CS 523: Social, Economic, and Legal Aspects of Security

Antitrust

Competition is viewed as beneficial

- Benefits consumers
  - Results in higher quality products, lower prices
- Provides opportunities for entrepreneurs
  - Results in greater economic efficiency
- Makes it harder for established firms to engage in abusive behavior
- Benefits were recognized throughout history
  - Roman empire

Monopolies: No competition

- Monopoly
  - Economic definition: 1 supplier, no competition
  - Legal definition: Supplier with significant market power (= power to charge overly high prices)
  - Need not be a large company
- Monopolies can arise naturally, e.g.,
  - First entrant enjoys such large economies of scale in production, that no competitors enter market
  - Network effects give rise to dominance by 1

Quasi-monopolies

- Oligopoly
  - Few sellers, limited competition
  - If sellers collude, they can set overly high prices
  - Cartel = colluding sellers
- Examples
  - Airline “alliances”
  - OPEC
- Many undesirable consequences

Laws to promote competition (1)

- Countries have laws that protect and promote fair competition in their national markets
- Laws have different names, similar purpose
  - Antitrust law (U.S.)
  - Competition law (E.U.)
  - Anti-monopoly law (China, Russia)
  - Trade practices law (U.K., Australia)
- International agreements for cross-border

Laws to promote competition (2)

- Typically do not forbid monopoly's existence, impose sanctions in case of abusive behavior
- They differ in how they deal with natural monopolies (in which it is inefficient to have multiple suppliers), e.g.,
  - Make it a government monopoly
  - Break it up into smaller entities
  - Regulate it

U.S. antitrust law

- Discourages the formation of monopolies
  - Limits conduct and organization of corporations
  - Prevents buying all competitors, or driving them out of business by selling products below-cost
  - Forces the breakup of overly dominant suppliers
- Prohibits anti-competitive behaviors
  - Collusion, price-fixing
  - Exchange of some information (prices, salaries, …)

Government regulation

- Tolerate but regulate the quasi-monopolies
- Government commissions to determine
  - Pricing
  - Quality
  - Access
- Drawbacks
  - Inefficiencies (less incentive to control costs)
  - Higher prices
  - Possibility of “regulatory capture”

Evolution of competition protection (1)

- 1970s and earlier: Focus on market structure
- Protect the competitive process itself
  - Prevent anti-competitive collusive behavior (such as salary or price fixing by supposed competitors)
  - Prevent accumulation of too much market power, for example through acquisitions of competitors, deliberately acting to put competitors out of business (retaliation against entities doing business with them, predatory pricing, …etc)

Evolution of competition protection (2)

- Currently: more tolerance for dominance, more focus on price and output effects
- As a result, huge (quasi-monopolistic) market power can be accumulated, as long as it does not cause deleterious price and output effects
  - An online platform can acquire arbitrary market power as long as it refrains from misusing it
  - Covert misuse can be hard to detect

Example of violation by acquisition

- Brown Shoe Company v. U.S. (1962)
  - Brown Shoe bought Kinney, another large shoe company
  - U.S. sued, arguing that the merger would substantially lessen competition in the shoe industry. Court ordered Brown to fully divest itself of all Kinney stock and assets.
  - Brown's appeal reached Supreme Court (where it lost)

Violation by information-sharing

- Information sharing can violate antitrust law unless the information exchange is carefully designed to prevent harm to competition
  - Exchanging pricing, capacity information
  - Exchanging salary information
- But sharing of technical cyber threat information with competitors is unlikely to raise antitrust concerns (if done with care)

Covert "cooperation" by oligopolies

- Difficult to prove its existence
  - Especially in criminal cases
  - Unless "smoking gun" evidence like emails, text messages, etc
- Easier in civil lawsuits
  - Burden of proof is lower
  - Some evidence can be statistical, obtained through data mining (e.g., "the observed X would have been extremely unlikely without collusion")

Example 1 of civil antitrust lawsuit

- Class action antitrust lawsuit against 4 airlines
  - Southwest, American, Delta, United (80% of U.S. market, measured in number of seats)
  - Alleges they gave each other mutual assurances about "capacity discipline" being good for all airlines
  - Also argues that since 2009, costs of their airfares rose substantially compared to other domestic air carriers, despite stagnant/decreasing demand and declines in fuel costs faced by airlines
- Southwest settled, the other 3 are still fighting it

Example 2 of civil antitrust lawsuit

- Class-action antitrust lawsuits against hospitals, by nurses in many geographic areas
  - Different specifics, but share many similarities
- Nurses complained that local hospitals had illegally conspired to hold down their salaries
  - Specifically challenged hospital participation in salary surveys as violations of antitrust laws
- Most hospitals settled for large amounts

When is salary survey not a violation?

- Survey must be managed by a third party
  - No organization should conduct a salary survey on its own (even informal)
- Data used must come from at least 5 entities,
  - None of them can be more than 25% of the data
- Information disseminated must be aggregated
  - Recipients must be unable to identify the salaries pertaining to a particular organization

What if a survey does not conform ?

- Violations have proved to be very expensive
  - Large legal fees
  - Large settlement amounts
  - Substantial non-monetary damage (to brand, public image reputation, …)
- Penalties were paid by users of the surveys
  - Not by the 3rd party entities that conducted them

[Note: Salary surveys that do conform are correctly viewed as being pro-competitive, e.g., the Taulbee Survey has helped raise CS faculty salaries, and helped their employers avoid disruptive job-hopping by faculty seeking market-competitive salaries]

Violations through no-poaching (1)

- No-poaching agreements = agreeing not to recruit each other's employees
  - Illegal (even when informal)
- Hugely expensive when perpetrators caught
  - Intuit, Lucasfilm, and Pixar, paid $20 M in 2013
  - Apple, Google, Intel, and Adobe paid $415 M in 2015 (judge threw out an initial deal for $324.5 M as "too low" and giving too much % to lawyers and not enough to the 65 K workers affected)

Violations through no-poaching (2)

- Why are so many of the no-poaching violators in California?
  - Probably because California does not allow non-compete clauses in employment contracts
  - In other states, non-compete clauses prevent employees from later working for a competitor (or from starting their own competing business)
  - How long is non-compete in effect? Courts have ruled that ≤ 6 months is OK, > 2 Yrs is not OK

Below-cost ≠ predatory

- Predatory pricing is illegal under anti-trust law
- But not all below-cost pricing is predatory
  - It does not create a "presumption of predation"
- Courts require proof that the below-cost seller will be able to raise prices and recoup losses
  - Difficult to prove − future customers might not buy, or buy elsewhere, or buy substitutes, or …
  - This has made it very difficult to win predatory pricing claims in court

Below-cost ≠ predatory (cont'd)

- Why is there no "presumption of predation" for below-cost selling ?
- Because there can be many legitimate business reasons for selling below cost, e.g.,
  - Compensating buyer for risk of buying new product
  - Expanding demand for a product to a level where economies of scale and/or network effects take hold
  - Expecting an imminent decline in costs
  - Matching competitor prices

Monopsony

- Like monopoly, except that the roles of buyer and seller are interchanged
  - Monopsony = 1 dominant buyer
  - Oligopsony = few buyers
  - Bad for sellers
- “Company town”
  - 1 major employer (“buyer of labor”)
  - Wages suffer

Monopsony (cont'd)

- Monopsonies tend to price-discriminate
  - Just like monopolies tend to charge different prices to different buyers for the same item, monopsonies tend to pay different sellers different amounts for the same item
- If the item supplied is labor, this means unequal pay for equally qualified employees
  - Employees face different costs in changing jobs, have different job preferences, …

Dominant online platforms

- A sale gives the platform X – Y where
  - X = what customer paid for the (e.g.) book
  - Y = what the book publisher gets
- Increasing X by gouging customers would be a risky proposition
  - It might attract regulatory scrutiny (appear "monopolistic")
  - It might result in a loss of market share

Dominant online platforms (cont'd)

- Less risky is to lower Y by squeezing suppliers into accepting a lower share of the sale price
  - Book publishers were squeezed into this (to them, the dominant platform is a quasi-monopsony)
- When a major book publisher balked, their sales were disrupted by the platform
  - It increased the listed prices of their books
  - It delayed delivery of their books
  - It steered customers away from them

How platform dominance arises

- Positive feedback: Dominance feeds on itself
  - E.g., Alice goes to eBay because that's where the best buyers and sellers are, and her use of eBay makes it even more so (a "network externality")
- Investors (rationally) reward companies that pursue market share rather than profits
  - Belief that profits will come later, after dominance has been established
  - Importance of "being there earlier than others"

Cyber security can impede dominance

- It can delay deployment, product releases
  - Fear that someone else may establish dominance while you work on better security and reliability
- It can increase costs in a price-sensitive market
  - Lower profits if costs cannot be passed on to buyers
- It is difficult to prove / showcase its benefits
  - How to claim credit for absence of something bad
  - Difficult for customers to assess security (all vendors claim to have it)

Intellectual property and competition (1)

- Intellectual property (IP) can help or hurt market competition
  - Patents, trade secrets, copyrights, …
- Help by protecting the rights of small firms and entrepreneurs from established giants
- Hurt if IP rights of an established firm are so extensive that they impede competitors
  - IP rights act as “barriers to entry” against others

Intellectual property and competition (2)

- What to do when IP rights conflict with competition laws? Which gets priority?
  - Deny patent application?
  - Revoke existing patent?
  - What if the IP is developed by many firms?
- What to do when the existing IP of a firm becomes an industry standard?
  - How to mitigate anticompetitive consequences?

Competition and IP cross-licensing

- Suppose the IP in the widget-manufacturing industry is split among a number of firms
  - No firm is dominant, and none can make widgets without licensing some IP from the other firms
  - If X denies licensing to Y, and Y retaliates in kind, then neither can make widgets (lose-lose, doesn't happen, instead there is massive cross-licensing)
- Such cross-licensing agreements can be huge barriers to entry for entrepreneurs, new firms

Competition and bundling

- Bundling that includes IP can give rise to anticompetitive effects
- Example:
  - A firm X has IP whose remaining life is t years
  - X makes that IP a part of a bundle of agreements and transactions with another firm Y
  - In effect for the next T years (where T >> t)
- A special case of tying (which can be illegal)

Tying

- Horizontal: Requiring consumer to purchase another unrelated product or service in addition to the one the consumer desires
  - Different from “free sample” marketing
- Vertical: Requiring consumer to purchase related products or services together, from the same company
  - Example: Car manufacturer requiring that car servicing be done only at its dealerships

Tying (cont'd)

- Tying is not inherently anticompetitive
  - It depends on the specifics of each case
- Price charged for tied item can reduce price that purchaser is willing to pay for tying item
  - Makes the tying item less attractive to customer
  - Can result in lower profits
- Tying items into a bundle
  - For the sake of price-discrimination

Example of tying: Drug maker

- It forced patients who wanted its medicine to also buy its blood monitoring services
  - It was the only supplier of that particular medicine
  - There were many providers of blood monitoring
- Antitrust action by FTC against drug maker
  - Drug maker lost, had to un-tie (allow patients to buy its medicine without its blood monitoring)

Examples of tying: Apple

- Use of locking to tie iPhones to specific networks, and restrict which applications can run on them
- Attempt to use the legal system against jail-breaking as a form of copyright infringement
- Apple argued that a jail-broken iPhone is "derivative work" that is protected by copyright law (license forbids modification of the OS)
- Apple lost: Jail-breaking was ruled to be lawful

Examples of tying: Microsoft

- U.S. v. Microsoft
  - Bundling of Internet Explorer to sales of Windows, and unpleasant Windows behavior with the competing browser Netscape Navigator
  - Microsoft argued (unsuccessfully) that browser is a part of the OS, "like a radio is part of a car even though it used to be separate from the car"
- Novell v. Microsoft
  - Lower price for Windows if bundled with Office

Exclusive contracts

- Not illegal, unless used by a monopolist trying to prevent competition, as in examples 1—3:
- Example 1: Large drug maker entered into 10-year exclusive supply agreements for an essential ingredient to make its medicine
  - No one else could get that essential ingredient
  - It gave the suppliers a % of profits from the drug
  - It was able to raise drug's price by 3000%

Exclusive contracts (cont'd)

- Example 2: A manufacturer of pipe fittings maintained its dominance by requiring its distributors to buy exclusively from it
  - This prevented a competitor from achieving the level of sales needed to compete effectively
- Example 3: The only newspaper in a town refused ads from companies that ran ads on the local radio station
  - Refusal to deal
  - "I won't deal with you if you deal with my competitor"

Competition and product lifespans

- Planned obsolescence (PO) = deliberately lowering useful life of a product
  - Goal is to increase sales volume by lowering the time between consecutive purchases
  - Can work if market is oligopoly (e.g., the U.S. automobile market of the 1960s)
  - A very risky strategy in a competitive market (consumers can switch to competitors whose products do not have built-in obsolescence)

Examples of PO

- Light bulbs starting in 1924
  - Long lives of light bulb were hurting sales
  - Light bulb producers met in Switzerland in 1924, ostensibly to cooperate towards producing "brighter" and "more energy-efficient" light bulbs (in reality to conspire towards lower life for bulbs)
  - Lifetimes of light bulbs dropped sharply thereafter
- Lack of forward compatibility in software
  - Inability to process inputs for later versions of self

Examples of PO (cont'd)

- Ink cartridges that stop even when full of ink
  - "Smart" chips make them stop after X pages have been printed, or after D days have passed, or …
  - Class action lawsuit against HP because cartridges stopped working at a set expiration date that was unknown to the consumer (HP paid)
- Printers that are programmed to stop working even though they're still perfectly fine
  - Samsung printers

Examples of PO techniques

- Prevention of repairs
  - Making the product impossible to service
  - Factory seals that prevent access to product's interior without destroying it
  - Use of "tamper-resistant" screws (Apple)
  - Devices with batteries that are not user-replaceable (Apple)
- Dropping support for older product
  - Force users to buy new, even if happy with old

The PO of PO: France

- 2015 French law makes PO punishable by a heavy fine and a jail term
- Applies to all “manufacturers planning the death of their products in advance”
- Law’s language is broad, explicitly mentions:
  - “deliberate introduction of a flaw, a weakness, a scheduled stop, a technical limitation, incompatibility or other obstacles for repair”

The PO of PO: European Union

- EU is studying “a total ban of planned obsolescence”
- They cite it as being
  - A waste of energy
  - A waste of resources
  - A source of environmental pollution
- At the very least, they’ll require a labeling system that informs the customer

EU antitrust enforcement

- Much more aggressive than in the U.S.
  - Complaints that fail in U.S. succeed in Europe
- Becoming even more so over time
  - June 2017: $2.7B fine against Google (over search engine results' favoring Google services)
  - January 2018: $1.2B fine against Qualcomm (over exclusivity deal with Apple, so Apple would not use chips from competitors to Qualcomm)

EU antitrust enforcement (cont'd)

- Why so different from the U.S.?
  - EU's definition of antitrust is broader (the power of "for example"), and its enforcement stricter
- They're not just picking on foreign companies at the request European companies
  - Complainants to the EU against Google included Yelp, TripAdvisor, Microsoft, Oracle, ... etc, who had complained without success to FTC in the U.S.

The case for regulatory caution

- Major lessons from the past point to caution
- Overzealous regulators often ended up
  - Thwarting or delaying innovation
  - Instead of protecting the competitive process, they protected inefficient incumbents
- E.g., transportation, containerisation (regulators had to approve route, price, …)

Transparency: Pro or anti competitive?

- Transparency
  - Universally viewed as good, but it has a dark side
  - Competitors know all about each others without communicating (e.g., their prices show up on their respective web sites, or on Amazon)
- Example: App that compares local gas prices
  - Consider competitors without relative geographic advantage (so customers compare them by price)
  - If one lowers price, all will: No incentive to lower!

Avoiding competition: Confusopoly

- **Confus**ion + olig**opoly**
- A group of sellers, with nearly identical product or services, want to avoid competing on price (they'd all have lower profits)
- Illegal to engage in collusive price-fixing
- Deliberately confuse customers with difficult-to-compare offerings
  - Customers make emotional rather than price-based buying decisions (a dream for marketing)

Confusopoly (cont'd)

- Example
  - Mobile phone plans for same device (dollars, minutes, texts, bandwidths, family, roaming, …)
- Difficult to engage in confusopoly in commoditized products and services
  - Commoditization = when consumers *perceive* little difference between brands or versions
  - Examples: Bushels of wheat, copper, standardized insurance policies, vitamin supplements, …

Violations using software agents

- Through the use of software
  - Automated selling agents gather info, set price
  - No illegal phone calls or conspiratorial meetings
- The algorithms produce the effects of collusion in a manner that is hard to prosecute
  - Collusion is not programmed in, what is programmed is learning algorithms that discover the strategies that resulted in the higher prices
  - Programmer could not predict, cannot be prosecuted

Preventing harm by algorithms

- Possibility of massive mischief
  - Much of which is hard to detect
- Examples
  - Collusive (anti-competitive) outcomes
  - Inaccurate decisions (like denial of loan)
  - Illegal discrimination (biased decisions)
- Algorithmic harm is a hotly debated issue
  - ACM has issued recommendations

ACM recommendations for algorithms

- Awareness
  - All stakeholders should be aware of possible harm
- Mechanisms for access and redress
- Accountability
  - Responsible for harm even when inexplicable
- Explanation (of procedures, decisions)
- Data provenance (collection, maintenance)
- Auditability (should be built-in)
- Rigorous validation and testing

Example: The $23,700,000 textbook

- How can it happen?
- Through a price spiral caused by software agents of two competing sellers, e.g.,
  - Seller Alice's software agent set her price to be 5% lower than Bob's price
  - Bob's software agent set his price to be 6% higher than Alice's price
  - Both prices will rise in tandem, indefinitely
- It took 11 days to reach $23,700,000

Discussion: Uber's surge pricing algo

- Uber: "it's supply and demand − our pricing algorithm had to raise the price sevenfold to attract enough drivers to meet the demand"
- Customer: "the market would have cleared at a much lower price if the drivers were acting like competing private contractors"
- Question: Did Uber's algorithmic pricing turn potential competitors into a techno-cartel?