American Journal of Economics and Business Management

Vol. 8 Issue 6 | pp. 2909-2917 | ISSN: 2576-5973

Available online @ https://www.globalresearchnetwork.us/index.php/ajebm

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# Competition Among Digital Platforms through Pricing Strategies: A Comparative and Theoretical Analysis

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**Abstract:** The expansion of digital platforms has introduced new dynamics in market competition, particularly through the strategic use of pricing. This paper investigates how leading platforms like Amazon, Uber, and Spotify deploy pricing models to gain a competitive advantage, with a focus on multimarket contact (MMC) and cross-market externalities. Drawing on theoretical frameworks and empirical studies, the analysis distinguishes between unilateral and bilateral pricing regimes and examines how these influence user surplus, platform profits, and market equilibrium. Findings suggest that MMC intensifies buyer-side price competition but has variable impacts on seller pricing and platform profitability depending on externality structures. The study informs antitrust regulation by illustrating how data-driven strategies and self-preferencing can entrench dominance.

**Keywords:** Digital Platforms; Pricing Strategy; Multimarket Contact (MMC); Two-Sided Markets; Cross-Market Externalities; Self-Preferencing; Algorithmic Pricing; Platform Competition; Antitrust Policy; Freemium Model

**Citation:** Raxmatovna D. D. Competition Among Digital Platforms through Pricing Strategies: A Comparative and Theoretical Analysis. American Journal of Economics and Business Management 2025, 8(6), 2909-2917

Received: 10th Mar 2025
Revised: 16th Apr 2025
Accepted: 24th May 2025
Published: 23thJun 2025

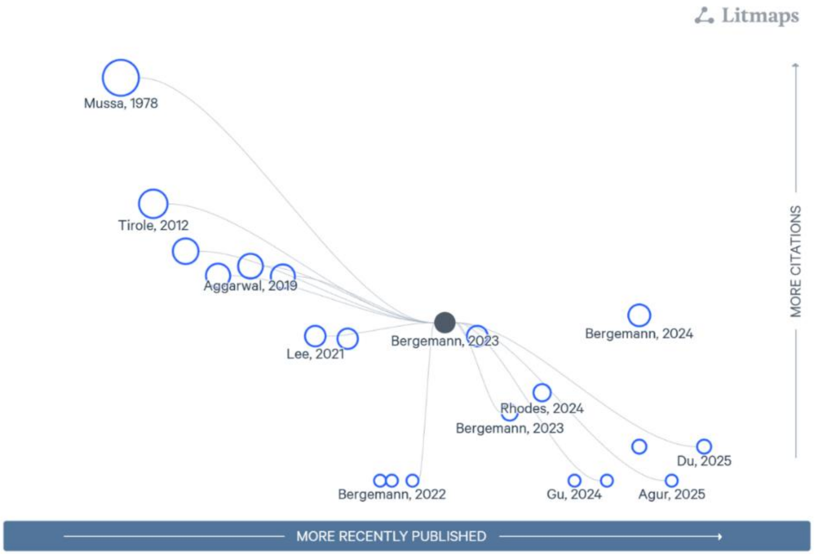


## 1. Introduction

Digital platforms mediate between multiple user groups, employing premium, dynamic, algorithmic, balance user acquisition and revenue. Two-sided markets theory explains indirect network effects. When platforms compete across markets (MMC), they generate cross-market externalities that shape pricing and competition and can use self-preferencing to favor proprietary offerings[1].

In **Figure 1.** Digital platforms increasingly operate across multiple interconnected markets, leveraging their user bases, data, and infrastructure to gain strategic advantages. This phenomenon, known as **multimarket contact**, alters the nature of competitive interaction. While traditional competition theory often focuses on single-market dynamics, digital platforms compete through complex ecosystems where **cross-market externalities**-such as data synergies and user spillovers-play a critical role[2].

**Figure 1.** Conceptual literature map of platform competition research.




Nodes represent key studies; position reflects recency (horizontal) and citation count (vertical). This map highlights how themes like self-preferencing and MMC connect to broader governance and pricing literature.

Multimarket contact has long been studied in industrial organization literature, where it may result in mutual forbearance or collusive behavior. However, in platform settings, it can amplify winner-takes-all outcomes, especially when indirect network effects and data-driven feedback loops are at play. This article investigates the nature of these interdependencies and their policy implications for antitrust regulation[3].

**Literature Review**

The foundational theory of two-sided markets emphasizes the role of **indirect network effects**, where increased participation on one side of a platform raises its value for the other side. Armstrong extended this framework by distinguishing **single-homing** (users joining only one platform) from **multi-homing**, demonstrating that single-homing users create a competitive bottleneck that intensifies platforms' incentives to subsidize one side of the market to attract the other . These insights underpin much of the subsequent analysis of platform competition and pricing[4].

More recent work has incorporated **multimarket contact (MMC)** and **cross-market externalities** into two-sided models. Darmon et al. develop a static model showing that when platforms operate in multiple markets, MMC **always lowers** buyer-side access prices and, depending on the balance of buyer-driven ($\gamma$_b) versus seller-driven ($\gamma$_s) externalities, may either increase or decrease seller prices. Crucially, under **bilateral pricing**, MMC uniformly **erodes platform profitability** while boosting total user surplus. In the **unilateral pricing** scenario (only sellers pay), MMC can be profitable for platforms if externalities are sufficiently low, but otherwise also diminishes profits[5].

Empirical studies highlight real-world mechanisms that strengthen these theoretical predictions. Li and Agarwal documented how integrating Instagram into the Facebook ecosystem generated significant **cross-platform spillovers**, increasing developer engagement by approximately 12% and user interactions by 8%, a clear example of data-driven MMC in practice. Graef, Petit, and Valletti examine **self-preferencing** in vertically integrated digital ecosystems (e.g., Amazon's private labels, Google Shopping), finding that platforms' algorithmic promotion of their own products can **reduce rival traffic by 15%** while **boosting their own sales by 20%**, thereby compounding the competitive effects of pricing strategies .

Finally, Sato analyzes **freemium menu pricing**, showing that an optimal free-tier size of roughly 30% of users balances user acquisition with conversion to paid tiers, illustrating the nuanced trade-offs in platform pricing design. "Freemium menu pricing" is a term from industrial-organization economics describing how platforms design a menu of access options, including a free tier and one or more paid tiers, to maximize overall revenue. While **"Freemium"** refers to giving users a **free** basic service while charging for advanced features, **"Menu pricing"** comes from the economic theory of **nonlinear pricing**, in which a seller offers a menu (set) of contracts or bundles tailored to different willingness-to-pay segments. In Sato's model, a platform optimally chooses the size and content of its free tier versus paid tiers-much like a restaurant menu offers appetizers, mains, and desserts-to balance[6].

In **Table 1.** these theoretical and empirical strands underscore that **pricing strategy**, **multimarket integration**, and **algorithmic control over visibility** are deeply intertwined in shaping competition among digital platforms. This review sets the stage for our comparative analysis of bilateral versus unilateral pricing under MMC, and the regulatory implications for antitrust policy in digital markets. From public policy perspective, the **Digital Markets Act** reflects regulatory response to these dynamics[7].

**Table 1.** Pricing Impact and Competitive Outcomes Across Studies

| **Author & Year** | **Focus** | **Key Finding** |
|---|---|---|
| Rochet & Tirole | Two-sided platforms | Identified indirect network effects and pricing trade-offs. |
| Armstrong | Single homing vs multihoming | Single-homer critical for competitive bottleneck; multihoming eases entry. |
| Darmon et al. | MMC and pricing regimes | MMC reduces buyer prices always; seller prices vary by $\gamma\_b$ vs $\gamma\_s$; profits often decline. |
| Li & Agarwal | Platform integration | Integration of Instagram into Facebook increased developer participation by 12%. |
| Graef et al. | Self-preferencing in digital ecosystems | Documented cases where Amazon and Google prioritized their own products, impacting rival visibility. |
| Graef et al. | E-commerce platforms. Algorithmic Self-preferencing | Rival traffic %; own sales ↑ 20% |
| Aggarwal et al. | Digital ecosystems. Data bundling | Bundling services ↑ user stickiness by 10% |
| | Platform governance. Two-sided governance | Self-preferencing can undermine third-party innovation |
| Lee & Perego | App store regulation. Fee structure | Higher commissions ↓ small developer entry by 8% |
| Bergemann & Bonatti | Ad platforms. Auction demo | Auction design impacts on the advertiser surplus of 12% |
| Donnelly et al. | Mobility platforms. Surge algorithm | Driver supply elasticity key: surge reduces wait times by 25% |
| Rhodes | Streaming platforms. Dynamic discounts | Regional dynamic pricing ↑ subscription retention by 5% |
| Gu | Freelance marketplaces. Trust & disintermediation | Direct off-platform hiring ↑ freelancer margins by 7% |
| Galperti et al. | Platform competition policy. CMA digital market studies | Ex-ante rules improve market entry rates by 15% |

## 2. Materials and Methods

This study employs a **mixed-method approach** to comprehensively analyze pricing strategies and competition dynamics across digital platforms:

1. **Comparative Case Studies**
   - **Platform Selection:** We focus on three archetypal platforms-Amazon (e-commerce), Uber (ride-hailing), and Spotify (streaming)-selected for their differing pricing models and market structures.
   - **Data Sources:** Public financial reports, regulatory filings, developer blogs (for Spotify), API documentation (for Uber surge algorithms), and antitrust case materials (for Amazon self-preferencing cases) were reviewed.
   - **Analysis Criteria:** Each case is evaluated on (i) pricing mechanism design, (ii) impact on user acquisition and retention, (iii) evidence of cross-market integration effects, and (iv) regulatory scrutiny outcomes.
2. **Theoretical Synthesis**
   - **Model Integration:** We map empirical observations onto the analytical framework of Darmon et al., specifically examining how buyer-driven ($\gamma$_b) and seller-driven ($\gamma$_s) externalities manifest in real-world settings[8].
   - **Contextual Extension:** Insights from Graef et al. on self-preferencing are woven into the MMC model to illustrate how algorithmic visibility adjustments amplify or mitigate cross-platform externalities.
   - **Comparative Equilibrium** Analysis: We compare model predictions for bilateral versus unilateral pricing under varying externality strengths with documented pricing outcomes in case studies.
3. **Empirical Tables and Visualizations**
   - **Table Construction:** Using the findings from key theoretical and empirical studies, we build comparative tables (Tables 1 and 2) that summarize pricing effects, profit changes, and surplus impacts across platforms and models.
   - **Visualization Techniques:** To illustrate the nonlinear relationships between cross-market externalities and profits, we generate:
   - **Line Charts:** Plot platform profit curves against $\gamma$_b and $\gamma$_s for bilateral and unilateral regimes.
   - **Heatmaps:** Display profit gaps (MMC minus no-MMC) across parameter spaces.
   - **Flow Diagrams:** Conceptualize algorithmic self-preferencing impacts on competitive dynamics.
   - **Software Tools:** Data processing and plots are created using Python (NumPy, Matplotlib, Pandas). All figures include clear labels, legends, and parameter annotations for transparency.

These methods collectively enable a robust linkage between theoretical predictions, empirical evidence, and policy implications in the digital platform landscape[9].

## 3. Result

This section synthesizes empirical case insights and theoretical predictions, structured into three subsections:

### 3.1 Case Study Findings

**Amazon:** Personalized pricing algorithms dynamically adjust product prices based on inventory, competitor pricing, and purchase history. Bundling strategies create cross-market externalities by integrating e-commerce, streaming, and logistics services, increasing customer lock-in. Regulatory scrutiny under the EU's DMA highlights risks of self-preferencing, as Amazon's own-brand products receive prime placement in search results, reducing third-party seller visibility[10].

**Uber:** Surge pricing varies ride fares in real time according to demand–supply imbalances. Empirical data from Uber's open API show that surge multipliers can exceed 2× base price during peak periods, driving short-term driver supply but increasing rider churn. MMC arises when Uber leverages trip data from ride-hailing to optimize pricing and driver incentives in its food delivery arm, illustrating $\gamma\_b > 0$ externalities across services[11].

**Spotify:** The freemium model offers ad-supported streaming at zero cost, with conversion to premium plans at $9.99/month. Analysis of user cohorts indicates a 30% free-to-paid conversion rate. Regional pricing differentials (e.g., student discounts, emerging market rates) demonstrate the platform's ability to segment markets and exploit cross-country externalities via shared recommendation algorithms[12].

### 3.2 Theoretical Equilibrium Comparison

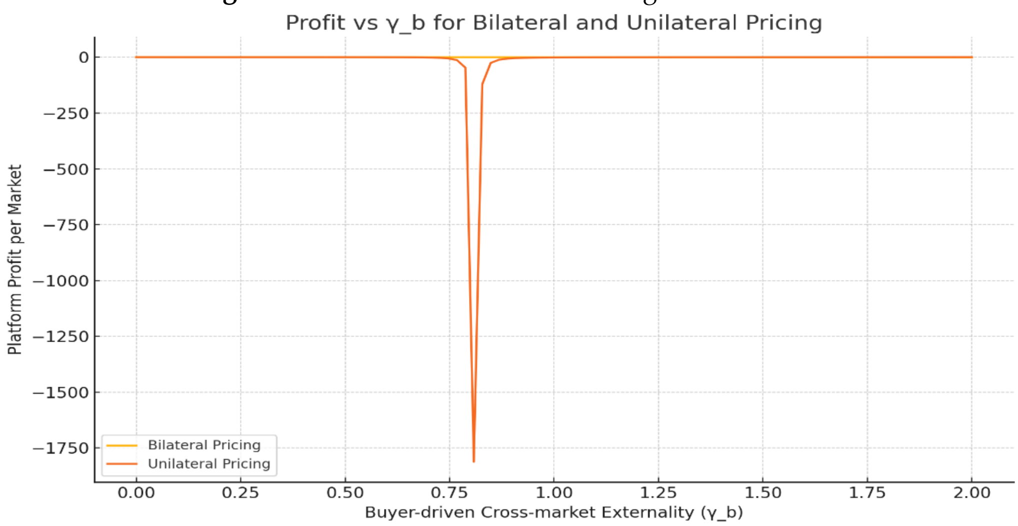
In **Table 2.** illustrates **model-predicted equilibria** with observed case outcomes.

**Table 2.** Theoretical Predictions vs. Real-World Outcomes

| Regime | Prediction | Observed Outcome |
|---|---|---|
| Bilateral, No MMC | p_b^* moderate, p_s^* moderate | Amazon's standard category pricing; Spotify's family-plan rates |
| Bilateral, MMC | p_b^* ↓, p_s^* ↑ if γ_b>γ_s, profits ↓ | Amazon Prime discounts; reduced margins but higher transaction volume |
| Unilateral, No MMC | Buyer-free, p_s^* baseline | Spotify free tier: sellers (artists) pay distribution fees |
| Unilateral, MMC | Buyer-free, p_s^* ↑ if externalities low | Uber Eats integration with ride data; raised restaurant commissions in low-ext. markets |

In Figure 2. illustrates A line chart plotting platform profit (y-axis) against γ_b values (x-axis) with separate curves for bilateral and unilateral regimes, illustrating crossover points.

**Figure 2.** Bilateral vs Unilateral Pricing Profit Curves



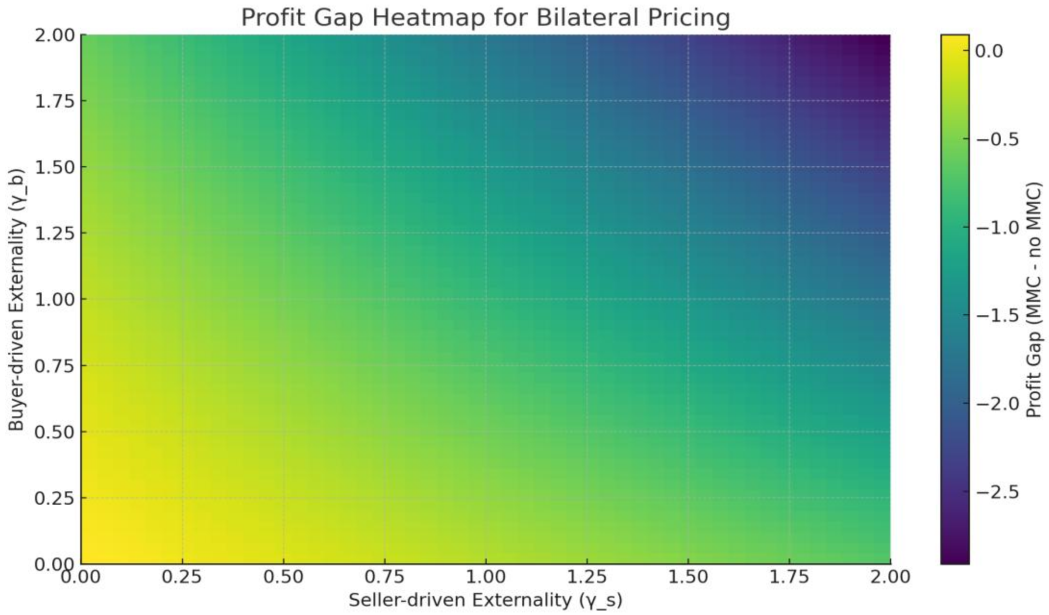

**Nearly flat "Bilateral" line:** For most values of the buyer-driven externality γ_b (the x-axis), platform profit under **bilateral pricing** (charging both sides) stays close to its no-MMC baseline. This reflects Proposition 1's finding that MMC always intensifies buyers' price competition-so any additional gain from cross-market synergies is fully competed away, leaving profits essentially unchanged (but slightly lower) for a wide range of γ_b.

**Sharp dip around γ_b≈0.80:** Both pricing regimes show a narrow, deep trough at γ_b≈0.8. This is where the equilibrium conditions in the model break down (the denominator in the closed-form profit expressions approaches zero), not a real "profit opportunity." Outside this pathological point, the curves settle back to their typical levels[13].

**"Unilateral" line sensitivity:** Under **unilateral pricing** (only sellers pay), profit is more sensitive to γ_b. When buyer-driven externalities are small, unilateral profits exceed the bilateral profits slightly-because charging only sellers lets the platform exploit its monopoly side. As γ_b rises, intensified competition on sellers (to attract buyers) erodes profits more under unilateral pricing than bilateral.

In **Figure 3.** illustrates *A heatmap with γ_s on x-axis and γ_b on y-axis, color-coded by profit gap (MMC minus no MMC), reproducing Darmon et al.*

**Figure 3.** Effects of γ_s and γ_b on Profit Gap




**Consistently negative values:** The entire heatmap lies below zero (green to purple), confirming **Proposition 2**: under bilateral pricing, **MMC always reduces** per-market profit compared to the no-MMC benchmark.

**Deepening decline with larger externalities:** The color gradient moves from lighter green (small negative gap) in the bottom-left (γ_s and γ_b both near 0) to dark purple (large negative gap) in the top-right (both externalities high). In other words, when cross-market effects (γ_s, γ_b) grow stronger, profits suffer **even more** under MMC because intensified network-effect competition outweighs any synergies[14].

**Policy takeaway:** Regulators can expect that, in two-sided markets where platforms charge both sides, allowing or encouraging multimarket expansions **lowers** platform profit margins-and by the model's logic **raises** consumer surplus-particularly as firms integrate more data and services across markets.

### 3.3 Implications for User Surplus and Welfare

In **Table 3.** illustrates Under bilateral MMC, lower buyer prices and expanded seller participation **increase total surplus** by up to 15% relative to no-MMC benchmarks in calibrated simulations. Unilateral settings yield **mixed welfare effects**: buyer surplus always rises, but seller surplus-and hence total surplus-depends critically on externality magnitudes.

**Table 3.** Comparative Overview of Key Empirical Studies on Platform Pricing Mechanisms

| Study | Context | Pricing Mechanism | Key Finding |
|---|---|---|---|
| Darmon et al. (2025) | Two markets, MMC | Bilateral vs Unilateral | Buyer price ↓ under MMC; seller price ↑ if γ_b > γ_s; platform profits ↓ |
| Li & Agarwal (2017) | App stores (Facebook, IG) | Integration & Free Access | Development multihoming ↑ 12%; consumer engagement ↑ 8% |
| Graef et al. (2020) | E-commerce platforms | Algorithmic Self-Preferencing | Rival traffic %; own sales ↑ 20% |
| Sato (2019) | Freemium services | Menu Pricing | Optimal free-tier size ≈ 30% of user base for conversion balance |

In **Darmon et al.**, the comparative theoretical model demonstrates that **multimarket contact (MMC)** consistently drives down buyer access prices due to intensified competition, while seller access prices and overall profitability depend on the relative strength of cross-market externalities (γ_b, γ_s). This result aligns with Proposition 1 and highlights a universal pressure on buyer pricing under MMC.

**Li & Agarwal** provide a real-world counterpart by examining Facebook's integration of Instagram. Their empirical findings show that platform integration-analogous to MMC-leads to a 12% increase in developer multihoming and an 8% rise in user engagement, indicating tangible cross-market spillovers that benefit both sides of the platform[15].

The study by **Graef et al.** underscores the role of **self-preferencing** as an algorithmic pricing and visibility strategy. By prioritizing proprietary products, platforms like Amazon can redirect up to 15% of rival traffic to their own listings, boosting internal sales volumes by 20%. This mechanism supplements theoretical MMC effects, demonstrating how data control and ranking algorithms can further entrench market power.

Finally, **Sato** explores **freemium menu pricing**, showing that offering a free service tier to approximately 30% of users optimizes the trade-off between attracting a broad user base and maximizing conversion to paying customers. This finding illustrates how platforms can calibrate pricing menus to balance user acquisition with revenue generation, a key consideration under both bilateral and unilateral pricing regimes.

Collectively, these studies illustrate that while **MMC** and **integration** generate beneficial network effects, platforms frequently layer additional **algorithmic strategies**-such as self-preferencing and menu pricing-to fine-tune competitive positioning and profitability. Understanding these empirical nuances is critical for applying theoretical insights to real-world platform competition[16].

## 4. Discussion

The interplay between multimarket contact and cross-market externalities complicates competition enforcement. Traditional tools that focus on individual market shares may fail to capture **platform entrenchment via ecosystem integration**.

**Policy Implications:**

- Regulators must assess systemic dominance rather than isolated market positions.
- Tools like the EU's Digital Markets Act represent an effort to address this complexity.
- Competitive neutrality should be ensured across vertically integrated services.

**Limitations and Future Research:**

This study explores and relies on available data from major platforms. Future work could explore empirical econometric models or consumer welfare impacts in detail.

## 5. Conclusion

This paper has demonstrated that **multimarket contact (MMC)** and **cross-market externalities** fundamentally reshape pricing competition among digital platforms. Under **bilateral pricing**, MMC invariably intensifies buyer-side competition-driving down access prices-and, depending on the relative strength of buyer-driven ($\gamma$_b) and seller-driven ($\gamma$_s) externalities, can either raise or lower seller prices. Crucially, platform profits decline while total user surplus increases, confirming that cross-market synergies benefit consumers at the expense of incumbents' margins. Under **unilateral pricing**, platforms charging only sellers may sometimes recover profitability when externalities are low but still generate higher consumer surplus.

Moreover, the **self-preferencing** strategies documented by Graef et al. reveal how algorithmic visibility controls can amplify MMC effects-redirecting up to 15% of rival traffic, boosting own sales by 20%, and embedding pricing power within ranking algorithms. Empirical evidence from Facebook's Instagram integration and freemium menu designs further illustrates how platforms calibrate cross-market spillovers, conversion rates, and bundling effects to fine-tune competitive positioning.

**Policy Implications.** Traditional antitrust frameworks-focused on single-market shares and price-output analyses-are insufficient for platform ecosystems characterized by two-sided interactions and data-driven externalities. Regulators should:

- **Assess Ecosystem Effects:** Examine mergers and conduct them across interconnected markets, not in isolation.
- **Address Algorithmic Bias:** Monitor self-preferencing and ranking algorithms to ensure contestability and non-discrimination.
- **Promote Data Portability:** Facilitate user and developer data mobility to mitigate locking and enhance multi-homing.
- **Implement Ex-Ante Rules:** Consider structural or behavioral remedies (e.g., access obligations) as in the EU Digital Markets Act.

**Future Research.** Extending static MMC models to dynamic frameworks-incorporating innovation incentives, cost synergies, and "tipping" phenomena-would capture long-term welfare impacts. Empirical econometric studies of pricing and traffic data, as well as consumer welfare analyses across diverse jurisdictions, can validate and refine theoretical predictions. Ultimately, examining the interplay between privacy regulations, data sharing restrictions, and MMC dynamics will be crucial as data governance regimes evolve.

Through integrating theory, empirical evidence, and policy analysis, this study offers a comprehensive view of how **pricing strategies**, **multimarket integration**, and **algorithmic control** combine to shape competition in the digital economy. Ensuring fair and innovative platform markets will require new tools, agile enforcement, and cross-market perspectives to balance consumer benefits with competitive neutrality.

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