionally with n_i itself. When K is large relative to Φ, this additional cost dominates. If the rival raises its price and buyers flow toward the focal platform, the platform finds it optimal to cut its own price rather than raise it, in order to attract even more buyers and amplify the seller-side revenue they generate. Price competition thus takes the form of strategic substitutes, a regime that has no counterpart in one-sided markets and arises entirely from the two-sided feedback loop between buyers and sellers.

The distinction between the two regimes also shapes the competitive role of first-party product categories. Under strategic complements, a platform that expands its range of first-party categories raises its access fee, because the broader product offering attracts buyers and the platform captures the resulting gains directly through buyer-side pricing. Under strategic substitutes, the same expansion of first-party categories leads the platform to lower its access fee rather than raise it. First-party categories and buyer subsidies are deployed as complementary instruments in the same competitive strategy, both serving to maximize the buyer base, since it is the scale of that base, rather than the direct margin on buyers, that generates profits through seller-side commissions. The equilibrium access fee consequently falls below marginal cost, and the buyer side is effectively subsidized. The prevalence of free or heavily subsidized access in digital platform markets reflects precisely this regime.

4.2 Equilibrium Prices and Market Shares

Solving the system of reaction functions simultaneously for given (v_1, v_2) yields the following results. We begin with the equilibrium access fee, as it follows directly from the competitive logic established in Lemma 1.

Proposition 1 (Equilibrium Prices and Cross-Subsidization)**.** *The equilibrium buyer access fee for Platform i is:*

$$P_i^*(v_i, v_j) = c + 2(\Phi - K) \cdot n_i^*(v_i, v_j). \tag{12}$$

If $\Phi \geq K$*, then* $P_i^* \geq c$ *and* $\partial P_i^* / \partial v_i \geq 0$*. If* $\Phi < K$*, then* $P_i^* < c$ *and* $\partial P_i^* / \partial v_i < 0$*.*

Proposition 1 is the equilibrium counterpart to Lemma 1. Under strategic complements, a platform that expands its range of first-party categories raises its access fee, because the broader product offering attracts buyers and the platform captures the resulting gains directly through buyer-side pricing. The equilibrium access fee therefore exceeds marginal cost, and platforms earn positive margins on the buyer side. Under strategic substitutes, the same expansion of first-party categories leads the platform to lower its access fee rather than raise it. First-party categories and buyer subsidies are deployed as complementary instruments in the same competitive strategy, both serving to maximize the buyer base, since it is the scale of that base, rather than the direct margin on buyers, that generates profits through seller-side commissions. The equilibrium access fee consequently falls below marginal cost, and the buyer side is effectively subsidized. The prevalence of free or heavily subsidized access in digital platform markets reflects precisely this regime.

Proposition 2 (Equilibrium Market Shares and Profits)**.** *In the Stage 2 equilibrium, for any given levels of first-party categories* (v_i, v_j)*, the equilibrium buyer market share for Platform i is:*

$$n_i^*(v_i, v_j) = \frac{1}{2} + \frac{\theta(v_i - v_j)}{2(3\Phi - 2K)}. \tag{13}$$

The corresponding seller share is $m_i^* = (1-\tau)\lambda\beta \cdot n_i^*$*. Both shares increase in own first-party categories:* $\partial n_i^*/\partial v_i > 0$ *and* $\partial m_i^*/\partial v_i > 0$*. The equilibrium profit for Platform i is:*

$$\pi_i^*(v_i, v_j) = (2\Phi - K)\left[n_i^*(v_i, v_j)\right]^2 - \frac{1}{2}\rho v_i^2. \tag{14}$$

Proposition 2 confirms that expanding first-party categories unambiguously grows the platform's ecosystem on both sides of the market. The profit expression takes a particularly clean form: gross profit is proportional to the square of the buyer market share, with the coefficient $(2\Phi - K)$ representing the effective margin per buyer after accounting for competitive erosion from the seller-side revenue race. Under Assumption 1, this coefficient is strictly positive, ensuring that expanding market share through first-party categories is always profitable in the pricing subgame. It is this relationship between market share and profit that drives platforms to expand their first-party offerings in Stage 1.

4.3 First-Party Categories and the Prisoner's Dilemma

We now turn to Stage 1. Each platform chooses v_i to maximize its equilibrium profit $\pi_i^*(v_i, v_j)$ from Proposition 2, taking v_j as given. The first-order condition is:

$$2(2\Phi - K) \cdot n_i^* \cdot \frac{\partial n_i^*}{\partial v_i} - \rho v_i = 0. \tag{15}$$

The marginal benefit of expanding first-party categories has two components. The factor $(2\Phi - K)$ is the effective margin per buyer: each additional buyer captured is worth $(2\Phi - K)$ in gross profit, incorporating both the direct access-fee revenue and the seller-side commission income the buyer generates. The factor $\partial n_i^*/\partial v_i = \theta/[2(3\Phi - 2K)]$ is the market-share sensitivity to first-party categories: a higher buyer valuation of first-party offerings θ, or more intense competition (smaller Φ relative to K), makes expanding first-party categories more effective at attracting buyers. Imposing symmetry $v_1 = v_2 = v^*$ yields the equilibrium level of first-party categories.

Proposition 3 (Equilibrium First-Party Categories)**.** *The unique symmetric equilibrium number of first-party product categories is:*

$$v^* = \frac{\theta}{3\rho}\left(1 + \frac{K}{2(3\Phi - 2K)}\right). \tag{16}$$

The equilibrium satisfies $\partial v^*/\partial t \leq 0$, $\partial v^*/\partial \alpha \geq 0$, $\partial v^*/\partial \beta \geq 0$, and $\partial v^*/\partial \lambda \geq 0$.

Proof. See Appendix. □

The expression for v^* decomposes naturally into two terms. The first, $\theta/(3\rho)$, is the number of first-party categories that would arise if seller-side revenue played no role — it reflects only the direct valuation of buyers for first-party offerings relative to the cost of expanding the product range, modulated by competitive intensity. The second term, $\theta K/[6\rho(3\Phi - 2K)]$, is strictly positive under Assumption 1 and represents the additional categories driven entirely by the seller-side revenue motive: platforms expand their first-party offering beyond the one-sided benchmark because more categories attract more buyers, who in turn attract more sellers, whose transactions generate commission income K.

The comparative statics follow from the effects of each parameter on Φ and K. A reduction in the transportation cost t lowers Φ directly, intensifying competition and raising v^*, because when platforms are less differentiated, the competitive value of attracting a marginal buyer is greater. An increase in α or β raises K while also reducing Φ through the cross-side network force, both effects amplifying the seller-side motive for expanding first-party categories. An increase in λ raises K directly by preserving more active sellers on the platform, strengthening the commission revenue that each buyer generates. In each case, the underlying mechanism is identical: a higher seller-side revenue stream, whether driven by more intense buyer competition or stronger network externalities, induces platforms to offer a broader range of first-party categories.

The Prisoner's Dilemma. To assess what the equilibrium level of first-party categories actually achieves for platform profits, we compare the hybrid equilibrium against a pure marketplace benchmark in which $v_1 = v_2 = 0$ and $\lambda = 1$, so that neither platform offers first-party categories and products are independent of third-party sellers. We denote the pure marketplace benchmark by superscript M and the hybrid equilibrium — in which platforms offer first-party categories that are independent of third-party products — by superscript I. In the pure marketplace benchmark, the symmetric equilibrium is:

$$P^M = c + \Phi - \tau(1-\tau)\beta^2, \tag{17}$$

$$n^M = \frac{1}{2}, \quad m^M = \frac{1}{2}(1-\tau)\beta, \tag{18}$$

$$\pi^M = \frac{1}{2}\Phi - \frac{1}{4}\tau(1-\tau)\beta^2. \tag{19}$$

Proposition 4 (The Prisoner's Dilemma)**.** *Comparing the hybrid equilibrium with the pure marketplace benchmark:*

1. *Prices and market shares are unchanged:* $P^I = P^M$*,* $n^I = n^M = \frac{1}{2}$*, and* $m^I = m^M = \frac{1}{2}(1-\tau)\beta$*.*

2. *Platform profits are strictly lower:*

$$\pi^I = \frac{1}{2}\Phi - \frac{1}{4}\tau(1-\tau)\beta^2 - C(v^*) < \pi^M. \tag{20}$$

Both platforms are trapped in a prisoner's dilemma.

Proof. See Appendix. □

In the symmetric hybrid equilibrium, both platforms offer the same number of first-party categories, leaving market shares and seller participation unchanged relative to the pure marketplace. Yet both bear the cost $C(v^*) > 0$ of their first-party offerings, so profits are unambiguously lower. The hybrid strategy is individually rational, however, because a platform that unilaterally refrains from offering first-party categories while its rival does so would lose a substantial share of buyers, and with them the seller-side commission revenue they generate. Each platform is therefore compelled to match the rival's offering, and both are drawn into an arms race over first-party categories from which neither can unilaterally escape. The severity of this dilemma increases with the intensity of competition and the importance of seller-side revenue, since a lower Φ and a higher K both raise v^*, amplifying the cost of the arms race, while the gains in market share and profits remain zero in the symmetric equilibrium.

This result also identifies the primary motivation behind hybrid platform behavior. Platforms do not expand first-party categories in order to displace third-party sellers, since with independent products sellers are entirely unaffected and participate in identical numbers under both regimes. The sole driver is competitive pressure — the fear of ceding market share to a rival that offers a broader product range. The hybrid strategy is not a choice but a competitive necessity.

4.4 The Mitigating Role of Substitution

The prisoner's dilemma established in Proposition 4 rests on the assumption that first-party and third-party products are independent. We now relax this assumption and allow $\lambda \in [0, 1)$, so that first-party categories displace a fraction $(1 - \lambda)$ of potential sellers. This introduces a new mechanism: by crowding out sellers, platforms endogenously weaken the cross-side network effects that fuel the price war over buyers. We show that this weakening paradoxically benefits platforms by softening competition and partially relieving the prisoner's dilemma.

To see the mechanism, note that the slope of the pricing reaction function is:

$$\frac{\partial R_i}{\partial P_j} = \frac{\Phi - \tau(1-\tau)\lambda\beta^2}{2\Phi - \tau(1-\tau)\lambda\beta^2}. \tag{21}$$

As λ decreases, the seller-side revenue potential $K = \tau(1-\tau)\lambda\beta^2$ shrinks, reducing the slope of the reaction function. With fewer active sellers, the marginal value of each buyer — in terms of the commission revenue that buyer generates — declines, and platforms have less incentive to compete aggressively for buyers. The price war that underlies the prisoner's dilemma loses intensity.

Proposition 5 (The Mitigating Role of Substitution)**.** *In the symmetric equilibrium, as first-party categories become stronger substitutes for third-party products, i.e., as λ decreases:*

1. *The equilibrium number of first-party categories decreases: $\partial v^*(\lambda)/\partial\lambda > 0$.*

2. *The equilibrium buyer access fee increases: $\partial P^*(\lambda)/\partial\lambda < 0$.*

3. *The equilibrium platform profit increases: $\partial \pi^*(\lambda)/\partial\lambda < 0$.*

Proof. See Appendix. □

The three results in Proposition 5 share a single underlying mechanism: substitution softens price competition. As λ falls and sellers are displaced, K shrinks. A smaller K

reduces the seller-side motive for expanding first-party categories, as shown in equation (16), so platforms offer fewer categories. A smaller K also softens the indirect seller effect in the pricing first-order condition, reducing the aggressiveness of price competition and allowing the equilibrium access fee to rise. The combined effect of lower expansion costs and higher access-fee revenue raises platform profits, partially mitigating the losses from the prisoner's dilemma.

This result carries a counterintuitive implication for competition policy. A platform whose first-party categories substitute for third-party products is typically viewed with suspicion in antitrust analysis, since the displacement of sellers is taken as evidence of anticompetitive foreclosure. Proposition 5 suggests a different perspective. In competitive markets, seller displacement weakens the network effects that drive destructive price competition, benefiting platforms at the expense of sellers. Whether this trade-off is harmful or beneficial from a social welfare perspective depends on the relative magnitudes of the gains to platforms and the losses to sellers and consumers, a question we take up in Section 5.

5 Welfare Analysis

The equilibrium analysis of Section 4 characterizes the private incentives of competing platforms. We now turn to the social welfare implications of hybrid platform competition. We examine whether the equilibrium number of first-party product categories is socially efficient, how the degree of product substitutability affects the welfare of different market participants, and what the consequences of a regulatory ban on first-party products are for buyers and society at large.

5.1 Socially Optimal Provision and Market Efficiency

Recall that v_i denotes the number of first-party product categories supplied by Platform i. Since both platforms are symmetric in equilibrium, it suffices to maximize total welfare as a function of $v \equiv v_1 = v_2$. Social welfare comprises consumer surplus, seller surplus, and platform profits:

$$\frac{W}{2} = \int_0^{1/2} \big(\theta v + \alpha m^* - tx - P^*\big)\, dx + \int_0^{m^*} \Big((1-\tau)\beta \cdot \tfrac{1}{2} - y\Big)\, dy - C(v). \tag{22}$$

A social planner choosing v to maximize W faces a simple trade-off: supplying an additional product category raises each buyer's utility by θ, so the marginal social benefit is $\theta \cdot n^* = \theta/2$ per platform, or θ in total across both symmetric platforms; the marginal cost is ρv. Equating the two yields the first-best number of first-party product categories:

$$v^{FB} = \frac{\theta}{2\rho}. \tag{23}$$

The social optimum reflects a straightforward cost-benefit calculation: the planner weighs the direct welfare gain that broader product variety delivers to buyers against the cost of supplying it. Notably, v^{FB} is independent of the network effect parameters α, β, and K, because from the social planner's perspective, any buyer attracted to one platform is simply diverted from the rival, leaving total participation unchanged. The business-stealing motive that shapes private incentives has no social value, and the planner correctly ignores it.

Comparing v^{FB} with the equilibrium number of first-party product categories from Proposition 3,

$$v^* = \frac{(2\Phi - K)\,\theta}{2\rho(3\Phi - 2K)}, \tag{24}$$

the sign of $v^* - v^{FB}$ reduces to a comparison between Φ and K, which is precisely the condition that distinguishes the two competitive regimes of Lemma 1.

Proposition 6 (Provision Efficiency)**.** *In the competitive equilibrium:*

1. *If $\Phi > K$, platforms supply too few first-party product categories relative to the social optimum: $v^* < v^{FB}$.*

2. *If $\Phi = K$, the number of first-party product categories is socially efficient: $v^* = v^{FB}$.*

3. *If $\Phi < K$, platforms supply too many first-party product categories relative to the social optimum: $v^* > v^{FB}$.*

Proof. See Appendix. □

Offering more first-party product categories serves two distinct purposes for a competing platform. First, a broader product range raises buyers' willingness to pay, allowing the platform to charge a higher access fee and extract more revenue from the buyer side directly. Second, more product categories attract a larger buyer base, which in turn draws more third-party sellers and generates additional commission revenue from the seller side. The relative strength of these two motives, captured by the comparison between Φ and K, determines whether platforms supply too few or too many product categories relative to the social optimum.

When $\Phi > K$, the buyer-side motive dominates, in that platforms primarily offer first-party product categories to raise buyers' willingness to pay. The problem is that platforms can only partially monetize the welfare gain they deliver to buyers—they capture the marginal buyer's surplus through a higher access fee, but the surplus accruing to inframarginal buyers who already prefer the platform is not appropriated. Since the social planner values the utility gain θ for all buyers on the platform while each competing platform captures only a fraction of it, platforms systematically supply fewer product categories than is socially desirable. The pure one-sided market ($K = 0$) is the limiting case of this regime: substituting $K = 0$ into equation (24) gives $v^*\big|_{K=0} = \theta/(3\rho) < \theta/(2\rho) = v^{FB}$, and the under-provision gap is at its largest.

When $\Phi < K$, the seller-side motive dominates entirely, as platforms offer first-party product categories primarily to steal buyers from the rival and capture the lucrative commission revenue that a larger buyer base generates. This business-stealing motive is privately powerful but socially wasteful. In the symmetric equilibrium, both platforms respond symmetrically, and the competitive expansion of product categories cancels out—market shares remain at $n_i^* = 1/2$ regardless of how many categories each platform supplies. The social gains from product variety are more than offset by the duplicated provision costs that both platforms incur in their mutually neutralizing arms race. Platforms thus supply too many first-party product categories, not because buyers value them enough to justify the cost, but because each platform individually cannot resist using them as a tool to capture seller-side revenue at the rival's expense. This over-provision is the direct welfare counterpart of the prisoner's dilemma established in Proposition 4, as both arise from the same seller-side feedback loop and both reflect the same tension between individual rationality and collective efficiency in competitive two-sided markets.

Before turning to policy implications, it is worth noting how product substitutability shapes the distribution of welfare across market participants. As λ increases (that is, as first-party product categories become more independent of third-party goods), platform profits fall monotonically. This is a direct extension of the prisoner's dilemma in Proposition 4: greater product independence strengthens the network effects that fuel price competition, intensifying the arms race and leaving both platforms worse off.

The welfare effects on buyers and sellers run in the opposite direction. Consumer surplus rises with λ through two channels: more third-party sellers remain active as the displacement effect weakens, and platforms supply more first-party product categories in equilibrium since $\partial v^*/\partial \lambda > 0$ from Proposition 3. Seller surplus also rises monotonically as fewer sellers are displaced. The interests of platforms are thus fundamentally opposed to those of buyers and sellers: what benefits platforms is precisely what harms the other two groups. We explore the policy implications of this tension in Section 5.2.

5.2 Policy Implications: A Regulatory Ban on First-Party Products

A central question in current platform regulation is whether platforms should be prohibited from selling their own products alongside third-party offerings. We evaluate this question by comparing buyer surplus under two regimes: the pure marketplace benchmark in which $v_1 = v_2 = 0$, and the hybrid equilibrium in which each platform supplies the profit-maximizing number of first-party product categories $v^*(\lambda)$ characterized in Section 4.

A ban on first-party products unambiguously benefits platforms, by resolving the prisoner's dilemma of Proposition 4 and eliminating the wasteful investment cost $C(v^*)$, and third-party sellers, whose displacement effect disappears entirely when $v = 0$. The welfare effect on buyers, however, is ambiguous. We compare buyer surplus across the two regimes and obtain the following result.

Proposition 7 (Ban and Buyer Surplus)**.** *We compare buyer surplus under the hybrid equilibrium ($v = v^*(\lambda)$) with the pure marketplace benchmark ($v = 0$).*

1. *If $\dfrac{\theta^2}{3\rho} \geq \dfrac{3}{2}(1-\tau)\alpha\beta + \tau(1-\tau)\beta^2$, a regulatory ban on first-party products reduces buyer surplus for all $\lambda \in [0, 1]$.*
2. *If $\dfrac{\theta^2}{3\rho} < \dfrac{3}{2}(1-\tau)\alpha\beta + \tau(1-\tau)\beta^2$, there exists a threshold $\lambda^* < 1$, strictly decreasing in $\dfrac{\theta^2}{3\rho}$, such that a ban improves buyer surplus for all $\lambda \in [0, \lambda^*]$.*

Proof. See Appendix. □

The proposition identifies two opposing forces that determine whether a ban benefits buyers. The first is the *product value loss*: under a ban, buyers forgo the direct utility θv^* delivered by first-party product categories. The second is the *network competition gain*: when $v = 0$, the displacement effect disappears and more third-party sellers participate on each platform, enriching the cross-side network externality that buyers enjoy. Whether the ban improves buyer surplus depends on which force dominates, and the answer is governed by two parameters.

When product efficiency $\theta^2/(3\rho)$ is high, first-party product categories generate substantial direct value for buyers. Even if these products are close substitutes for third-party goods and displace many sellers, the product value loss from a ban always dominates, regardless of λ: the ban unambiguously harms buyers. When product efficiency is low, platforms offer first-party products primarily as competitive weapons in the seller-side revenue race rather than as genuine sources of consumer value. In this case, the network competition gain from

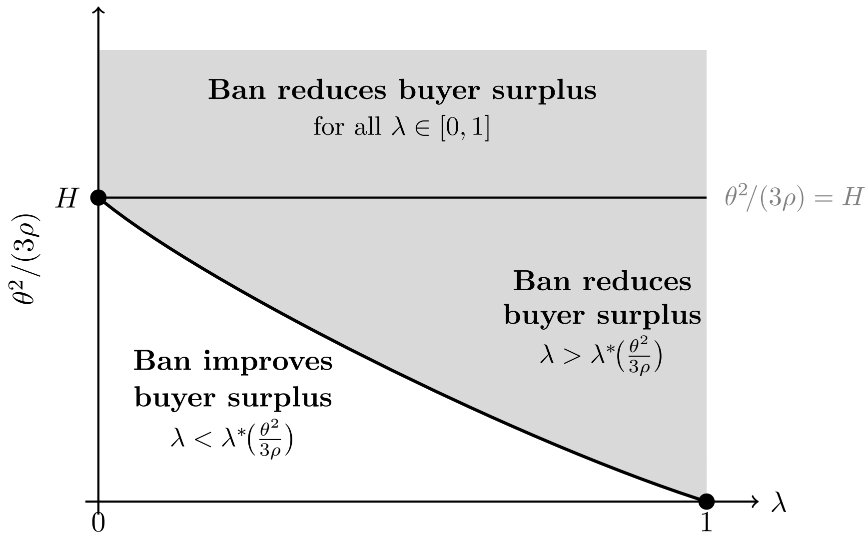

Figure 1: The shaded regions indicate parameter combinations under which a regulatory ban on first-party products reduces buyer surplus; the unshaded region indicates combinations under which a ban improves buyer surplus. $H \equiv \frac{3}{2}(1-\tau)\alpha\beta + \tau(1-\tau)\beta^2$.

restoring the displaced seller network can outweigh the product value loss, but only when λ is sufficiently small. When first-party products are highly substitutable for third-party goods, the displacement effect is severe and the ban's restoration of seller participation delivers a large benefit to buyers. As λ increases and products become more independent, fewer sellers are displaced and the network competition gain shrinks, until eventually the product value loss dominates again. This explains why λ^* is strictly decreasing in $\theta^2/(3\rho)$: the higher the product efficiency, the narrower the range of λ over which a ban can benefit buyers, and the more substitutable first-party products must be before a ban improves buyer surplus. In other words, even if first-party products are strong substitutes for third-party goods, a ban may still harm buyers if those products are sufficiently efficient. Figure 1 illustrates the resulting partition of the parameter space $(\lambda,\ \theta^2/(3\rho))$ into regions where a ban improves or reduces buyer surplus.

This result carries a counterintuitive implication for antitrust policy. The conventional regulatory concern is that substitutable first-party products harm consumers by displacing third-party sellers. Our analysis suggests the opposite: it is precisely when λ is small and products are close substitutes that a ban is most likely to improve buyer surplus, because the network competition gain is largest. Conversely, when first-party products are highly independent of third-party goods, a ban is most likely to harm buyers, even though independent products pose little competitive threat to third-party sellers. The relevant criterion for consumer welfare is not whether first-party products displace sellers, but whether they create sufficient direct value for buyers to justify the competitive distortions they generate.

6 Extensions

The baseline model delivers four main results: platforms offer first-party products primarily to gain a competitive advantage over rivals; this leads to a prisoner's dilemma in which both platforms are made worse off; stronger substitutability between first-party and third-party products paradoxically mitigates the dilemma by softening price competition; and the welfare effects of a regulatory ban depend critically on whether first-party products create sufficient direct value for buyers. We now examine the robustness of these findings by relaxing two key assumptions of the baseline model. Section 6.1 allows first-party products to generate direct profits for the platform, and Section 6.2 endogenizes the degree of substitutability between first-party and third-party products.

6.1 Profitable First-Party Products

In the baseline model, first-party products create value for buyers directly through the utility term θv_i, but the platform itself does not earn revenue from them beyond what is captured through the buyer access fee. This abstracts away from an important feature of real-world hybrid platforms, namely that first-party products are often directly profitable in their own right. Amazon's private-label goods earn retail margins; Apple's App Store generates licensing revenue from its own applications; JD.com's self-operated logistics arm earns fees on every order it fulfills. In each case, the platform captures a direct profit stream from its own products that is independent of the access fee charged to buyers.

We extend the baseline model by introducing a parameter $\gamma \geq 0$, representing the direct unit profit earned per category of first-party products. Platform i's profit function becomes:

$$\pi_i = (P_i - c + \gamma v_i)n_i + Kn_i^2 - C(v_i). \tag{25}$$

A key observation is that the term γv_i reduces the effective opportunity cost of serving each buyer from c to $c - \gamma v_i$. It is through this reduction that profitability shapes the equilibrium.

Proposition 8 (Profitability Paradox)**.** *We extend the baseline model by allowing first-party products to generate a direct unit profit $\gamma \geq 0$ per product category. Solving the three-stage* *game yields the symmetric equilibrium:*

$$v^*(\gamma) = v^* + \frac{\theta\gamma}{3\rho}\left(2 + \frac{5K}{2(3\Phi - 2K)}\right), \tag{26}$$

$$P^*(\gamma) = P^* - \gamma v^*(\gamma), \tag{27}$$

$$n^*(\gamma) = \frac{1}{2}, \tag{28}$$

$$\pi^*(\gamma) = \frac{1}{2}\Phi - \frac{1}{4}K - C(v^*(\gamma)). \tag{29}$$

The equilibrium exhibits the following comparative statics:

$$\frac{\partial v^*(\gamma)}{\partial\gamma} > 0, \quad \frac{\partial P^*(\gamma)}{\partial\gamma} < 0, \quad \frac{\partial n^*(\gamma)}{\partial\gamma} = 0, \quad \frac{\partial \pi^*(\gamma)}{\partial\gamma} < 0. \tag{30}$$

Paradoxically, greater profitability of first-party products intensifies both investment and price competition, yet leads to strictly lower platform profits.

Proof. See Appendix. □

The key to understanding these results lies in the effective opportunity cost $c - \gamma v_i^*$. When $\gamma > 0$, each category of first-party products reduces the net cost of serving a buyer, strengthening the platform's incentive to expand its first-party offering through two reinforcing channels. First, a broader first-party range raises the direct return to attracting buyers, since each additional buyer generates not only the standard access-fee margin and seller-side commission, but also the direct profit γ on first-party sales. Second, the lower effective opportunity cost raises the marginal value of market share in the pricing subgame, inducing platforms to compete more aggressively for buyers in Stage 2. Both channels amplify the Stage 1 investment incentive, driving $v^*(\gamma)$ strictly above the baseline v^*.

The reduction in effective opportunity cost feeds directly into equilibrium pricing. In the baseline model, the symmetric equilibrium access fee takes the form $P^* = c + \Phi - K$, where c is the true opportunity cost of serving a buyer. In the extended model, the effective opportunity cost falls to $c - \gamma v^*(\gamma)$, and the equilibrium access fee adjusts accordingly to $P^*(\gamma) = (c - \gamma v^*(\gamma)) + \Phi - K < P^*$. Platforms pass the benefit of lower effective costs through to buyers in the form of a reduced access fee, deploying direct profits from first-party products as a buyer subsidy. This logic is precisely analogous to the role of seller-side revenue K in the baseline model, in that platforms use first-party profits to justify subsidizing buyer access just as they use commission income, intensifying competition for buyers on the access-fee margin.

The paradox emerges from the interaction between these two effects in a symmetric equilibrium. Although $\gamma > 0$ generates additional profit on each unit of first-party output, the symmetric response of both platforms neutralizes any gain in market share: $\partial n^*(\gamma)/\partial\gamma = 0$, and each platform retains exactly half the buyer market regardless of how profitable its first-party products are. What remains is the cost of the arms race itself. Higher γ drives both platforms to expand $v^*(\gamma)$, raising the investment cost $C(v^*(\gamma))$, while simultaneously compelling both to lower $P^*(\gamma)$, compressing the buyer-side margin. The direct profit $\gamma v^*(\gamma)$ earned on first-party sales is more than offset by the combined effect of higher investment costs and lower access fees, and platform profits fall strictly as γ increases. The profitability of first-party products does not rescue platforms from the prisoner's dilemma of Proposition 4; it deepens it.

6.2 Endogenous Product Selection

In the baseline model, the degree of substitutability λ between first-party and third-party products is treated as an exogenous structural parameter reflecting the nature of the product market. In practice, however, platforms exercise considerable discretion over which product categories to enter. Amazon can choose to launch private-label goods in categories dominated by third-party sellers, or instead develop offerings in underserved niches where little displacement occurs. We extend the baseline model by endogenizing this choice, allowing each platform to select its degree of product substitutability $\lambda_i \in [0, 1]$ as part of its competitive strategy.

The timing of the extended game is as follows:

1. **Stage 1**: Platforms simultaneously choose the degree of substitutability $\lambda_i \in [0, 1]$.
2. **Stage 2**: Observing (λ_1, λ_2), platforms simultaneously choose the quantity of first-party products v_i.
3. **Stage 3**: Platforms simultaneously set buyer access fees P_i.
4. **Stage 4**: Buyers and sellers make their participation decisions.

We continue to solve the game by backward induction. Stages 3 and 4 are identical to the baseline model. The new strategic interaction is concentrated in Stage 1.

In Stage 1, platform i chooses λ_i to maximize its equilibrium profit, anticipating the downstream effects on both its own and its rival's investment and pricing decisions. The first-order condition decomposes the impact of λ_i into two effects:

$$\frac{d\pi_i}{d\lambda_i} = \underbrace{\frac{\partial(\Phi_i + \Phi_j - K_i)}{\partial \lambda_i} n_i^{*2}}_{\text{Direct Effect}<0} + \underbrace{\frac{\partial \pi_i}{\partial v_j} \cdot \frac{\partial v_j}{\partial \lambda_i}}_{\text{Strategic Effect}} \tag{31}$$

The Direct Effect is unambiguously negative. Increasing λ_i raises K_i and lowers Φ_i, strengthening the cross-side network effects that fuel price competition between platforms. As established in Proposition 5, a higher λ intensifies the arms race over first-party investment and compresses equilibrium profits. From the perspective of the Direct Effect alone, platform i therefore has an unambiguous incentive to drive λ_i toward zero, committing to products that are close substitutes for third-party goods in order to weaken the network effects and soften price competition.

The Strategic Effect operates through the rival's investment response $\partial v_j/\partial \lambda_i$. Since $\partial \pi_i/\partial v_j < 0$, meaning that a larger rival investment always hurts platform i, the sign of the Strategic Effect is determined entirely by whether increasing λ_i induces the rival to invest more or less. The direction of $\partial v_j/\partial \lambda_i$ is ambiguous and depends on the relative strength of two opposing forces. On the one hand, when platform i raises λ_i, its first-party products become more independent of third-party goods, strengthening the network effects on platform i and intensifying competitive pressure on platform j, which may induce platform j to expand its investment v_j. On the other hand, a higher λ_i also raises platform i's own equilibrium investment v_i^*, intensifying the overall arms race and potentially reducing the marginal return to platform j's investment, which may instead cause platform j to scale back v_j.

Proposition 9 (Endogenous Substitutability)**.** *Solving the four-stage game, the equilibrium degree of substitutability λ^* depends on the rival's investment response $\partial v_j/\partial \lambda_i$:*

1. *Perfect substitutes holds ($\lambda^* = 0$) if $\partial v_j/\partial \lambda_i \geq 0$.*

2. *Partial substitutes holds ($\lambda^* \in (0, 1]$) if $\partial v_j/\partial \lambda_i < 0$ and the strategic effect is sufficiently strong.*

When $\partial v_j/\partial \lambda_i \geq 0$, the Direct Effect and Strategic Effect reinforce each other, and both point toward reducing λ_i. Platforms have an unambiguous incentive to commit to more substitutable first-party products, driving the equilibrium to the corner solution $\lambda^* = 0$. The endogenous choice of substitutability is not driven by a desire to foreclose third-party sellers per se, but by the competitive incentive to dampen the two-sided feedback loop that makes platform competition so costly.

When $\partial v_j/\partial\lambda_i < 0$ and the strategic effect is sufficiently strong, however, a countervailing force emerges. A platform that commits to more substitutable products triggers a reduction in the rival's investment, which is beneficial. This threat of an investment arms race acts as a deterrent, compelling platforms to maintain some degree of product differentiation in equilibrium. These two forces balance at an interior equilibrium $\lambda^* \in (0, 1]$: the direct incentive to reduce λ_i is offset by the strategic incentive to maintain partial independence.

7 Conclusion

This paper has studied the strategic motivations and welfare implications of first-party product investment by competing platforms in a two-sided market. We develop a game-theoretic model of two horizontally differentiated platforms that simultaneously choose their range of first-party product categories and the access fees charged to buyers, with buyers single-homing and sellers multi-homing. First-party products may range from perfect substitutes for third-party goods to entirely independent offerings, allowing us to characterize equilibrium behavior across the full spectrum of hybrid strategies.

Our analysis delivers four main findings. Competing platforms invest in first-party products primarily to attract buyers and amplify seller-side commission revenue, not to displace third-party sellers. The two-sided feedback loop between buyers and sellers can reverse the nature of price competition from strategic complements to substitutes, leading platforms to simultaneously expand first-party offerings and lower buyer prices as a coordinated competitive strategy that has no counterpart in one-sided markets. This competitive motive is self-defeating, as both platforms invest in equilibrium yet profits are strictly lower than under a pure marketplace. The dilemma deepens as network effects strengthen. Two paradoxes further characterize the equilibrium. Greater substitutability between first-party and third-party products paradoxically benefits platforms, because seller displacement endogenously weakens the network effects that fuel destructive price competition. And higher direct profitability of first-party products deepens rather than relieves the dilemma, as the additional profit motive intensifies the arms race for buyers. Finally, a regulatory ban unambiguously benefits platforms and third-party sellers, but its effect on buyers is governed by product efficiency rather than substitutability. The correct regulatory criterion is whether first-party products create sufficient direct value for buyers, not whether they displace sellers.

These findings carry implications for platform managers and policymakers. For platform managers, the strategic value of first-party products depends critically on market structure. When seller-side revenue potential is large relative to platform differentiation, first-party products serve as buyer acquisition weapons deployed alongside price subsidies rather than as differentiation tools that support higher margins. Expanding first-party offerings may be individually rational but collectively destructive in such markets, and even highly profitable first-party products deepen rather than relieve this trap. For policymakers, antitrust scrutiny should focus on whether first-party products create genuine value for buyers rather than on whether they displace third-party sellers, since highly substitutable first-party products may still benefit buyers when their direct efficiency is sufficiently high.

Several limitations point toward promising directions for future research. Our Hotelling framework fixes the total mass of buyers, so platforms compete purely for market share rather than for market expansion. Allowing for an elastic buyer population would introduce an additional social benefit of hybrid behavior and could alter the investment efficiency and welfare results. Consumer heterogeneity in our model is also limited to horizontal location, with all buyers sharing the same valuation of product variety. Richer heterogeneity in preferences over product breadth would interact with platform pricing decisions in ways not captured here, and might restore the case for endogenizing the commission rate by creating a strategic link between two-sided pricing and first-party investment. Finally, while our extension on endogenous product selection takes a first step toward understanding how platforms choose the degree of substitutability, a fuller treatment would allow platforms to choose which specific categories to enter and how many to offer, questions central to ongoing antitrust debates surrounding platforms such as Amazon and Apple.

Our analysis ultimately suggests that the hybrid platform model, widely viewed as a deliberate strategy by which platforms exploit their gatekeeper position, is better understood as a competitive trap that two-sided market dynamics create and sustain. Recognizing this distinction matters both for platform strategy and for the design of regulatory policy.

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Appendix. Proofs

Proof of Lemma 1

The first-order condition for Platform i with respect to P_i is:

$$n_i + (P_i - c)\frac{\partial n_i}{\partial P_i} + 2Kn_i\frac{\partial n_i}{\partial P_i} = 0.$$

Substituting $\partial n_i/\partial P_i = -1/(2\Phi)$ and rearranging:

$$n_i\left(1 - \frac{K}{\Phi}\right) = \frac{P_i - c}{2\Phi}.$$

Substituting the expression for n_i from equation (6) and solving for P_i yields the best-response function:

$$P_i = R_i(P_j) = \left(\frac{\Phi - K}{2\Phi - K}\right)\left[\theta(v_i - v_j) + P_j\right] + \left(\frac{\Phi}{2\Phi - K}\right)(c + \Phi - K).$$

The slope of the reaction function is $\partial R_i/\partial P_j = (\Phi - K)/(2\Phi - K)$, which is non-negative if and only if $\Phi \geq K$, establishing the strategic complements and substitutes results. The sign of $\partial P_i^*/\partial v_i = (\Phi - K)\theta/(2\Phi - K)$ follows immediately. ■

Proof of Propositions 1 and 2

Solving the system of reaction functions simultaneously, let $\mu \equiv (\Phi - K)/(2\Phi - K)$ and $\Delta v \equiv v_i - v_j$. Substituting one reaction function into the other and simplifying, using $1 + \mu = (3\Phi - 2K)/(2\Phi - K)$ and $1 - \mu = \Phi/(2\Phi - K)$, yields:

$$P_i^* = c + \Phi - K + \frac{(\Phi - K)\theta\,\Delta v}{3\Phi - 2K}.$$

Substituting P_i^* and P_j^* into equation (6) gives:

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

establishing Proposition 2. The equilibrium price can be written as $P_i^* = c + 2(\Phi - K)n_i^*$, establishing Proposition 1. Substituting $P_i^* - c = 2(\Phi - K)n_i^*$ into the profit function (7):

$$\pi_i^* = (P_i^* - c)n_i^* + K(n_i^*)^2 - \frac{1}{2}\rho v_i^2 = 2(\Phi - K)(n_i^*)^2 + K(n_i^*)^2 - \frac{1}{2}\rho v_i^2 = (2\Phi - K)(n_i^*)^2 - \frac{1}{2}\rho v_i^2,$$

completing the proof. ■

Proof of Proposition 3

Differentiating $\pi_i^* = (2\Phi - K)(n_i^*)^2 - \frac{1}{2}\rho v_i^2$ with respect to v_i and setting equal to zero:

$$2(2\Phi - K)\, n_i^* \cdot \frac{\theta}{2(3\Phi - 2K)} - \rho v_i = 0.$$

Imposing symmetry $n_i^* = 1/2$ and solving:

$$v^* = \frac{(2\Phi - K)\theta}{2\rho(3\Phi - 2K)} = \frac{\theta}{3\rho}\left(1 + \frac{K}{2(3\Phi - 2K)}\right).$$

For the comparative statics, let $f(\Phi, K) \equiv (2\Phi - K)/(3\Phi - 2K)$, so that $v^* = \theta f/(2\rho)$. Direct computation yields:

$$\frac{\partial f}{\partial \Phi} = \frac{-K}{(3\Phi - 2K)^2} \leq 0, \qquad \frac{\partial f}{\partial K} = \frac{\Phi}{(3\Phi - 2K)^2} \geq 0.$$

Since $\partial\Phi/\partial t = 1$ and K does not depend on t:

$$\frac{\partial v^*}{\partial t} = \frac{\theta}{2\rho}\frac{\partial f}{\partial \Phi} \leq 0.$$

Since $\partial\Phi/\partial\alpha = -(1-\tau)\lambda\beta < 0$ and K does not depend on α:

$$\frac{\partial v^*}{\partial \alpha} = \frac{\theta}{2\rho}\frac{\partial f}{\partial \Phi} \cdot \big(-(1-\tau)\lambda\beta\big) \geq 0.$$

Since $\partial\Phi/\partial\beta = -(1-\tau)\lambda\alpha < 0$ and $\partial K/\partial\beta = 2\tau(1-\tau)\lambda\beta > 0$:

$$\frac{\partial v^*}{\partial \beta} = \frac{\theta(1-\tau)\lambda}{2\rho(3\Phi - 2K)^2}\big[K\alpha + 2\tau\beta\Phi\big] \geq 0.$$

Since $\partial\Phi/\partial\lambda = -(1-\tau)\alpha\beta < 0$ and $\partial K/\partial\lambda = \tau(1-\tau)\beta^2 > 0$:

$$\frac{\partial v^*}{\partial \lambda} = \frac{\theta(1-\tau)\beta}{2\rho(3\Phi - 2K)^2}\big[K\alpha + \tau\beta\Phi\big] \geq 0,$$

completing the proof. ■

Proof of Proposition 4

In the symmetric hybrid equilibrium with $\lambda = 1$ and $v_1 = v_2 = v^*$, the market share formula (13) gives $n^I = 1/2$, and the equilibrium price formula (12) gives:

$$P^I = c + 2(\Phi - K) \cdot \frac{1}{2} = c + \Phi - K.$$

With $\lambda = 1$, we have $K = \tau(1-\tau)\beta^2$ and $\Phi = t-(1-\tau)\alpha\beta$, so $P^I = c+\Phi-\tau(1-\tau)\beta^2 = P^N$. The seller share $m^I = (1-\tau)\beta \cdot n^I = (1-\tau)\beta/2 = m^N$ follows immediately, establishing part 1.

For part 2, note that $\pi^N = (1/4)(2\Phi - K)$ and:

$$\pi^I = (2\Phi - K)(n^I)^2 - C(v^*) = \frac{1}{4}(2\Phi - K) - C(v^*) = \pi^N - C(v^*).$$

Since $C(v^*) = \frac{1}{2}\rho(v^*)^2 > 0$, we have $\pi^I < \pi^N$. ■

Proof of Proposition 5

The result $\partial v^*/\partial\lambda > 0$ was established in the proof of Proposition 3.

In the symmetric equilibrium, $P^* = c + \Phi - K$. Differentiating with respect to λ:

$$\frac{\partial P^*}{\partial\lambda} = \frac{\partial\Phi}{\partial\lambda} - \frac{\partial K}{\partial\lambda} = -(1-\tau)\alpha\beta - \tau(1-\tau)\beta^2 = -(1-\tau)\beta(\alpha + \tau\beta) < 0,$$

establishing part 2.

For part 3, in the symmetric equilibrium $\pi^* = \frac{1}{4}(2\Phi - K) - C(v^*)$. Differentiating with respect to λ:

$$\frac{\partial\pi^*}{\partial\lambda} = \frac{1}{4}\left(2\frac{\partial\Phi}{\partial\lambda} - \frac{\partial K}{\partial\lambda}\right) - C'(v^*)\frac{\partial v^*}{\partial\lambda} = -\frac{(1-\tau)\beta(2\alpha + \tau\beta)}{4} - \rho v^*\frac{\partial v^*}{\partial\lambda}.$$

The first term is strictly negative. The second term is strictly negative since $\rho v^* > 0$ and $\partial v^*/\partial\lambda > 0$. Therefore $\partial\pi^*/\partial\lambda < 0$, completing the proof. ■

Proof of Proposition 8

We solve the three-stage game by backward induction.

Stage 3 (Participation). The participation decisions of buyers and sellers are identical to the baseline model. The market share for platform i is:

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

Stage 2 (Pricing). Platform i maximizes $\pi_i = (P_i - c + \gamma v_i)n_i + K n_i^2 - C(v_i)$ with respect to P_i. The first-order condition is:

$$n_i + (P_i - c + \gamma v_i)\frac{\partial n_i}{\partial P_i} + 2K n_i \frac{\partial n_i}{\partial P_i} = 0.$$

Substituting $\partial n_i/\partial P_i = -1/(2\Phi)$ and rearranging yields the best-response function:

$$P_i = R_i(P_j) = \left(\frac{\Phi - K}{2\Phi - K}\right)\big[\theta(v_i - v_j) + P_j\big] + \left(\frac{\Phi}{2\Phi - K}\right)(c - \gamma v_i + \Phi - K).$$

This is identical to the baseline best-response function with c replaced by $c - \gamma v_i$. Solving the system of reaction functions simultaneously yields the equilibrium access fee:

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

and the equilibrium market share:

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

Substituting into the profit function gives:

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

Stage 1 (Investment). Platform i maximizes $\pi_i^*(v_i, v_j)$ with respect to v_i, taking v_j as given. The first-order condition is:

$$2(2\Phi - K) \cdot n_i^* \cdot \frac{\partial n_i^*}{\partial v_i} + \gamma n_i^* + \gamma v_i \cdot \frac{\partial n_i^*}{\partial v_i} - \rho v_i = 0.$$

Substituting $\partial n_i^*/\partial v_i = \theta/[2(3\Phi - 2K)]$ and imposing symmetry $v_i = v_j = v^*(\gamma)$, so that $n_i^* = 1/2$:

$$\frac{(2\Phi - K)\theta}{2(3\Phi - 2K)} + \frac{\gamma}{2} + \frac{\gamma v^*(\gamma)\theta}{2(3\Phi - 2K)} - \rho v^*(\gamma) = 0.$$

Collecting terms in $v^*(\gamma)$ and solving:

$$v^*(\gamma) = \frac{\dfrac{(2\Phi - K)\theta}{2(3\Phi - 2K)} + \dfrac{\gamma}{2}}{\rho - \dfrac{\gamma\theta}{2(3\Phi - 2K)}} = v^* + \frac{\theta\gamma}{3\rho}\left(2 + \frac{5K}{2(3\Phi - 2K)}\right).$$

The equilibrium access fee follows by substituting $v_i = v_j = v^*(\gamma)$:

$$P^*(\gamma) = c - \gamma v^*(\gamma) + \Phi - K = P^* - \gamma v^*(\gamma).$$

The equilibrium market share $n^*(\gamma) = 1/2$ follows immediately from symmetry. For the equilibrium profit, note that in the symmetric equilibrium, $P^*(\gamma) - c + \gamma v^*(\gamma) = \Phi - K$, so that the direct profit $\gamma v^*(\gamma)$ earned on first-party products is exactly offset by the reduction in the equilibrium access fee. Substituting $n^*(\gamma) = 1/2$ into the profit function:

$$\pi^*(\gamma) = (\Phi - K) \cdot \frac{1}{2} + K \cdot \frac{1}{4} - C(v^*(\gamma)) = \frac{1}{2}\Phi - \frac{1}{4}K - C(v^*(\gamma)).$$

Comparative Statics. Differentiating $v^*(\gamma)$ with respect to γ:

$$\frac{\partial v^*(\gamma)}{\partial \gamma} = \frac{\theta}{3\rho}\left(2 + \frac{5K}{2(3\Phi - 2K)}\right) > 0,$$

since all terms are strictly positive under Assumption 1. Differentiating $P^*(\gamma)$ with respect to γ:

$$\frac{\partial P^*(\gamma)}{\partial \gamma} = -v^*(\gamma) - \gamma\frac{\partial v^*(\gamma)}{\partial \gamma} < 0,$$

since $v^*(\gamma) > 0$ and $\partial v^*(\gamma)/\partial\gamma > 0$. The result $\partial n^*(\gamma)/\partial\gamma = 0$ follows directly from symmetry. Finally, differentiating $\pi^*(\gamma)$ with respect to γ:

$$\frac{\partial \pi^*(\gamma)}{\partial \gamma} = -C'(v^*(\gamma))\frac{\partial v^*(\gamma)}{\partial \gamma} = -\rho v^*(\gamma)\frac{\partial v^*(\gamma)}{\partial \gamma} < 0,$$

since $\rho v^*(\gamma) > 0$ and $\partial v^*(\gamma)/\partial\gamma > 0$. ■