The Welfare Effects of Sponsored Product Advertising

Chuan Yu

October 2024

Sponsored Product Advertising

Amazon.com   Walmart.com   Instacart   UberEats
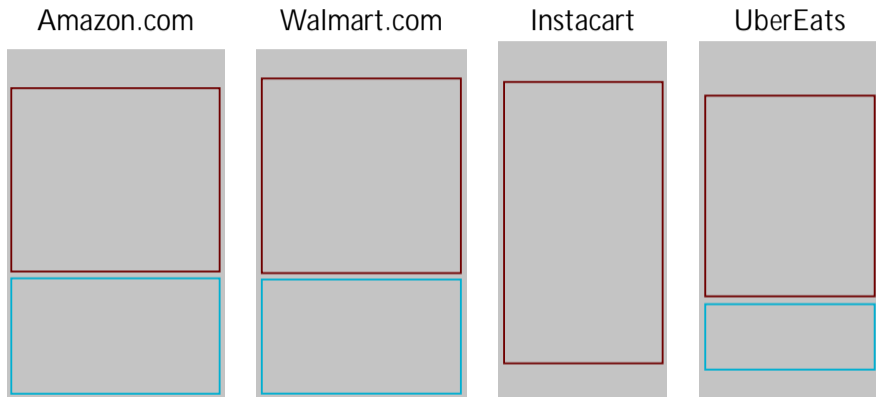
- Sponsored products ad auction. Organic products platform's algorithm

- All products pay a percentage of price as commissions for each unit sold

Motivation

- Many retail platforms have seen substantial growth in ad revenues

	Amazon	Walmart	Instacart	UberEats
Ad Revenues in 2023 (billion)	$46.9	$3.4	$0.9	$0.7
Year-to-Year Change	24%	28%	18%	30%

- Amazon: ad revenues increased from **$2** billion in 2016 to **$47** billion in 2023
- Instacart: nearly **30%** of its revenues in 2023 came from selling ads

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  - Change in monetization strategies: commissions   ad revenues

- Federal Trade Commission sued Amazon in 2023

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- **Roadmap**

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  - **Model**: Estimate an equilibrium model of consumers, sellers, and the platform
  - **Counterfactual**: Simulate new equilibria with different sponsored positions

Outline

Data

- **Scraped search results** of 3,237 high-tra c keywords on Amazon, collected six times a day for two months in 2022   over one million searches
  - Observe sponsored and organic results on the first page
  - Most result pages contain **60 products**, with **12 sponsored** ones

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- **Product characteristics**, e.g., daily prices, sales quantities, listed time, and consumer reviews
    - Compared to top organic ones in the same search, top sponsored products have shorter listing times on Amazon, 83% fewer reviews, and 16% higher prices

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  - Demand, profits, and welfare under a counterfactual set of sponsored positions

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  - Demand, profits, and welfare under a counterfactual set of sponsored positions
- Agents in the model: **consumers**, **sellers**, **platform**
- **Input** (primitives to be estimated)
  - **Consumers**' price sensitivity and search frictions
  - **Sellers**' organic ranks, quality, and costs
  - **Platform**'s objective function

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Model: Timeline

Platform selects **a commission rate** to maximize its objective

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 Consumers make purchase decisions under **search frictions**

Model: Stage 3, Consumers

- Consumer i's utility of purchasing product j on day t follows:

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- Search results contain $N = 60$ positions indexed by n
- **Consumers consider only the top n products in search results**
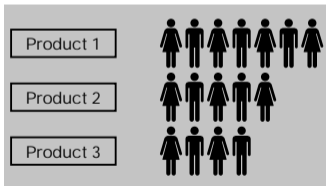
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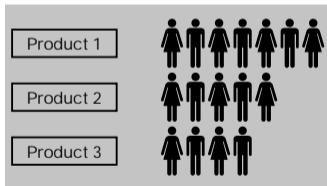
- Market shares depend on product ranks and prevalence of different consumers

Model: Stage 2, Sellers

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Model: Stage 2, Sellers

- Each seller sets a price and chooses a bid each week to maximize expected profits, considering uncertainties in **organic ranks** and **auction outcomes**
- **Organic ranks** are drawn from a fixed distribution for a keyword in a week
  - May not perfectly align with consumer preferences
- **Auction outcomes** are stochastic due to factors like budget constraints and platform experimentation
  - Sellers bid for probabilities of winning each sponsored position

Model: Stage 2, Sellers

|

Model: Stage 1, Platform

- Platform sets an average commission rate to maximize a linear combination of

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| Platform sets an average commission rate to maximize a linear combination of **commissions**, **ad revenues**, **consumer surplus**, and **seller profits**

$$\max \quad \underbrace{COM(\ )}_{\text{commissions}} + \underbrace{AD(\ )}_{\text{ad revenues}} + \mu \quad \underbrace{CS(\ )}_{\text{consumer surplus}} + \underbrace{PS(\ )}_{\text{seller profits}}$$

| μ measures the platform's long-term considerations (e.g., Castillo 2023, Rosaia 2024)

| The commission fee can represent various monetization methods that act as **substitutes** for ad revenues, e.g., storage & shipping fees paid by sellers

| Fees   sellers' WTP for sponsored positions   ad revenues

Outline
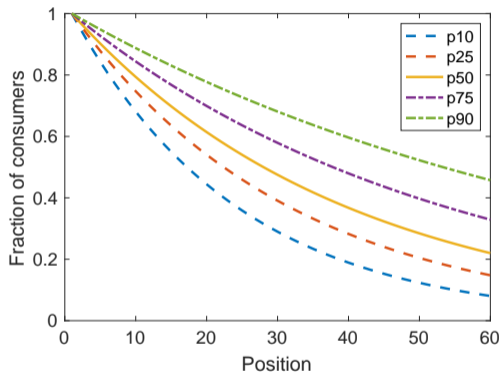
Estimation: Demand

| For a median consumer, the 28th page position is the upper limit she considers

Estimation: Demand
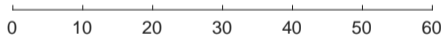
| Organic ranks are reasonably correlated with consumer preferences
| Sponsored products on average deliver lower utility to consumers

Estimation: Supply
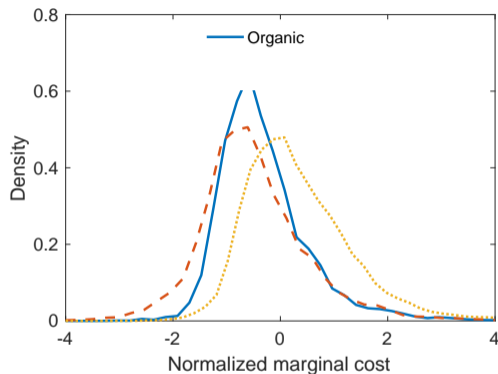
- Top sponsored products have 0.17 SD lower average marginal costs
- Ad payment reverses this cost advantage

Estimation: Platform
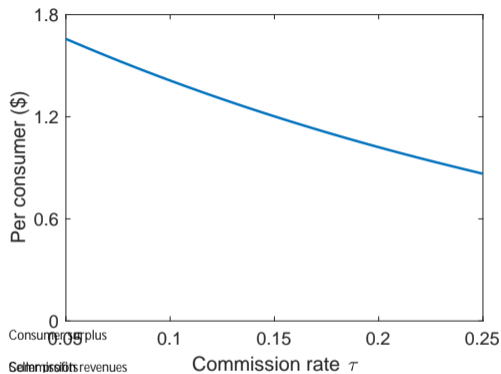
| Amazon puts a weight of 0.12 on the welfare of consumers and sellers relative

Outline

Counterfactual: Aggregate Welfare Effects, Fixed Commission Rate
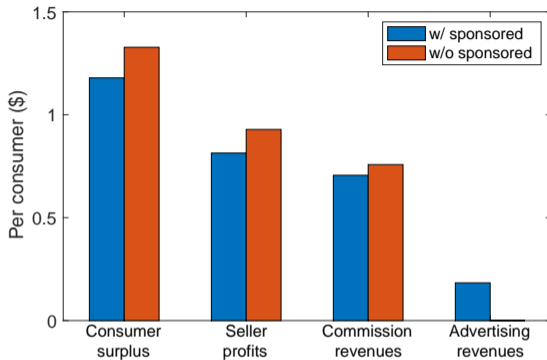
- Under a fixed commission rate, removing advertising **increases consumer surplus by 13% and seller profits by 14%**, and decreases platform revenues by 15%
  - Sponsored products deliver lower average utility
  - Ad payment reverses the cost advantage of sponsored products

Counterfactual: Optimal Commission Rate Without Sponsored Positions
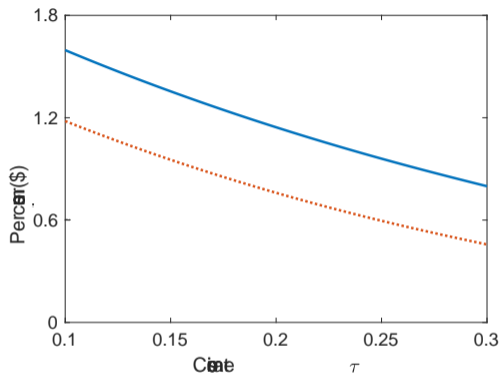
- **Platform's objective is maximized at** = 20.3% (current rate: 15.6%)

- Lower commission rate   higher seller margins   higher bids   higher ad revenues

Counterfactual: Aggregate Welfare Effects, Endogenous Commission Rates
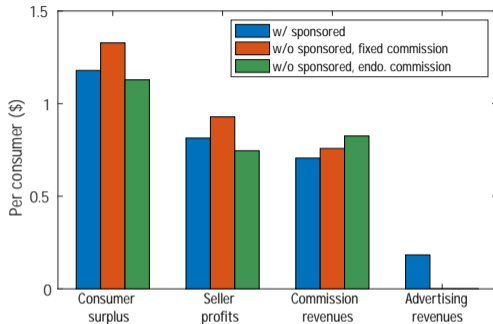

Under endogenous commission rates, removing advertising **decreases consumer surplus by 4% and seller profits by 8%**, and decreases platform revenues by 7%

# Counterfactual: Aggregate Welfare Effects, Endogenous Commission Rates
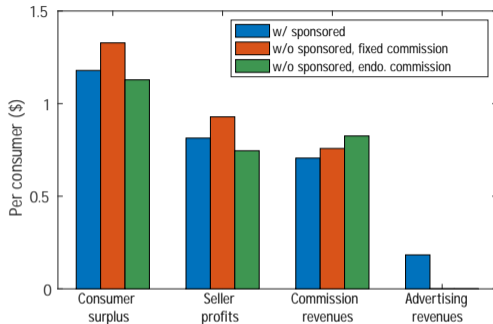
- Under endogenous commission rates, removing advertising **decreases consumer surplus by 4% and seller profits by 8%**, and decreases platform revenues by 7%

- Auctions allow Amazon to price discriminate against sellers
  - High-quality, high-cost organic: lower commission rate
  - Low-quality, low-cost sponsored: higher effective commission rate

# Counterfactual: Alternative Numbers of Sponsored Positions

| Consumer Surplus | Seller Profits | Platform Objective |
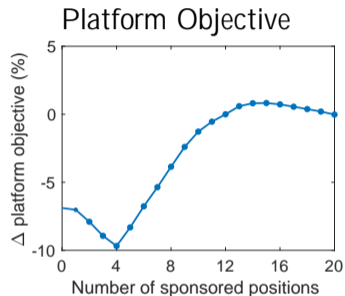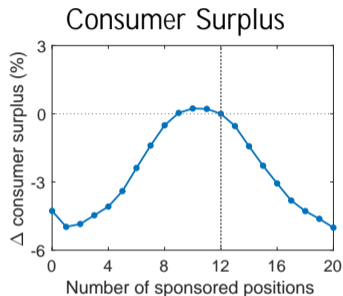
- Vary the number of sponsored positions by (1) removing from bottom to top and (2) adding more in the middle

- **Consumer- or seller-optimal number of sponsored positions is lower than the platform-optimal number**

Counterfactual: Varying Platform Weight μ
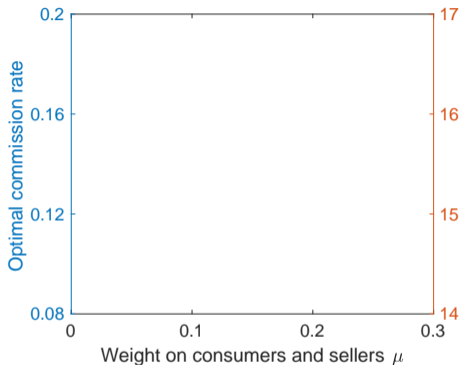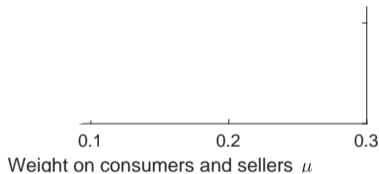
- Vary the weight μ on the welfare of consumers and sellers $COM + AD + \mu(CS + PS)$
- Could measure the effects of increased platform competition

Conclusion

- When regulating platforms with access to multiple revenue streams, it is important to account for the platform's response

- Sponsored product advertising on Amazon benefits consumers and sellers on average by incentivizing a lower commission rate

- A cap on total sponsored positions or more competition among platforms could benefit consumers and sellers