

ECON-C5100 Digital Markets

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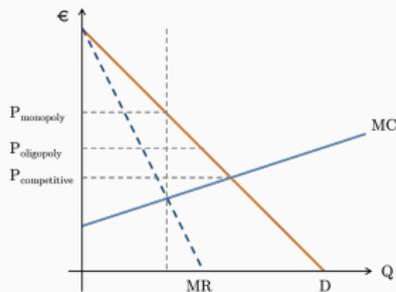
September 21, 2022

Aalto University

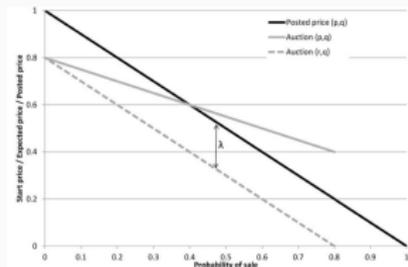
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Lecture 6: Online markets

Happened previously: Trade-offs in market design



N	$E[\text{revenue}]$
1	0
2	33
3	50
4	60
5	67



left: Competition between the sellers lowers prices.

mid: Competition between the buyers leads to better deals for the sellers.

right: Hassle cost: e.g. trade-off between auctions and posting prices.

Figure on the right: Einav et al. 2018.

- Frictions between buyers and sellers
- Use of data
- Wider economic effects

Reminder: Reducing frictions in trade

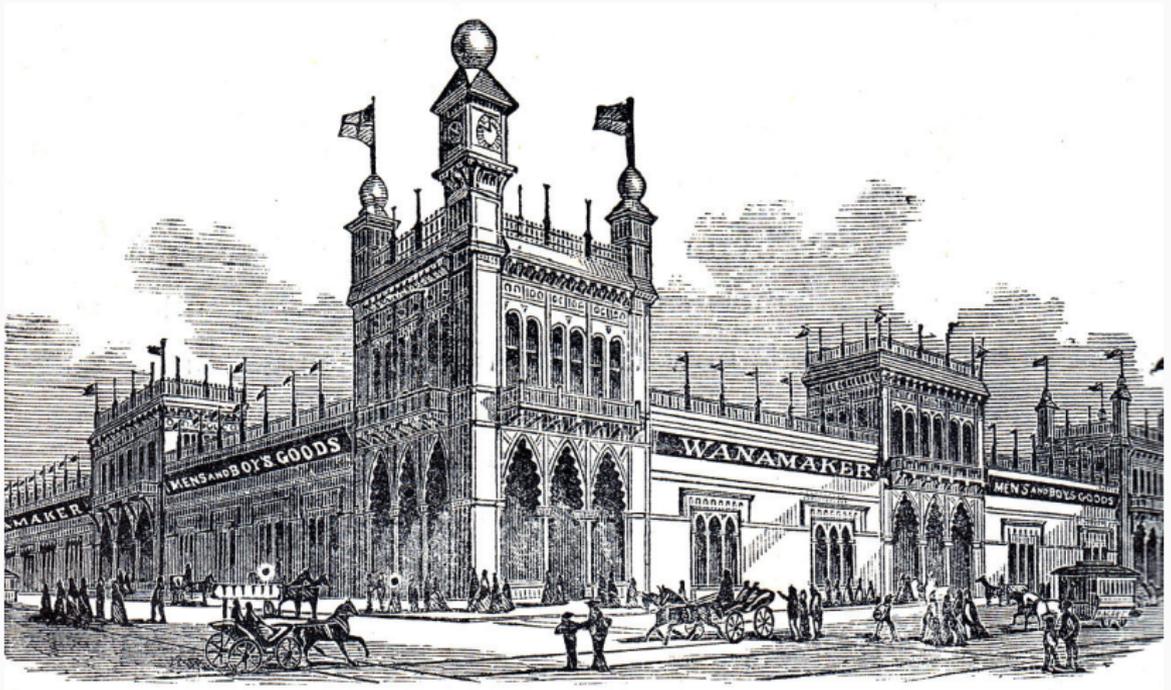


Figure: WikiCommons.

Online marketplace: Conflicting incentives?

Low cost for buyers:

- Transparent and low prices attract buyers.
- To serve buyers, marketplaces want to limit search frictions and induce competition.

High prices for sellers:

- Sellers are attracted by higher prices.
- Those with cost advantage win if prices are low.
- Others may want to differentiate or make it harder for consumers to understand their pricing (price obfuscation).

Online marketplaces: Competition and selection

- Marketplaces will be competing with each other.
 - Direct price (transaction costs) competition would eat all the margins.
 - Would seem to make sense to compete in other dimensions.
- Both buyers and sellers will select to the marketplace that fits their preferences best.
- Enough to recognize the issues for now: We'll return to these questions later in the course.

Online search design affects consumer search and seller incentives at the same time. The search can be used to:

1. Predict consumers' demand, and to guide them toward their most desired product:
 - Can be in response to a user query and/or data.
 - Or through advertising or product recommendations.
 - Or based on the private interests of the marketplace.
2. Help consumers to find a retailer who offers an attractive price for the product:
 - This increases the effective price elasticity faced by sellers, and increases competition.

Webpage is the new layout of a store

The screenshot shows a Microsoft Bing search results page for the query "loans". The search bar at the top contains "loans" and a "Search the web" button. The page displays 42,100,000 results, with a location filter for Helsinki, Uusimaa. On the left sidebar, there are sections for "On this page:" with "Videos", "People Also Ask", and "Related Search". The main content area features a featured snippet for "Compare Loans & Apply Online Today | MoneySuperMarket" with a URL and a brief description. Below this are three columns of information: "What are secured and unsecured loans?", "What can I take out a loan for?", and "How much can I borrow?". Further down, there is an "EXPLORE FURTHER" section with five links to various financial websites. A "Personal Loans - Apply For A Low Interest Loan - Tesco Bank" result is also visible. On the right side, there is a "Loan" knowledge panel with a Wikipedia snippet and a "feedback" link. Below the knowledge panel is an "Explore more" section with three cards: "Student loan", "Installment loan", and "Interest". At the bottom right, there is a "See results for" section with a link to "Loans, South Ayrshire".

Figure. Reminder: Huge amount of A/B testing behind this screen.

Figure: Microsoft.

Do these things matter?

At least three channels seem evident:

- The amount of competition among the sellers is determined on the basis of how many items the user can see. This will affect which choices the customer can make.
- The order of the items / sellers will affect who gets most sales. May be based on other criteria than price, gives control to the marketplace (→ moral hazard problem).
- The available customer choices will start to affect the pricing (and other) decisions by the sellers.

Some examples below.

Different online marketplaces take very different approaches:

- How many items and from how many sellers the user can see.
- The order of the items / sellers.
- Present different sequences of choices:
 - Choose exact product first, then present price alternatives.
 - Present alternative products and prices directly.

Example: Search in Amazon.com (U.S.)

Showing selected results. See all results for [beats headphones](#).



Sponsored ⓘ

Beats Studio3 Wireless Over-Ear Headphones - Shadow Gray

by Beats

\$349⁹⁵ ✓ prime

Get it by **Tue, Jan 22**

FREE Shipping on eligible orders

★★★★☆ ▾ 957



Sponsored ⓘ

Beats Solo3 Wireless On-Ear Headphones - Matte Black

by Beats

\$299⁹⁵ ✓ prime

Get it by **Tue, Jan 22**

FREE Shipping on eligible orders

★★★★☆ ▾ 3,812

Figure: Amazon.

Example: Search in eBay (U.S.)

Price: Under \$45.00 | \$45.00 - \$80.00 | Over \$80.00 | Earpiece Design: Ear-Cup (Over the Ear) | Ear-Pad (On the Ear) | Earbud (In Ear)

 <p>New Authentic Beats by Dr. Dre Solo 3 Wireless Bluetooth...</p> <p>\$159.95 to \$184.95</p> <p>Buy It Now</p> <p>Free Shipping</p> <p>Guaranteed by Fri, Jan. 25</p> <p>Free Returns</p> <p>788+ Sold</p>	 <p>Beats studio 3 Wireless Headphones - Earphones</p> <p>\$175.00</p> <p>or Best Offer</p> <p>Free Shipping</p> <p>119 Sold</p>	 <p>New OEM Beats by Dr Dre Powerbeats3 In-Ear Wireless...</p> <p>\$79.95 to \$99.95</p> <p>Buy It Now</p> <p>Free Shipping</p> <p>Free Returns</p> <p>2,276+ Sold</p>	 <p>SPONSORED Beats studio 3 Wireless</p> <p>\$175.00</p> <p>or Best Offer</p> <p>Free Shipping</p> <p>119 Sold</p>
 <p>SPONSORED New Authentic Beats by Dr. Dre</p> <p>\$159.95</p> <p>Buy It Now</p> <p>Free Shipping</p> <p>1,636+ Sold</p>	 <p>New OEM Beats by Dr. Dre BeatsX Beats X Wireless...</p> <p>\$67.95 to \$84.95</p> <p>Buy It Now</p> <p>Free Shipping</p> <p>Free Returns</p> <p>1,962+ Sold</p>	 <p>USA SELLER-Original Beats by Dre iBeats In-Ear Headphones...</p> <p>\$17.99</p> <p>Buy It Now</p> <p>Free Shipping</p> <p>Free Returns</p> <p>1,254 Sold</p>	 <p>Beats by Dr. Dre Powerbeats 3 Wireless in Ear Bluetooth...</p> <p>\$62.99</p> <p>Buy It Now</p> <p>Free Shipping</p> <p>Free Returns</p> <p>450+ Sold</p>

Figure: eBay.

Experiment with eBay market design

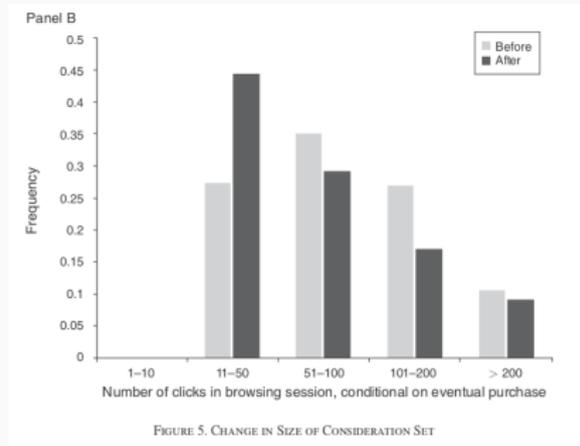
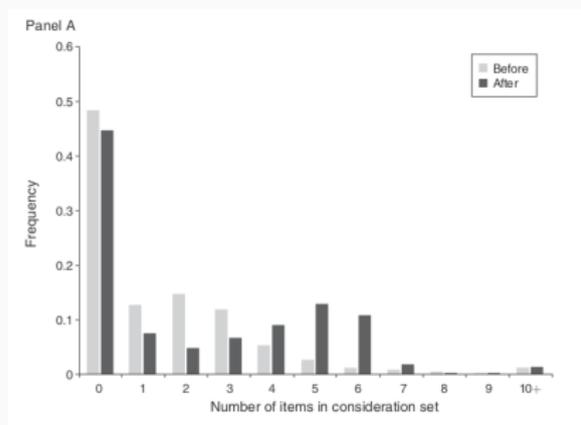


Figure. Impact of the design change to choices people see (left) and number of clicks they need to make (right).

Source: Dinerstein et al. 2018.

Experiment with eBay market design

- In May 2011, eBay introduced a new search result page:
 - Prominent “Buy Box” that displayed the lowest posted price among the sellers classified as “top rated” by eBay.
 - As a result customers could both see more choices and resort to the default choice with fewer clicks.
 - This reduced prices of trades, both because customers could more easily choose the lower price and because the prices offered by the sellers were lower.
- Apparently also quantities sold were slightly reduced. In any case, eBay reverted back to a search that was close to their original search page in 2012.

More formally: basic consumer search theory

- Consider a stylized search model, where the utility of buying a product with price p and characteristics x is given by

$$u(p, x, \gamma) = \gamma x - p,$$

where γ describes the consumer preferences over the characteristics.

- Consumers search through alternatives, but this has a cost s .
- Consumers with $s = 0$ buy the product with highest utility and consumers with $\gamma = 0$ buy the cheapest product.
- If the consumers are assumed to have some prior understanding on the distribution of the potential values, then the optimal search rules can be written out and solved.

Illustration: Search options

Example of options to buy a CD (this is from 2007...).

PRICE MINISTER
l'achat vente garanti
9 718 888 réalisations • 72 228 024 articles
Écoutez • Découvrez

Accueil | Musique | CD | Pictures

Pictures Melus, Katie

2 occasions à partir de : **14,97 €** - 25%
3 neufs à partir de : **11,90 €**

CD Album
Titre: Melus, Katie
Auteur: Melus, Katie
Éditeur: Naïve
Label: Naïve
Sortie: 01/10/2007

• Faire un souhait (ajuste prix)
• Donner votre opinion en 1er !
• Envoyer cette page à un ami et gagner 7 €

5 annonces pour ce produit

Afficher	Tout (n)	Neuf (n)	Discussion (n)	Collection (n)	Trier par	Prix	Note du vendeur	État du produit
11,90 €	Vendu par: goluc3 (PRC) Nata: 4,8/5 pour 25278 ventes Expédition: normal, recommandé	Produit Neuf Voir le détail de l'annonce						Ajuster au panier
13,50 €	Vendu par: ledespot (PRC) Nata: 4,7/5 pour 7474 ventes Expédition: normal, recommandé	Produit Neuf Voir le détail de l'annonce - Poser une question						Ajuster au panier
14,97 €	Vendu par: ZUMM-cd (PRC) Nata: 4,9/5 pour 740 ventes Expédition: normal, recommandé	Corinne Neuf En stock. - Comme neuf - Envoi de l'Allemagne par avion. Délai de livraison: 3-7 jours ouvrables. Voir le détail de l'annonce - Poser une question - Négozier le prix						Ajuster au panier
14,99 €	Vendu par: MetalJazz Nata: 4,9/5 pour 11156 ventes Expédition: normal, recommandé	Corinne Neuf État impeccable! Voir le détail de l'annonce - Poser une question						Ajuster au panier
15,85 €	Vendu par: ZUMM-cd (PRC) Nata: 4,9/5 pour 740 ventes Expédition: normal, recommandé	Produit Neuf En stock. - Envoi de l'Allemagne par avion. Délai de livraison: 3-7 jours ouvrables. Voir le détail de l'annonce - Poser une question - Négozier le prix						Ajuster au panier

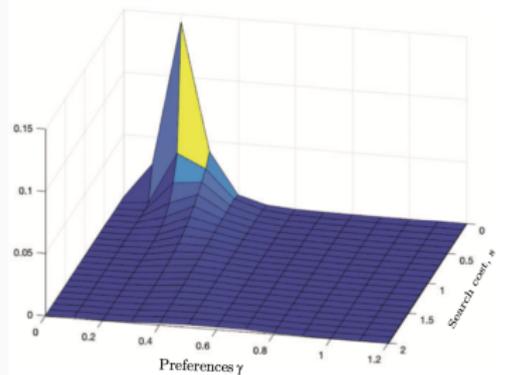


Figure. Estimated distribution of preferences γ and implied costs s . Largest mass at $s = 0$ and $\gamma = 0.2$: consumers care about non-price characteristics.

In-class exercise: Search costs

Go to Amazon.com. Find the cheapest price for the product with following specifications:

- A sleeve for a laptop.
- Needs to be a good fit for a 2021 MacBook Pro 14”.
- Sustainable.
- Ships to Finland.

Use the chat in Presemo presemo.aalto.fi/digimar to report your price and the link.

- Online transactions create data for the companies.
- We'll explore the evidence on some of the (known) ways by which the companies can use these data to advance their business:
 - Dynamic pricing.
 - Product steering.
 - Price discrimination.

- One of the fundamentals in economic theory is the the law of one price:

The price of an identical good traded should be the same across all buyers and sellers.

- If this is not true, then some assumptions on perfect competition are not met, for example:
 - Information is not perfect.
 - Transaction costs (e.g. fixed fees, taxes) distort the outcomes.
- If a good were sold at different prices in different places, a trader could make arbitrage profits until prices are even.

Example: Dynamic pricing

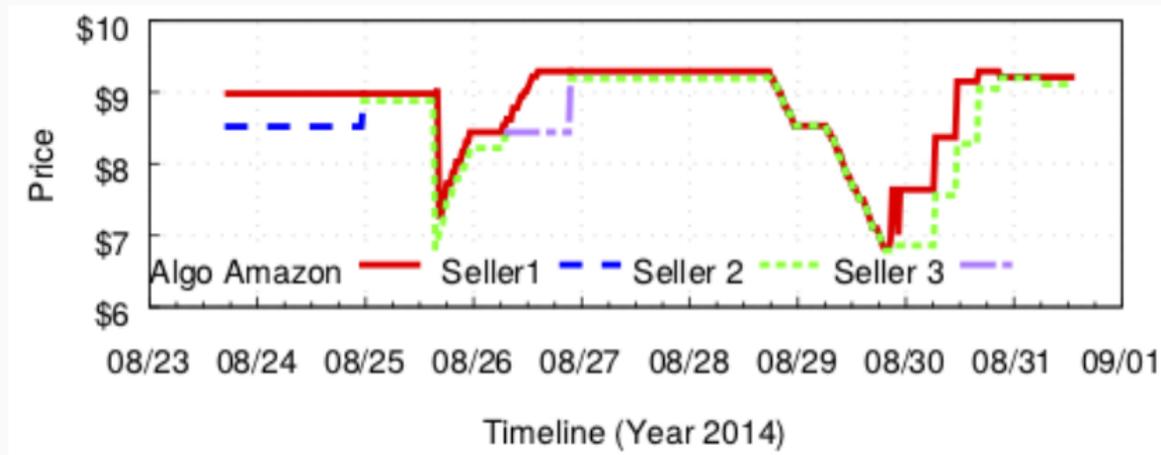


Figure. Example of Amazon matching the lowest seller.

Source: Chen et al. 2016.

Example: Dynamic pricing

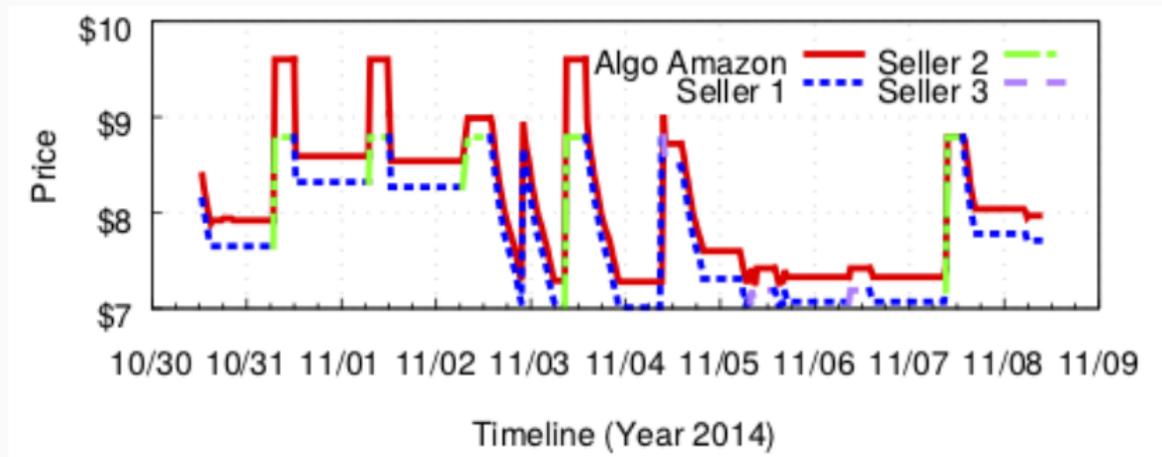


Figure. Example of Amazon keeping a premium over other sellers.

Algorithmic collusion?

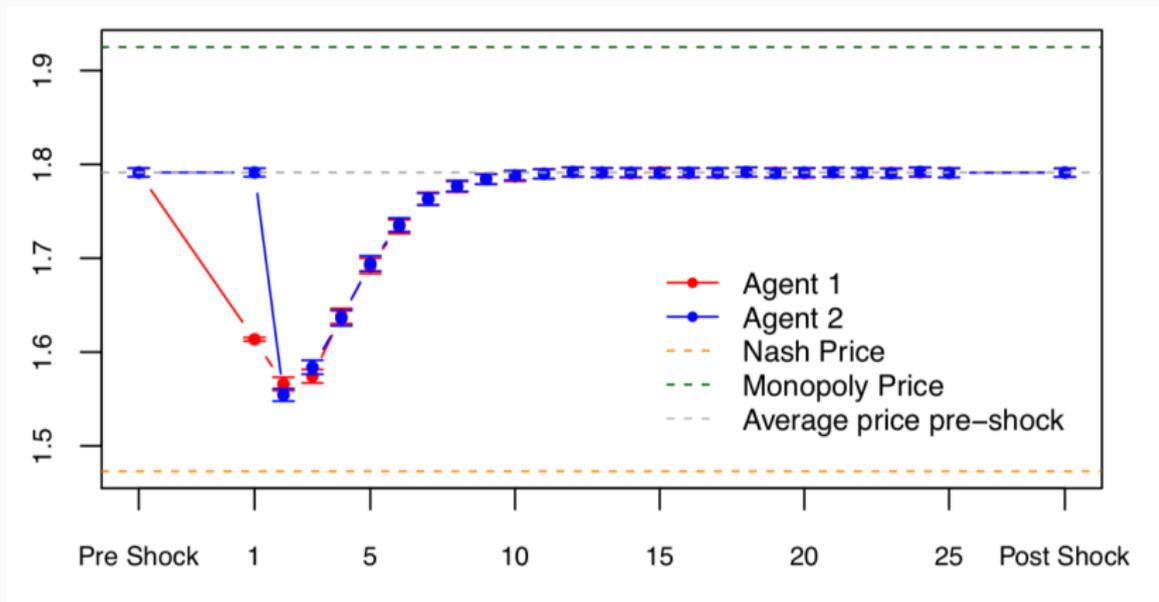


Figure: Calvano et al. 2019.

- Reminder: If a firm has market power, but can only set one price:
 - The price will be based on the marginal benefit to the company (set to equal the marginal cost).
 - There will be a loss in efficiency.
- Similarly: If a firm has market power, but can only set one quality level:
 - The quality will be based on the tastes of the marginal user.
 - There will be a loss in efficiency.
- Product steering is one way to “discriminate” on quality.

Product steering

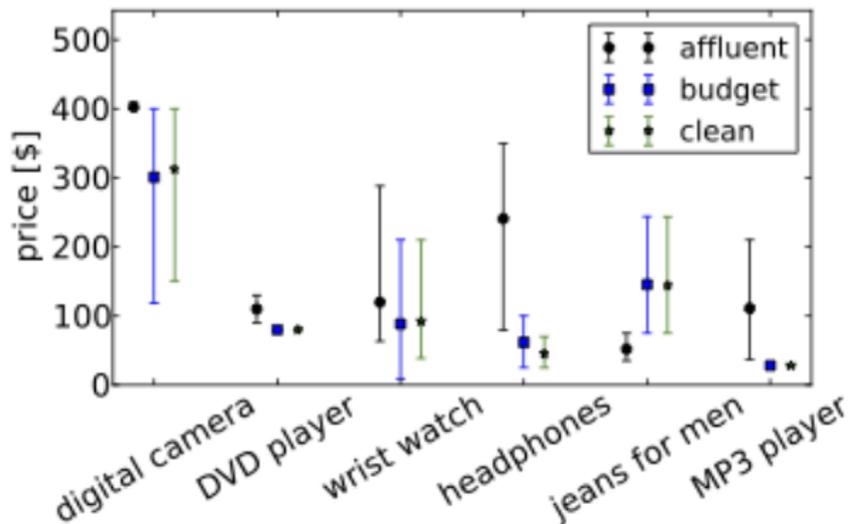


Figure. Example of the use of data to steer product selection, see e.g. the prices offered in headphones or MP3 players.

Figure: Mikians et al. 2012.

Product steering – Amazon and moral hazard

The screenshot shows the Amazon website interface for a search of "lightning cable". At the top, the Amazon logo is on the left, and the search bar contains "lightning cable". To the right of the search bar is a "Valentine's Day Gift Shop" banner. Below the search bar, the text "1-16 of over 10,000 results for 'lightning cable'" is displayed, along with a "Sort by" dropdown menu set to "Featured".

On the left side, there is a "Show results for" section with a list of categories: "Cell Phones & Accessories" (including Cell Phone Cables, Cell Phone Chargers & Power Adapters, Cell Phone Accessories, and Cell Phone Car Chargers), "Computers & Accessories" (including Lightning Cables, Computer Cables & Interconnects, and USB Cables), and "Electronics" (including Audio & Video Cables & Interconnects). There is also a "Refine by" section with options for "Subscribe & Save", "Delivery Day", and "Amazon Prime".

The main content area displays three sponsored product listings:

- Top listing:** "Shop Lightning Cables from AmazonBasics" with a "Shop now" link. It features two images of white cables. To the right, two specific products are shown: "AmazonBasics Lightning to USB A Cable - MFi Certified iPhone ..." (1,937 reviews, 4.5 stars, Prime) and "AmazonBasics Nylon Braided Lightning to USB A Cable - MFi ..." (9,526 reviews, 4.5 stars, Prime).
- Middle listing:** "AmazonBasics Double Braided Nylon Lightning to USB A Cable, Advanced Collection - MFi Certified iPhone Charger - Dark Grey, 10-Foot" by AmazonBasics. Price: \$15.99. Promotion: "Get it Thu, Feb 21 - Sat, Feb 23 FREE Shipping on eligible orders". Rating: 4.5 stars, 2,135 reviews.
- Bottom listing:** "AmazonBasics Lightning to USB A Cable, Advanced Collection - MFi Certified iPhone Charger - Red, 4-Inch" by AmazonBasics. It features two images of red cables.

Figure. Example of Amazon search for “lightning cable” (1/3).

Product steering – Amazon and moral hazard

The image shows a screenshot of an Amazon search results page for 'lightning cable'. On the left, there are several filter sections:

- Amazon Prime:** prime
- Eligible for Free Shipping:** Free Shipping by Amazon
- Data Cable Interface:** Lightning, Micro USB, DVI, USB, AUX, HDMI
- Avg. Customer Review:** 5 stars & Up, 4 stars & Up, 3 stars & Up, 2 stars & Up
- Brand:** AmazonBasics, Apple, Anker, SMALLElectric, ONSON, TNSO, Aimus, Everdigi, YUNSONG, QIANXIANG, HokoAcc, lightning Cable, Lightning Cables, DTLake, AKEDRE

The main product listing at the top is for 'AmazonBasics Lightning to USB A Cable, Advanced Collection - MFI Certified iPhone Charger - Red, 4-Inch' by AmazonBasics. It is sponsored, priced at \$7.99 with Prime, and has a 4.5-star rating from 244 reviews. It is available by Tuesday, Feb 12 with free shipping on eligible orders.

Below this, there is a 'Top Rated from Our Brands' section with three product cards, all from AmazonBasics:

- Product 1:** AmazonBasics Nylon Braided Lightning to... (USB A to Lightning). Price: \$12.99 with Prime. Rating: 4.5 stars from 9,526 reviews. Labeled as 'Our Brand'.
- Product 2:** AmazonBasics Lightning to USB A Cable... (Lightning to USB A). Price: \$11.98 with Prime. Rating: 4.5 stars from 1,920 reviews. Labeled as 'Our Brand'.
- Product 3:** AmazonBasics Lightning to USB... (Lightning to USB A). Price: \$7.64 with Prime. Rating: 4.5 stars from 1,925 reviews. Labeled as 'Our Brand'.

Figure. Example of Amazon search for “lightning cable” (2/3).

Product steering – Amazon and moral hazard

PRICELINE

Cell Phone Compatibility

- iPhone X
- iPhone 8
- iPhone 8 Plus
- iPhone 7
- iPhone 7 Plus
- iPhone 6/6S
- iPhone 6/6S Plus
- iPhone 5/5S/SE
- iPhone 5C
- Samsung Galaxy S 9
- Samsung Galaxy S 9 Plus
- Samsung Galaxy S 8
- Samsung Galaxy S 8 Plus
- Samsung Galaxy S 7
- Samsung Galaxy S 7 Edge
- Samsung Galaxy S 6
- Samsung Galaxy S 6 Edge
- Samsung Galaxy S 5

Cable & Interconnect Length

- Under 4 Feet
- 4 to 5.9 Feet
- 6 to 7.9 Feet
- 8 to 9.9 Feet
- 10 to 14.9 Feet
- 15 to 24.9 Feet
- 25 Feet & Above

Cable Color

Cable Length

- Under 4 Feet
- 4 to 5.9 Feet
- 6 to 7.9 Feet

Amazon's Choice



AmazonBasics Nylon Braided Lightning to USB A Cable - MFI Certified iPhone Charger - Dark Grey, 6-Foot
by AmazonBasics

\$12.99 ✓prime
Get it by Tue, Feb 12
FREE Shipping on eligible orders

More Buying Choices
\$12.08 (4 used offers)

★★★★☆ 9,526

Product Features
... Lightning and USB ends to improve durability and reduce fraying; Cables ...



AmazonBasics Lightning to USB A Cable - MFI Certified iPhone Charger - White, 3-Foot, 2-Pack
by AmazonBasics

\$11.98 ✓prime
Get it by Tue, Feb 12
FREE Shipping on eligible orders

More Buying Choices
\$8.99 (6 used offers)

★★★★☆ 1,920

Product Features
... Six feet of cable give you the ... PowerLine Lightning, Hook and ...



iPhone Charger, Anker Powerline 6ft Lightning Cable, MFI Certified for iPhone Xs/XS Max/XR/X / 8/8 Plus / 7/7 Plus / 6/6 Plus / 5s / iPad, and More (White)
by Anker

\$8.99 ~~\$10.99~~ ✓prime
Get it by Tue, Feb 12
FREE Shipping on eligible orders

More Buying Choices
\$8.81 (1 used offer)

[See newer version](#)

★★★★☆ 4,231

Product Features
... Six feet of cable give you the ... PowerLine Lightning, Hook and ...

Figure. Example of Amazon search for “lightning cable” (3/3).

Impact of competition with product steering

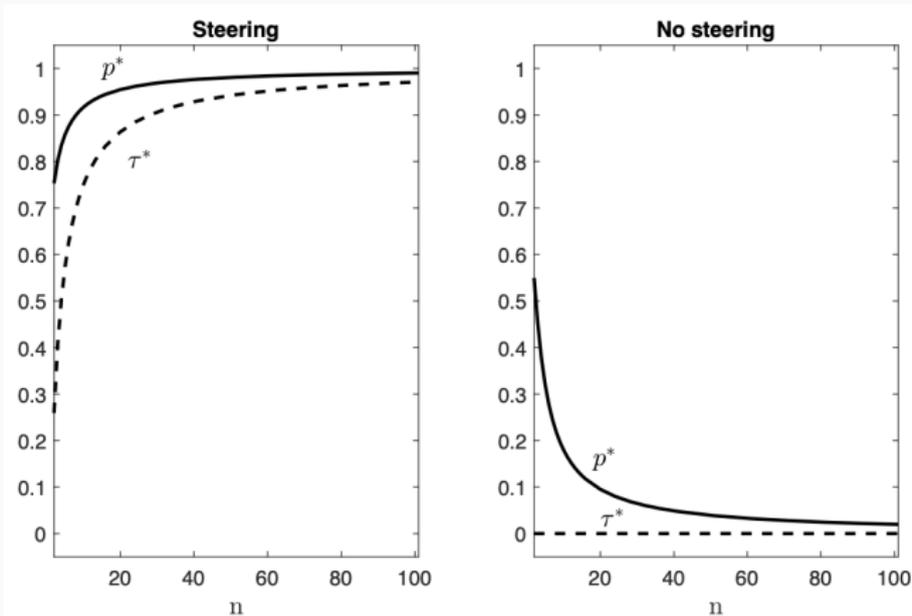


Figure 1: Prices and commissions when M steers versus when it does not.

Figure. Consumers search for products, search is costly, intermediary can recommend products and charge commissions, firms set prices.

- Product steering and price discrimination are ways by which the firm tries to extract the maximum amount you are willing to pay.
- Remember that in perfect competition all sellers would be willing to sell at their cost (if they would try sell at a higher price, someone else would sell at cost level).

- Despite the potential, evidence suggests that price discrimination is not that wide-spread:
 - In 2015, the U.S. Council of Economic Advisers: price discrimination is used in a “limited and experimental fashion”.
- Arguments against price discrimination:
 - Transparency of online prices.
 - The fear of antagonizing customers, e.g. in 2000, Amazon was caught selling the same DVD with different prices. This led to the following statement by their CEO:
“We’ve never tested and we never will test prices based on customer demographics.”
 - Other firms can learn from your profiling.

Price discrimination: Easy to get caught

The image displays two identical hotel listings for Hôtel Renaissance Paris Arc de Triomphe, illustrating price discrimination. Each listing includes the hotel name, address (39 avenue de Wagram Paris, Paris, 75017 France), a five-star rating, and a photograph of the hotel building at night. The top listing shows a nightly price of \$633, while the bottom listing shows a nightly price of \$565. Both listings feature a green checkmark icon and the text 'FREE cancellation', a green button labeled 'Pay now or at hotel', and a blue button labeled 'Select'.

Listing	Nightly Price
Top	\$633
Bottom	\$565

Figure. Example of price discrimination. Two identical searches with different online fingerprint.

Use of data in price discrimination

- The effects of data to competition can be surprising, as the following result from duopoly competition demonstrates:
 - Two firms sell a homogenous product to a group of consumers some of which they can profile with some accuracy
 - Firms can price discriminate those consumers that they can profile and they'll set a list price for others
 - If firms are equally able to profile consumers or if only one firm is able to profile consumers, then profiling does not allow firms to escape from the Bertrand paradox and make positive profits.
 - If both firms can profile customers and price discriminate, but there is uncertainty (did one firm recognize the consumer or did they both?), then the firms can earn positive profits.
- We'll continue to discuss the role of data in connection with privacy issues later.

- Online information on the bids of competitors makes it easy to match prices.
- If and when consumers are inattentive, Amazon has the advantage of deciding when it wants to sell the product and at what price.
- This also works the other way around: Other companies can start to match Amazon prices.

Amazon effects: Price changes

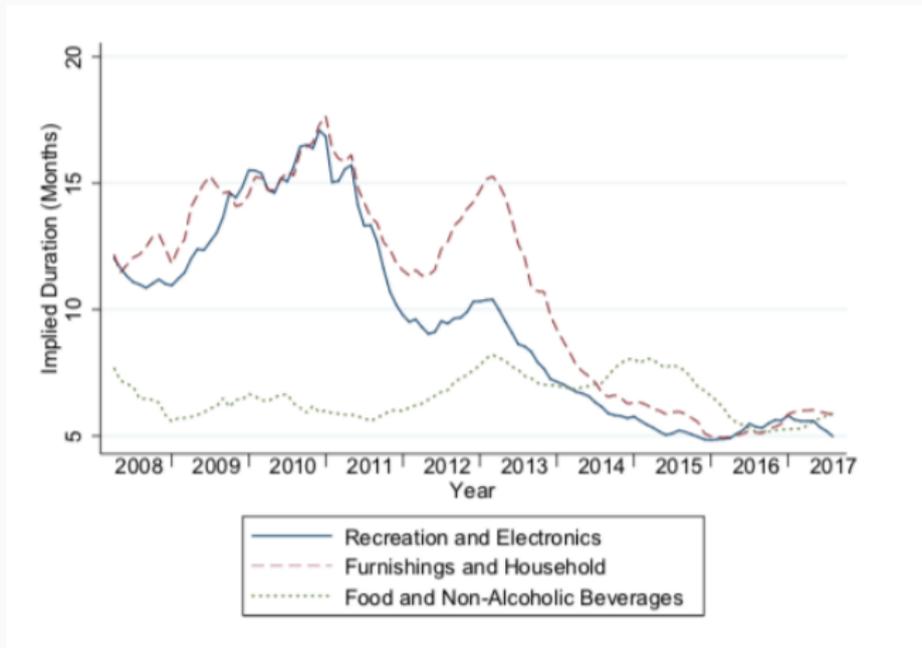


Figure. Entry of Amazon to some sector seems to increase the rate of price changes that the offline retailers make.

Amazon effects: Price discrimination

Table 5: Uniform Pricing for Walmart's Grocery Products Found on Amazon

	<u>Share of Identical</u>		<u>Average Price Difference</u>	
Found on Amazon	0.058 (0.008)	0.055 (0.008)	-1.979 (0.306)	-1.891 (0.309)
Zip Codes Sampled		0.002 (0.000)		-0.044 (0.017)
UE Rate Difference		-0.006 (0.002)		0.386 (0.071)
Constant	0.914 (0.004)	0.921 (0.009)	2.939 (0.152)	1.794 (0.386)
Observations	3,982	3,949	3,778	3,746
Obs. on Amazon	934	929	908	903
R-squared	0.022	0.031	0.014	0.024

Notes: The dependent variables are measured using prices collected from multiple zip codes in March 2018. The variable "Found on Amazon" is a dummy that identifies whether the product was found by a scraping robot that searched for the first 100 characters of the product description on Amazon's website. Fixed effects are computed using the product's COICOP 3-digit category. Standard errors are in parentheses.

Table. Impact of Amazon to price dispersion in Walmart's grocery products.

Implications of online markets

- Increase in competition between online and offline retailers can lower markups, and prices.
- After the competitive channel is exhausted, more permanent change in the wider economy may result as the pricing patterns change both online and offline.
- May benefit the consumers as productivity gains are passed on to prices quicker.

Source: Cavallo, (2018).

Overall gain from online shopping to consumers

- Share of online trade in the U.S. reached 10 % of in 2017.
- Variety gain (ca. 1 % of consumption):
 - Online retailers are less constrained by physical space, they can offer a wider variety of products.
 - E-commerce also enables consumers to access stores that do not have a physical location near them.
- Convenience gain (ca. 0.4 % of consumption):
 - Consumers can purchase the same product online that they may have previously purchased at a brick-and-mortar store without making a physical trip.

- Online markets increase efficiency and result in permanent changes to the economy.
- Yet online marketplaces face a trade-off:
 - Reduce search frictions to benefit buyers.
 - Attract sellers by allowing for higher margins.
- Data collected online presents firms with new opportunities: dynamic pricing, price discrimination, and product steering.

Reading assignment 3:

- **Ad auctions.** Easley, David and Jon Kleinberg (2010), Chapter 15 from “Networks, Crowds, and Markets: Reasoning about a Highly Connected World”. Read at least Sections 15.1, 15.5, and 15.7.
- **Online markets.** Levin, Jonathan (2011) “The Economics of Internet Markets”, NBER Working Papers 16852. Read Section 4 (you are not expected to memorize who wrote what, focus on the economics and empirical evidence given).
- **Macro impacts.** Cavallo, Alberto (2018) “More Amazon effects: Online competition and pricing behaviors”, NBER Working Paper 25138. Sections I Introduction and VI Conclusions enough.

- Networks
- Network effects
- Model of fulfilled expectations