

ECON-C5100 Digital Markets

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Lecture 11: Digital goods

- Digital goods
- Cyber security

A definition



Economics is the study of how society allocates scarce resources and goods.



- What changes if the scarcity is relaxed?
- The replication costs of digital goods is (nearly) zero.
- Digital goods are non-rival
 - Consumption of a movie from Netflix does not affect the possibility of others to consumer the same movie.
- In comparison to traditional goods
 - Going to a movie theater: the seat that you take takes away the possibility to see the same movie from someone else.
 - Renting a DVD: the disc can only be in one place at a time.
- The cost of delivering the movie from Netflix server to a consumer is also nearly zero.

So producing digital goods is (nearly) free, but how can the goods be priced profitably?

1. Selling eyeballs
2. Selling data
3. Selling the service

Reminder: Auctions as a tool for selling stuff

How to choose price for thousands of ads sold to billions of consumers?

- What is the right price to ask?
 - It will depend on how much buyers are willing to pay.
 - Buyers are not going to tell you their true value.
 - Auction is a mechanism for price discovery.
- Auctions also create a competition between buyers.

Reminder: Selling eyeballs

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Figure. Search for “loans” in Google (U.S.).

Reminder: Selling eyeballs

- Ad auctions in Google search
 - Advertisers send their bids in cents per click by search term.
 - Auctions are used to clear the market.
- Advertisements seen on a normal webpage or within an app are auctioned in a similar fashion.
 - Can be also cost per impression rather than cost per click.
 - Exact auction form varies.

Value of digital goods?

How much is Google search worth to you?

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

Importance of digital services to well being

Table 1. Median WTA estimates for most popular digital goods categories

Category	WTA per year 2016, \$	WTA per year 2017, \$	95% CI WTA per year 2016, \$		95% CI WTA per year 2017, \$		n
			Lower	Upper	Lower	Upper	
All search engines	14,760	17,530	11,211	19,332	13,947	22,080	8,074
All email	6,139	8,414	4,844	7,898	6,886	10,218	9,102
All maps	2,693	3,648	1,897	3,930	2,687	5,051	7,515
All video	991	1,173	813	1,203	940	1,490	11,092
All e-commerce	634	842	540	751	700	1,020	11,051
All social media	205	322	156	272	240	432	6,023
All messaging	135	155	98	186	114	210	6,076
All music	140	168	112	173	129	217	6,007

Figure. How much money a median user would have to get (WTA, willingness-to-accept) in order to not have access to digital services.

Source: Brynjolfsson et al., 2019.



Figure. Relative disutilities from not having access.

Source: Brynjolfsson et al., 2019.

- Many of the online services provide utility to the users
 - Search, maps, email, e-commerce, social media, messaging, entertainment, etc.
- Companies that can provide such utility can attract users to their pages.
- Repeated opportunities to sell ad space.
- Free access to a webpage maximizes the number of users.

- Reduction of transaction costs
 - No need for billing
 - Sometimes no need for accounts etc.
- Consumers like zero-price products.
 - Seems to go beyond simple utility maximization.

Unwanted consequences of free pricing: E-mail

Cost of Spam Advertising Relative to Other Advertising Media

(cost per thousand impressions (CPM))

Advertising vector	CPM	Breakeven conversion with marginal profit = \$50.00	
		Percent	Per 100,000 deliveries
Postal direct mail	\$250–1,000	2–10% ^a	2000
Super Bowl advertising	\$20	0.04%	40
Online display advertising	\$1–5	0.002–0.006%	2
Retail spam	\$0.10–0.50	0.001–.0002%	0.3
Botnet wholesale spam	\$0.03	0.00006%	0.06
Botnet via webmail	\$0.05 ^b	0.0001%	0.1

Figure. Spammers were responsible of roughly half of the 300 billion emails send every day in 2018. Their annual private gain was estimated to be \$200 million in 2012 with a social cost that was 100 times greater.

Source: Rao and Reiley, 2012.

Firms use tracking to collect data that is used

- To target the ads more precisely
- To develop services
- To keep people coming back
- For sale

- Advertising revenues support new services on the Internet.
- Targeted advertising gives consumers useful information.
 - User see ads that should more precisely reflect their “needs”.
 - Reduces the showing of unwanted ads.
 - Improves efficiency of advertisement.
- Information can be “reused”, increasing its value.

- Trade-off in the incentives for consumers to reveal data
 - Sharing information may increase benefits.
 - Equally rational to not share too much information.
 - Possibility for resale of data leads to more caution.
- Implications to market efficiency and competition ambiguous.
- We'll return to privacy questions in the lecture about regulation.

- Who has the property rights for data?
 - Consumers waiver a lot of their rights in the terms of services.
 - Granting access to data not always made knowingly.
- Birth of data intermediaries
 - Collecting data from various sources for resale.
- Also possibility for data breaches.
- Solution proposed by Tim Berners-Lee: “Pods,” personal online data stores.

Data breaches: Hacking

World's Biggest Data Breaches & Hacks

Select losses greater than 30,000 records

Last updated: 29 Jun 2020

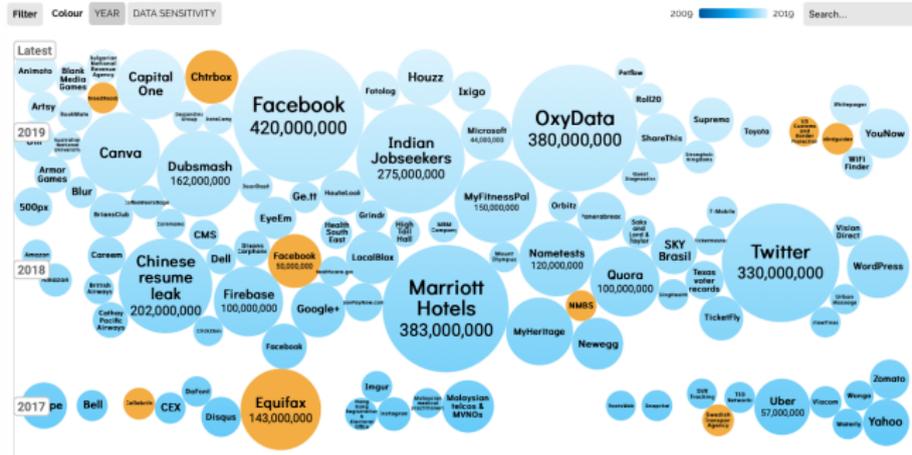


Figure. Data breaches of various sorts seem to be an increasing problem, with total global losses of \$2–3 trillion in 2019.

Figure: <https://www.informationisbeautiful.net/visualizations/worlds-biggest-data-breaches-hacks/>

Data breaches: Hacking

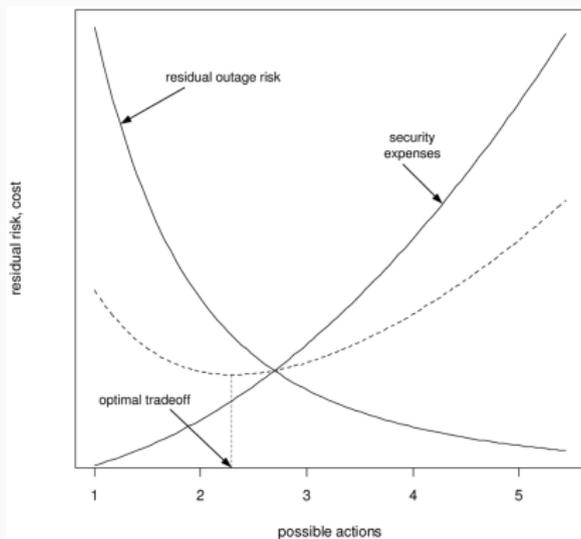


Figure. Investment to security reduces the risk of security breach. While initially effective, security investments have diminishing marginal returns that make it unprofitable to protect against all eventualities. The level of security is set where the total cost (\sim dashed line) is minimized.

- If marginal costs are near zero, why are not all digital services prices near zero?
- In many services network effects play a role and give the network operators pricing power, for example:
 - Marketplaces that can offer a large number of buyers and sellers (e.g. Alibaba, Amazon).
 - Software platforms that have a large number of users (Android, Apple iOS, Windows).
- Notice though that the profits are due to innovation and investments.

- The non-rival nature of digital goods makes it possible to bundle products.
- Bundling so far particularly popular in entertainment in the form of streaming
 - Exemplified by Spotify that took over Apple iTunes.
 - Development in technology has allowed the spread of streaming to video, here Netflix was an early pioneer.

Why streaming won?

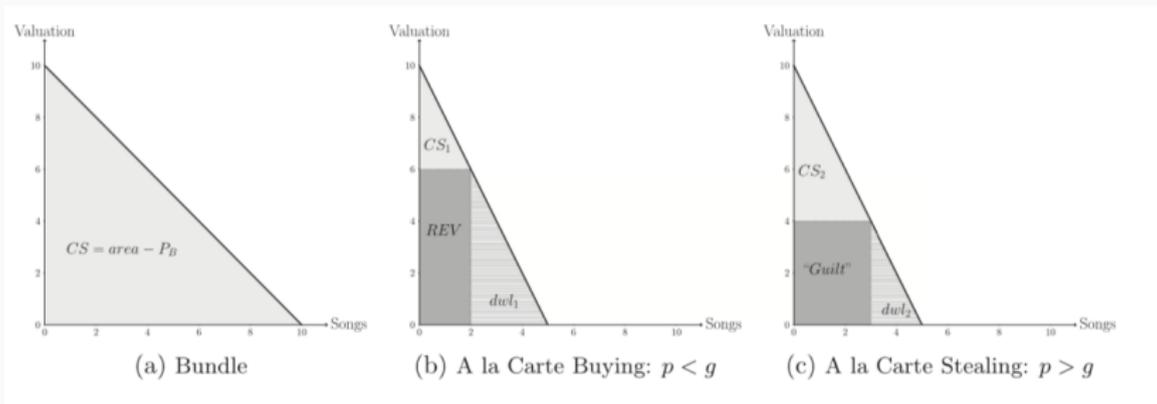


Figure. Alternatives for a consumer to enjoy music.

Source: Aguiar and Waldfogel, 2018.

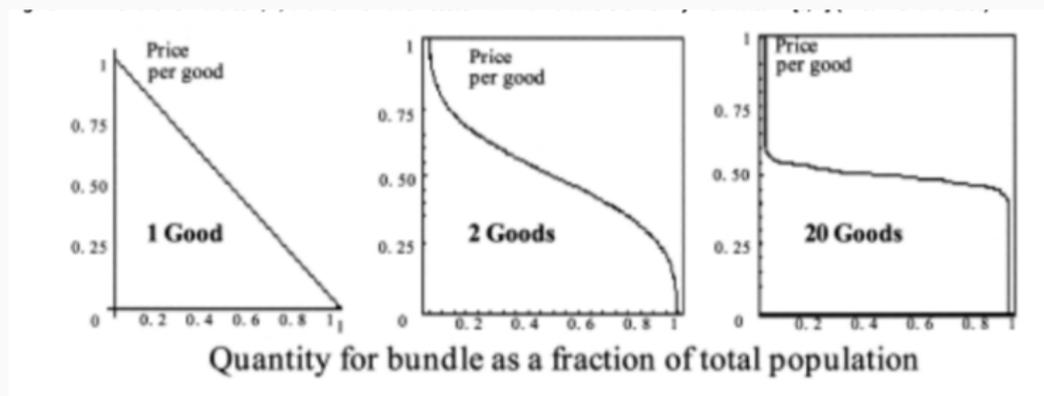


Figure. Bundling several non-rival goods to heterogeneous consumers will extract higher rents from consumers than pricing the products individually.

Source: Bakos and Brynjolfsson, 1999.

Exclusive content – A “must have”?



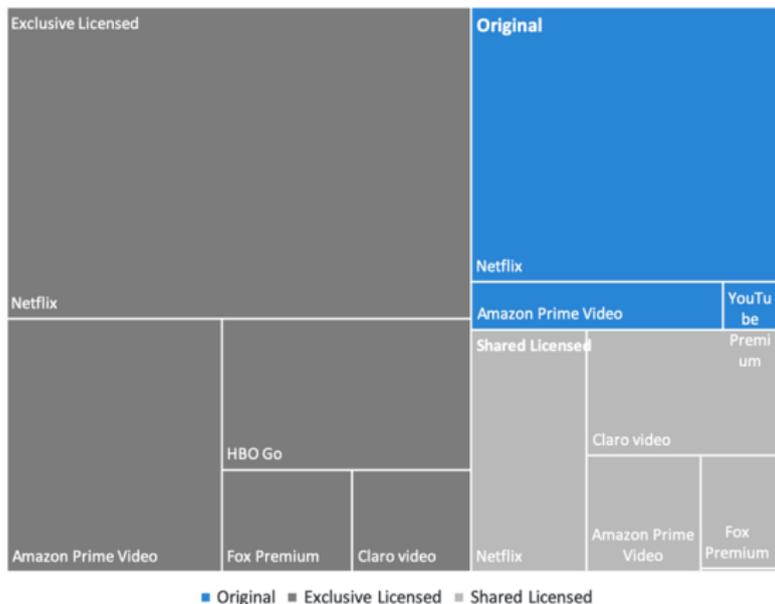
At trial, much time was spent debating the “must have” status of Turner’s programming content. According to the Government, distributors literally “must have” Turner’s content in order “to compete effectively” Defendants countered that the term “must have” simply a marketing phrase used to mean “popular” and, similarly, that Turner content is not actually necessary to allow distributors to operate their business successfully.

–Judge Richard Leon in USA v. AT&T et al. (2018)



Reminder: Exclusive content vs. bulk

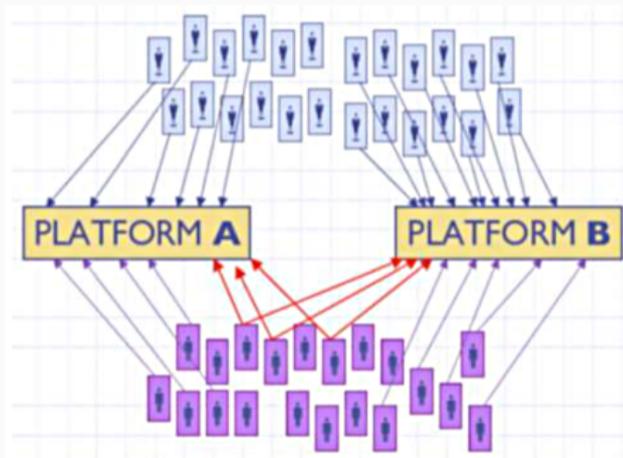
Most attention is destined to licensed content:
Demand across direct-to-consumer platforms in Mexico



Reminder: multihoming

Intuition:

- Platforms have a monopoly access for singlehomers.
- Singlehomers are courted: once captured are monopoly subjects.
- Multihomers are exploited: they want to have access to the singlehomers.



Must-have items

- Consider two items on sale: A and B and two service providers $R1$ and $R2$.
- Product A has no substitutes, product B has several.
- Some consumers like A , some B , and yet others both.
- If there are enough singlehomers, then product A can become a “must-have”:
 - Say that initially both service providers carry both items.
 - Now consider the removal of item A from $R2$. Then $R1$ has better selection to consumers who like both A and B .
 - Singlehomers that like both will then converge to $R1$, and this will affect the sales of also item B at $R2$.

Opinion

AN OP-ED FROM THE FUTURE

We Should Have Bought the DVDs

It's 2022. I don't know if I'll ever own a house, but I can own my favorite television shows in their entirety.

By Veronica Walsingham

Ms. Walsingham is a writer.

Figure. Result of “streaming wars”?

New York Times, 20 Jan 2020.

- Ownership of physical things is most often clearly defined (in our times and parts of the world).
- Such clarity is missing online and with digital content.
- Copyright laws offer some guidance:
 - Copyright protects original works of authorship, e.g. literary, dramatic, musical, and artistic works, including movies, songs, and computer software.
 - But fair use clauses allow the use of copyrighted material in some circumstances.
- Copyright holder is entitled to the earnings created by the use of the protected work.
 - Who is entitled to the ad revenue from video gameplay in Twitch or remix in YouTube?

- *Coase Theorem* states that negotiation and trade always lead to an efficient allocation if
 1. Property rights are well defined.
 2. Transaction costs are negligible.
- But because of transaction costs, a need to balance:
 - Relying on the assignment of property rights and markets.
 - Setting liabilities with regulation and rules.
- The old institutions governing copyright are clearly stretched by these online phenomena.

- Information creators can decide to share their goods for free.
 - Open source software.
 - Wikipedia and the like.
- A puzzle, why do they choose to do so?
 - Altruistic behavior: want to do good.
 - For a developer, a possibility to signal your value.
 - For a company, possibility to sell complementary services.
- Many digital public goods have network good characteristics
 - More people working with the same project help in development.
 - Can reach a dominant position.
 - Can reduce incentives to innovate.

- Digital goods are different from traditional goods: they are non-rival and not affected by some of the scarcity constraints and costs of traditional goods.
- Monetization of digital goods and services has three main routes: selling eyeballs, selling the service, or selling the data.
- Digitalization creates new opportunities (open source, blockchain) but also puts pressure to the established institutions (IPR, privacy).

Reading assignment 6:

- **Digital markets.** Lambrecht, Anja, Avi Goldfarb, Alessandro Bonatti, Anindya Ghose, Daniel G. Goldstein, Randall Lewis, Anita Rao, Navdeep Sahni, and Song Yao (2014) “How Do Firms Make Money Selling Digital Goods Online?” Marketing Letters.
 - References to literature, the models that do get sometimes slightly complicated can be freely skipped.
- **Regulation.** Demange, G. (2018) “Mechanisms in a Digitalized World”, CESifo Working papers. Should be relatively easy read.

- Consumer protection
- Market power
- Externalities

Appendix

Usage Growth when Marginal Prices Drop

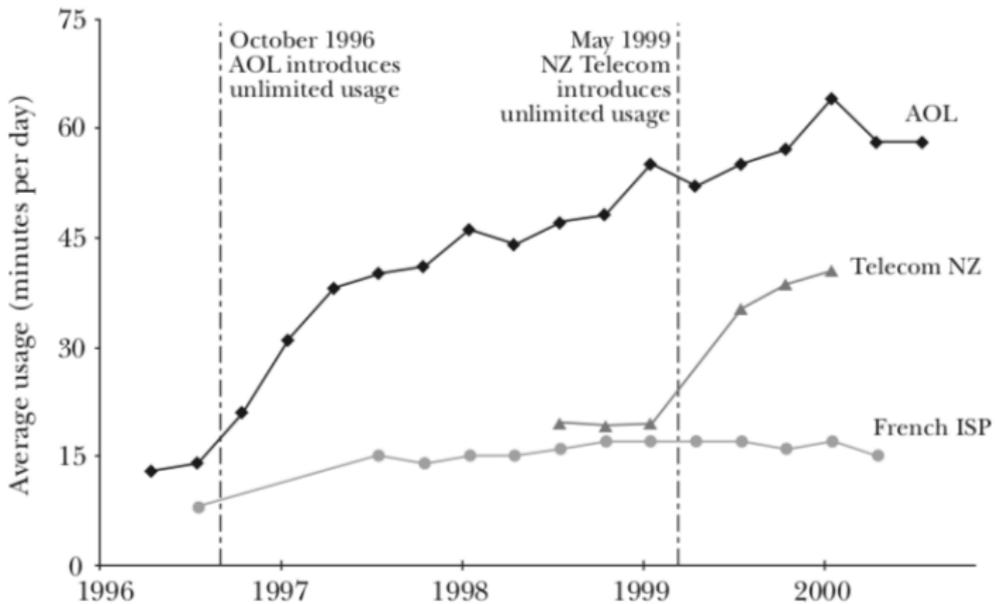


Figure. Change in usage when pricing moved from usage to access.

Source: Odlyzko, 2001.

- Publishers and record labels less important as digitalization opens new avenues for distribution of work, for example
 - Video, e.g. Vimeo and YouTube.
 - Inexpensive publishing and distribution services Smashwords for books, Soundcloud and Jamendo for music.
- It may be optimal to share some of the content for free to increase consumer awareness
 - Publishers less eager to enforce their rights.
- Revenues collected from various sources.