Economics of Strategy for Online and Digital Markets
Topics in Economic Theory and Policy, 31C01000
Lecture notes 2019 – Draft

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1 Introduction

Economics has been at the heart of much of the digital revolution, from Google to Amazon. While success of these companies builds on new technologies, economic theory has found some surprising uses from auctions to market design and the understanding of how modern online platforms should price their products. The course "Economics of Strategy for Online and Digital Markets" aims to increase the understanding of the economics of firm decisions and strategies, and competition in online and digital markets and how the special features of such markets affect decisions.

This draft is intended to be helpful for the course 2019 participants together with the lecture slides. The idea with the notes is to include most of the relevant economics from the slides in a easy to read-through format. There are some additions to clarify a few points where the slides are not self-sustained, and much repetition. This may or may not be helpful in addition to your own notes.

Reading materials

- Athey, S. and M. Luca (2018) "Economists (and Economics) in Tech Companies".

2 Prerequisites and markets

The course material builds on principles level understanding of economics theory, which is not repeated here nor will this material be questioned as such in the exam. The reading list below should provide a sufficient material to follow the other parts of the course. Note that these units from CORE may not necessarily be self-sufficient. If you are unfamiliar with the topics covered you may want to familiarize yourself with the other CORE units as well.

Reading materials

- Preferences (CORE 3.2-3.5)
- Basics of game theory (CORE 4.1-4.3)
- Pareto efficiency (CORE 5.2)
- Institutions, supply and demand (CORE 8.1, 8.2)
- Competitive equilibrium (CORE 8.5)
- Perfect competition (CORE 8.8)

3 Auctions

The introduction to auction theory is pretty standard, but some key points are repeated here briefly for completeness.

Why auctions online

We consider a situation where a seller has a single item for sale and there a number of potential buyers. What is the price that the seller should set? It will depend on how much buyers are willing to pay; but they are not going to tell you their true value. Auction is a mechanism for price discovery. Auctions also create a competition between buyers.

Arranging an auction is a trade-off between the benefit of price discovery vs. the cost of arranging an auction. Both the advantage and disadvantage change online: many more participants are possible online vs. physically, the costs of arranging of lower, and the emergence of popular sites has made it easier for people to know where to find the auction action. Though the early enthusiasm for selling stuff via auctions online (eBay) has somewhat reduced, auctions are the backbone of much of the revenue made in online advertisements.

The analysis of auctions builds on the understanding of how bidders behave within a given auction mechanism. Game theory is extensively used to analyze the strategic interaction that takes place through bidding strategies.

Winner's curse

Consider the following auction mechanism, popular in e.g. public procurement and private M&A ownership transactions between firms. Seller asks for bids from potential buyers. There is only one round of bidding. Buyers deliver their bids so that the other buyers do not observe their bids. Highest bidder wins and pays their bid.

Though the rules seem straightforward, this *first price auction* actually leads to complex strategic behavior. Your optimal bid depends on what you think the others will bid. In a Nash equilibrium, all bidding strategies maximize the expected payoff of the bidder taking in to account the uncertainty about opponent values. Bidders do not know their opponent's values: this incomplete information requires that assumptions on the potential range and probability of other bids will be required.

In the first price auction, optimal bid is less than your true value. A higher bid, but still below your value, will increases your chances to win but decreases your profit if you do win. In a *common value* auction the bidder with the highest valuation on the value of the item, i.e. the most optimistic bidder, wins. A bidder who fails to take this into account pays, in expectation, more than the item is worth. This is called the winner's curse.

Simple truthful bidding

Easy access to online marketplaces has enabled auction mechanisms where the optimal bidding strategies are simpler. In particular *ascending price auctions* are popular online. In this auction seller asks for bids from potential buyers. Several rounds of bidding are possible. Price starts low and is increased until only one bidder is left. Remaining bidder pays their bid. This mechanism is often also called an English auction.

In this auction it is optimal for you to bid until the price is higher than your *private value*: If you continue bidding above your value and win, you need to pay a price that is higher than your private value. If you stop bidding below your value, you lose the potential gain from buying the item below your value. Bidder with the highest valuation will win and pay the second highest value. This is the crucial difference to the first price auction, there is no need for strategic bidding as the price you pay if you win will not depend on your own bid. The same outcome can also be achieved with a *second price sealed bid auction*: The highest valuation will win and the winner will pay the second highest valuation.

Efficiency and expected revenue

Auction outcome is efficient if the high value bidder wins. The Nash equilibrium outcome is the same in several auction mechanisms: The high value bidder wins and the expected auction price equals the expected value of the second highest bidder. This is the essence of the *Revenue Equivalence Theorem*[1]: Every auction that allocates the goods efficiently has the same expected profits for every bidder valuation and the same expected revenue for the seller.

Reading materials

- Milgrom, P. (1989) "Auctions and Bidding: A Primer", Journal of Economic Perspectives.
- Ockenfels, A., Reiley, D. and Sadrieh, A. (2006) "Online auctions", NBER Working Paper 12785.

[1] There are some conditions to when the theorem applies, the more important criteria here is that the auction mechanisms offer no profit to a zero valuation bidder.

- Reiley, D. (2000) “Auctions on the Internet: What’s Being Auctioned, and How?", Journal of Industrial Economics.

4 Market design

Mechanism design

Game theory is helpful in describing the rational strategic interactions between agents, such as the bidding strategies in auctions. Mechanism design turns the question around: *Assuming that the agents will play a strategic interaction game, what should the rules for the game be?*

In the study of existing markets, mechanism design can be used to identify the “rules of the game", the incentives for the participants, and how they behave. This understanding is required to try to comprehend why the market functions well, or not so well. In the design of new markets, mechanism design can be used to identify the economic problem to be solved, the players, and their incentives and information. The task is then try to understand what sort of market rules would lead to desired outcomes.

Impact of design to auction outcomes

Auction theory tells us what to expect in a Nash equilibrium: In an efficient allocation, the high value bidder wins and expected revenue is the same in many auction methods. But the outcomes of the auction will still depend on the level of competition in the market and the implementation detail. The expected revenue for the seller can be increased, for example, by facilitating competition and the introduction of reserve prices. The effect of competition is clear. If there are more buyers then the chances are better that some of them have higher valuations for the item that is being auctioned. This can make it worthwhile for the seller to even subsidize participation to auctions, but at least make the access as easy as possible. A reserve price works almost as a phantom bidder because the other bidders need to bid higher than the reserve price to win. When setting the reserve price, there is a balance though: a higher reserve price will reduce the probability of sales but increase the expected sales price.

Ad auctions

Advertisement auctions are the way many internet companies make their money. Google was the first to successfully switch to auctions as the mechanism for selling advertisement slots in their search platform. They operate a *generalized second price auction*, which works as follows. An advertiser chooses a set of keywords that are related to the product it wishes to sell. Each advertiser states a bid for each keyword that can be interpreted as the amount that it is willing to pay if a user clicks on its ad. When a user’s search query matches a keyword, a set of ads is displayed. These ads are ranked by bids (or a function of bids) and the ad with the highest bid receives the best position; i.e., the position that is mostly likely to be clicked on by the user. If the user clicks on an ad, the advertiser is charged an amount that depends on the bid of the advertiser below it in the ranking (from Varian 2007). Though not theoretically perfect, the mechanism has been widely adopted and is used in millions of transactions daily.

Other considerations for market design

Market design is always a balance between what tasks are left to the competition/game in the marketplace to decide and what is decided by the rules. Choice of implementation detail will depend on the desired outcomes. The following list, by Alvin Roth (2008), gives an idea of the different aspects that can be relevant in the design of successful markets or platforms.

1. Provide *thickness*. Attract a sufficient proportion of potential market participants to come together ready to transact with one another.
2. Overcome the *congestion* that thickness can bring. Ensure that market participants can consider enough alternative possible transactions to arrive at satisfactory ones.
3. Make it *safe* to participate in the market as simply as possible. As opposed to trading outside of the marketplace or engaging in strategic behavior.
4. Some markets can be *repugnant*: they should not exist.
5. *Experimentation* to diagnose and understand market failures and successes, and to communicate results to policy makers.

There needs also to be sufficient enforcement mechanisms in place to ensure that the actual outcomes meet desired outcomes (see section on Regulation).

Reading materials

- Varian, H. (2012) “Revealed Preferences and its Applications", Economic Journal.

5 Online markets

Reducing frictions and managing competition

An online marketplace needs to serve two competing groups: Buyers want to find the products quickly and with low prices, sellers want to maintain high margins. Online search design affects consumer search and seller incentives at the same time. First, the search can be used to predict consumers' demand, and to guide them toward their most desired product. Second, the search can 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.

The amount of competition among the sellers is determined on the basis of how many items the buyer can (effectively) see when making the search. This will affect which choices the buyer can make. Also, the order of the items or sellers displayed by the marketplace will affect which seller gets most sales. This ordering may be based on other criteria than price, giving control to the marketplace. Finally, the available customer choices will start to affect the pricing (and other) decisions by the sellers. Different marketplaces have adopted different strategies on how easy they make for the buyer to find the lowest prices, and how they treat the sellers.

Use of data by the marketplace operators

Companies can collect and use data to their advantage in at least three way: *dynamic pricing*, *price discrimination*, and *product steering*.

Online information on the bids of competitors makes it easy to adjust prices dynamically to match prices or have prices higher than the competitors. For example, 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. The empirical evidence suggest that this price convergence is a widespread phenomena, and may even start to influence macroeconomic indicators, such as inflation.

Product steering and price discrimination are ways by which the firm tries to extract the maximum amount the buyers are willing to pay. If the firm has market power and is only able to offer *uniform pricing*, i.e. the same price for everyone, then it will withhold output to maximize its profit but there is an efficiency loss as some trade will not happen. The possibility for price discrimination can in fact increase the total welfare in the short-term allocation (but see section on Regulation for concerns).

Reading materials

- Milgrom, P. and S. Tadelis (2018) "How artificial intelligence and machine learning can impact market design", NBER Working Paper 24282.

6 Networks

Network effects

Network effects are essential in understanding how interactions between users benefit larger internet firms. The analysis starts with traditional networks where network externalities arise because a typical subscriber can reach more subscribers in a larger network. The number of potential transactions increases with network size. If every new transaction has positive value, a larger network gives higher value to a subscriber. Links from subscribers to the operator are used as complements.

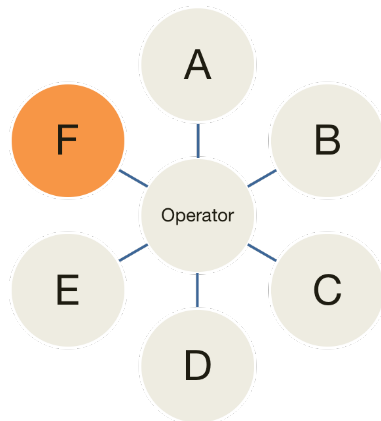

Figure 1: Example of direct network effects: Enabling connection F–A through the operator enables also connections F–B, ..., F–E.

The key reason for the appearance of network effects is the complementarity between network components. Depending on the network, the network effect may be direct or indirect. See Figure 1 for an example of direct network effects. A credit card is an example of indirect network effects: User does not directly gain if one more person has the same credit card, but the additional person will encourage more merchants to accept a credit card. From a cardholder's perspective there is more choice and variety of merchants accepting this card.

Demand for a network good

The existence of positive network effects implies that, as sales expand, people are willing to pay more for the last unit. Consider a typical two-way network, such as the local telephone network in Figure 1, with n subscribers: There are $n(n-1)$ potential goods, i.e. potential connections from subscriber i to everyone else and back. An additional customer, $(n+1)$, provides direct network effects to all other customers in the network. It adds $2n$ potential new goods through the provision of a complementary link to the existing links.

Figure 2 shows an example of how the demand for a network good may look like. Take 1000 people who are in a market for a network good. Index the people from $v = 1, \ldots, 1000$. v can here be thought to be the person's private value, the reservation price or intrinsic willingness-to-pay for the good. Now assume that the actual value of the good to person v is vn, where n is the number of subscribers to the network[2]. If the price is set at p, then

[2] This is actually a trick used by Hal Varian in his Intermediate Microeconomics book. I used this version

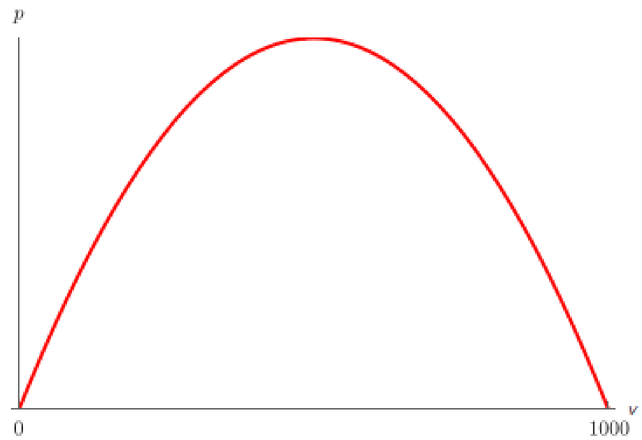

Figure 2: Equilibrium prices as a function of the network size.

some individual, with index value $\hat{v}$, is indifferent between buying the good or not buying it, i.e. the price is given by $p = \hat{v}n$. Everyone whose valuation is higher than this indifference value, will join the network and everyone whose valuation is lower, will not.

Now how many will join the network? Remember, the total number of people in the market is 1000. The number of people whose valuation is greater than index value $\hat{v}$ is simply $n = 1000 - \hat{v}$. Solving for $\hat{v}$ and substituting to the price equation above gives the following equilibrium prices:

$$p = (1000 - n)n.$$

As a result of the network effects, some portions of the demand curve can slope upwards, i.e. it may be the case that the demand for a network good is higher with a higher price. This is in contrast to the law of demand for traditional goods that states that the demand curves should be downward sloping.

Efficiency with network goods

In perfect competition for a traditional good, prices will equal marginal cost of production, and the allocation will be socially efficient. But if there are network effects, then marginal cost pricing is no longer efficient. When making a decision to join the network, individuals count only their own benefits. With a positive network externality, the marginal benefit to the society is greater than the marginal benefit to any one individual. In some cases, this could be an argument for government subsidies or regulation.

in class, so better stick with it to avoid any further confusion (this is a delicate point). But the n in this price equation is actually the same as the expected number of users in the network n_e, as discussed in the lecture slides, i.e. people will make the decision to join or not to join on the basis of expectations on how big the network is going to be.

If a network operator is a monopoly, it will also not necessarily choose socially optimal size. Incentive of the monopolist to restrict output can outweigh its incentive to increase consumer demand. If the network firm is allowed to internalize the external benefits (e.g. via price discrimination), then the service level can be closer to socially optimal than with strict enforcement of competition. This price discrimination can be achieved also indirectly. As an example, a free-to-play game with optional purchases within the game allows a large number of players to join the game, increasing welfare[3]. The players who have a higher willingness-to-pay for the game can do so via the options.

Reading materials

- Complementarity (CORE 21.1-21.3), network effects (CORE 21.4)
- Katz, M. and C. Shapiro (1994) "Systems Competition and Network Effects", Journal of Economic Perspectives.

7 Platforms

Platforms over networks

The popular belief in 1990s was that the introduction of internet would lead to winner-take-all competition in many areas because of the network effects between internet users. With network goods, a service is more valuable if more customers are using it because customers want to interact with each other. If a firm moves fast and gets some customers, those customers make the network more valuable to next group of customers, which would attract even more people to join. In a simplistic model of competition, this could lead to explosive growth and result in a single firm owning the market forever.

The network effects story turned out to be only part of the competition narrative. Rochet & Tirole (2003) realized: "[M]any, if not most markets with network externalities are characterized by the presence of two distinct sides whose ultimate benefit stems from interacting through a common platform." Network effects in many circumstances are indirect, between different kinds of customers rather than direct for the same kind of customers. Network effects result from getting the right customers, and not just more customers. Finally, the same dynamics that can strengthen a network rapidly can work in reverse leading to rapid decline of networks.

Externalities within the platforms

There can be many sides within a platform, depending on the market and application. A following typology (Evans & Schmalensee, 2007) has gained some traction:

[3] Not considering if playing can be consider a social gain.

- Ads: Find right ads to viewers in traditional media or users online.
- Exchanges: Match buyers with sellers.
- Software: Match developers, users, and hardware.
- Transaction: Match consumers with merchants.

The typology arises from the differences between the externalities on the platform, both between the sides (inter-group) and within the sides (intra-group). For example, the inter-group externalities on an ad platform – advertisers like users, but users dislike advertisers – is different from an exchange where buyers and sellers both benefit from more participants on the other side. As an example of the differences in within the side or intra-group externalities, advertisers may dislike competition between other advertisers, but users in a social media platform may enjoy the presence of other users. See Evans & Schmalensee (2007) for more discussion.

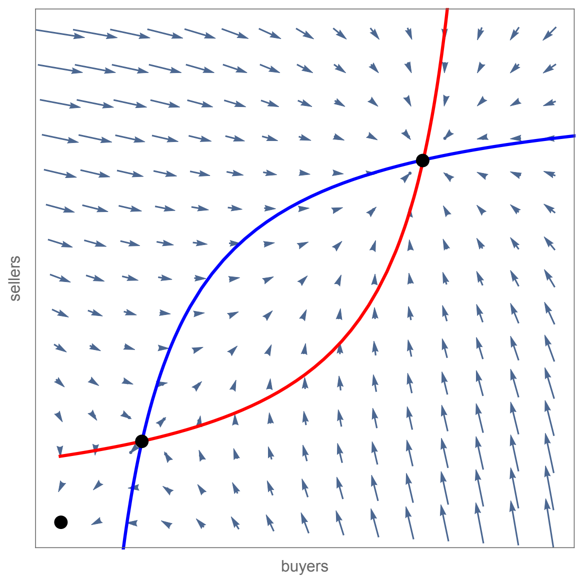

Figure 3: Indifference curves for buyers (red line) and sellers (blue line) with fixed prices. Pricing on each side affects demand on that side, but also on the other sides through externalities.

Figure 3 present a simple case of an exchange platform with buyers and sellers who like more users on the other side, but do not have a preference on the number of participants on their own side. Red line is the indifference curve for the buyers, blue line for the sellers. On both sides the intrinsic value of the users to participate to the platform declines (cf. network good case). For example, each additional buyer values the platform slightly less than the ones who have already joined. There needs to be more and more sellers to make the platform interesting enough to join. Likewise for the sellers: there needs to be more and more buyers in the market to attract new sellers.

Key strategic choice 1: Openness

Sometimes a firm can decide if it is a platform or not and how many sides it opens. For example, Apple launched iOS as a one-sided business with in-house apps, the possibility for third parties to sell through AppStore came later. Sometimes the "platformness" is part of the business, like for many exchanges, software, and transaction systems.

Links on a network are potentially complementary. Compatibility makes complementarity actual, real world example is nuts and bolts. Some network goods are immediately combinable because of their inherent properties, like road network. However, for many complex products, actual complementarity can be achieved only through the adherence to specific technical compatibility standard, like the internet. Within a platform, the firm chooses whether to provide all services itself or allow others to do some.

Producers' profits can be enhanced when they coordinate on a standard that permits the production of compatible components as there is less competition. A network good has higher value than a traditional because of the network effects. Different firms conforming to the same technical standard can create a larger network effect while still competing with each other in other dimensions, such as quality and price. Android is a good example. Main code is developed by Google and shared as open source for mobile phone makers to customize.

Providers of platforms often prefer incompatibility because it locks in current customers and locks out competitors. Network effects that are associated with the installed base generate *switching costs*, which are the costs of switching from one brand to another incompatible brand. Oftentimes in digital world compatible services are also hard to envision: e.g. Google search, Facebook or Amazon. Also, if users "pay" with e.g. the data that they generate, it may be harder to split profits compared to users paying money for compatible products to different firms (nuts and bolts).

Key strategic choice 2: Pricing

Platform pricing needs to take into account the externalities that a change in demand on one side causes in the other sides. Choice of price on one side affects how many users will use the platform. Number of users on that side will affect the interest on other sides through externalities. The changes in prices affect market equilibria.

Returning to the example in Figure 3. For the first buyer to join, there needs to be a minimum number of sellers to make the platform worth the price, and vice versa. The prices determine where the indifference curves cross the horizontal and vertical axes, i.e. the number of sellers or buyers that would be needed for any participants from the other side to join. The indifference curves intersect at two points: the intersection with higher number of buyers and sellers is an equilibrium. In an equilibrium both the buyers and serllers who are in the platform are happy to stay with the given prices, and there are no additional buyers or sellers who would prefer to join the platform. The other intersection point is a tipping point or critical mass; above that point the platform can start to grow towards the higher equilibrium, below it will shrink towards zero. Zero is the other equilibrium point (no platform). A change in prices on either side will change the demand on that side, but also affect the demand on the other sides through the externalities.

Many internet firms operate multi-sided platforms where content for users is free and the money comes from advertisements. By keeping the content free, the firms can attract more users than if they would require a payment. The large user base is attractive for the advertisers who are willing to pay for access to the users. This price subsidy paid by the platform to one side in order to attract more demand on the other sides is true in many cases, for example marketplaces charge transaction costs from the seller side to attract more buyers, credit cards offer rewards to the card holders etc.

Platform competition

In general, the effects of competition between platforms are complex and outcomes market specific. For example, in the video game industry (like Xbox vs. Playstation) competition can improve the availability of games, but in newspapers competition may further distort the amount of advertisement (White & Weyl, 2016).

Multiple platforms are more likely to coexist, if platforms are sufficiently different (Android vs. Apple iOS), multihoming is feasible (travel search engines) or it is hard to differentiate within a platform (advertisers in ad auctions). The companies can and do affect the competitive situation by the strategic choices. For example, if two marketplace platforms have a different pricing strategy (Taobao vs. Amazon) it may help them to differentiate on one or many sides of the platform. Because of the externalities, these differences may affect demand on the other sides of the platforms as well, leading to overall differences between the platforms. As a result, the platforms do not need to compete as fiercely on participants as they would in a symmetrical situation.

Reading materials

- Two sided markets (CORE 21.5)
- Evans, D. and R. Schmalensee (2007) "The Industrial Organization of Markets with Two-Sided Platforms", Competition Policy International.
- Rysman, M. 2009. "The Economics of Two-Sided Markets". Journal of Economic Perspectives, Volume 23, Number 3.

8 Sharing economy

Peer-to-peer market platforms

Sharing economy or *peer-to-peer markets* increase efficiency of the use of durable goods or labor. In traditional rental markets, owners hold assets to rent them out in a professional capacity. Sharing economy has introduced a new kind of rental market, in which owners sometimes use their assets for personal consumption and sometimes rent them out. Such markets are referred to as peer-to-peer or sharing economy markets. Sharing economy platforms within these markets solve matching, search, and transaction frictions between the parties.

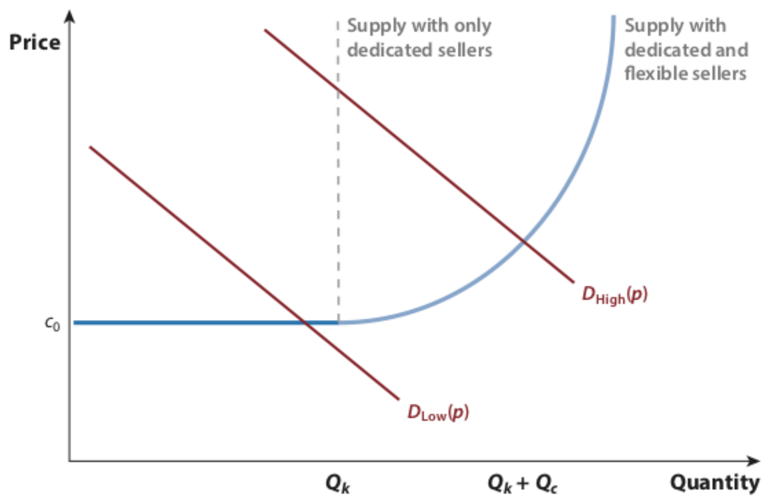

Figure 4: Sharing economy can increase capacity in traditional businesses (Einav et al. 2016).

Figure 4 gives an simple illustration of the economics. For example, Q_k could be the number of available rooms in Helsinki. In times of low demand (winter time), the capacity is sufficient to meet demand and prices are low. But in peak times (summer), there would be more demand and the market becomes capacity constrained. The total number of transactions is limited to the capacity and the prices paid by visitors increase. Now if there are homeowners who are willing to rent their own apartments for visitors, there is additional flexible supply. In the case of high demand, the supply from these homeowners allows more demand to be matched. As a result, the allocation becomes more efficient, because more transactions take place, and also the prices for visitors are lower. The only losers in this picture are the hotel owners, who cannot get the high rents anymore[4].

[4]Note that the figure ignores potential longer-term implications: hotels may shut down etc.

In addition to the potential efficiency gains, the sharing platforms have become more popular because they are often a cheaper option. Critics charge that the primary competitive advantage of P2P platforms is their ability to duck costly regulations that protect third parties. Rules and regulation in place for traditional businesses to protect consumers and limit externalities, for example: environmental regulation, consumer protection law, copyright law, health and safety laws, labor laws etc. Conflicts when non-traditional business models make rights and compliance requirements of the platforms participants unclear.

Establishing trust

Information asymmetry

In a peer-to-peer platform, the lack of responsible professional seller means that buyers face higher risks, but also the sellers may not have the capacity that the professional operators have to handle problems. The heterogeneity on both sides creates also information asymmetries and the problem for both parties to signal their quality.

In order to work, peer-to-peer markets have to maintain an adequate level of trust by developing mechanisms to guard against low quality, misbehavior, and outright fraud. The success of the markets as a whole is built on trust. These problems with establishing trust are evident also in “regular" online marketplaces.

Reviews

In addition to information asymmetries, the offering on sharing economy platforms is often not standardized (taxi vs. Uber), and can be complex (e.g. coding services). Reviews are a natural response to each of these problems. They describe the performance of a transaction counterpart, a user can alert others to what went right and what went wrong. Simultaneously reviews improve future matches and penalize bad behavior.

Review process however suffers from several complications. First, the reviews are subject to reviewers behaving strategically. Especially if both sides can make reviews, then the first one to give a review has to take into account that the review she is going to write may affect the review she is going to get. This leads to positive bias in reviews. Other problems include 1) that at the start, there are no reviews available, 2) user reviewed unfavorably might decide to start over and 3) users who submit reviews might differ systematically from normal users, by selection or by collusion as the targets of the reviews have an incentive to inflate their ratings to get more sales on the platforms.

To tackle the problem with reviews, platforms have added other information to reduce the need for reviews. Collecting and publishing such other information may however have unwanted discriminatory consequences (see section on Regulation).

More recently, AI algorithms have been developed to automatize the monitoring and enforcement of representative feedback. Examples include the assessment of the quality of sellers by analyzing the communication between the buyers and the sellers, and the creation of a market for feedback by automatic ranking the informativeness of user feedback (Milgrom & Tadelis, 2018).

Reading materials

- Luca, M. (2016). "Designing Online Marketplaces: Trust and Reputation Mechanisms". Harvard Business School Working Paper. No. 17-017.
- Milgrom, P. and S. Tadelis (2018) "How artificial intelligence and machine learning can impact market design", NBER Working Paper 24282.

9 Regulation and policy

Regulatory concerns

Typical motivations for regulation are the limitation of market power, consumer protection and externalities. When considering which action to take, the regulator needs to balance the potential harm with how regulation can be implemented and what the cost of regulation to consumers will be. Benefits of online markets and other platforms can be large enough to compensate for the costs and risks involved. Also, rapid development of new innovations may be unnecessarily hampered with too stringent or early regulation. Some of the current real or perceived problems may be solvable by the markets. Others won't.

Privacy

Nobel-winner Joseph Stiglitz has stated (2018) that "Big data and privacy... represents one of the biggest challenges to our society, and to competition law and consumer protection." Individuals often don't know that their data is being taken and what is really being done with it, and what the value of the data is. Privacy is consider to be human right on its own. The recurrent breaches of privacy where sensitive or economically valuable personal data is misused or ends up in the hands of bad actors can create other concerns, such as safety, frauds, and political interference. Big data and algorithms that process data are relatively new phenomena, that could warrant caution to limit unforeseen misuses.

Market power and efficiency

In some cases, there may be social value in the collection and use of data. In many other cases, data is being used to extract more consumer surplus out of buyers. This is possible if the firms collecting data can exercise market power, either because of the data or because of their market position otherwise.

The direct potential way to use data in an online market context is that it provides new means for price discrimination and product steering. These may be beneficial strategies for the companies, but the empirical evidence suggests that they are not that widely used.

This may be a result of industry self-regulation, getting caught with price discrimination may alienate customers and lead to a regulatory backslash.

Longer-term, data can give a competitive advantage to those with more data, not necessarily the most efficient firms. Data can be used to improve e.g. logistics and marketing, offer ancillary services like financing, or develop new products and services.

Seemingly harmless use of data, e.g. through algorithmic pricing, may lead to (tacit) collusion. If the algorithms can immediately respond to price discounts by some seller that reduces the potential gain from setting the discounts in the first place. Sophisticated price discrimination may lead to narrower relevant product markets, i.e. if a company can target a group of consumers very precisely with a certain offering, the other companies' algorithms may decide that that group of consumers is not worth the effort, reducing competition.

Finally, a dominant platform may use market power in a new way by controlling what a user of that platform is shown. Few prominent examples are Google and Amazon. The algorithm that determines search results in Google is made by Google, giving it at least implicit control over what the users see. Likewise, the search within Amazon gives it similar power, but in addition Amazon can choose whether to sell a product themselves or let the third parties to compete over the product.

Discrimination

Use of data by algorithms is highly selective and may lead to discrimination of certain user groups. To increase trust, many platforms encourage users to provide personal profiles and even to post pictures of themselves. These features may facilitate discrimination based on sellers' race, gender, age, or other aspects of appearance. Discrimination has been documented in various types of services. Building trust without discrimination can be challenging. The inherent informational asymmetries need to be solved, but it can be hard to find the proper signal.

Other externalities

Gig economy platforms (e.g. Uber in the U.S., Wolt in Finland) typically try not to have employees, but contract their workers as self-employed. Workers are outside the normal labor law protections, and may find it hard to organize: there is no office and workers have no knowledge on their colleagues. Bargaining power in employment terms is more in the hands of the platforms. Algorithms that control the worker hours and pay bring efficiency to the platform, but are insensitive to workers. As a result, the rights of the workers for these sharing economy platforms have been challenges in the courts of many jurisdictions.

The possibility to rent out assets in a sharing economy platform may lead to increase in consumer purchase of such assets. For example with Airbnb, increased apartment prices, together with preference of short-term over long-term rentals, leads to more congested housing markets. Change from long-term rentals to short-term stays causes externalities to the neighbors. While the evidence is still being gathers, in some studies, the increase of ride-sharing has been associated with adverse environmental impacts. Overall the novelty of these phenomena and heterogeneity of effects across markets mean that the regulatory wisdom of how to best handle these externalities is still limited.

Who's to regulate

Regulatory concerns can be seen to require government intervention. The questions on should the regulation be on local, national or global level is much trickier as the interest of different regions differ. For example, EU has a higher interest in protecting its citizens against the interests of U.S. based companies than the U.S. Government: the monetary benefits end up in the U.S. but the potential harm is spread worldwide.

At the moment not clear how to achieve socially optimal market conditions. Public regulation may reduce the efficiency of the markets. For example, it may hinder innovation, reduce the entry of new competition, and there can be actual costs of organizing effective regulation. Information asymmetries support letting the firms decide on the best course of action as they are superior both with data and other resources to the regulators. The firms themselves have also an interest in self-regulation to remain viable.

Reading materials

- Demange, G. (2018) “Mechanisms in a Digitalized World", CESifo Working papers.