Introduction to Industrial Organization

Peer-to-Peer Market

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Peer-to-Peer Market

- Definition: A market is provided for transactions between large numbers of buyers and sellers.
- eBay, a consumer auction website, started by Pierre Omidyar in 1995.
- Many other examples:
  - marketplaces for local goods and services (Craigslist)
  - computer programming (Upwork, formerly oDesk, and Freelancer)
  - consumer loans (Prosper, Lending Club)
  - start-up financing (Kickstarter)
  - accommodations (Airbnb)
  - babysitting (Care.com)
  - currency exchange (TransferWise, CurrencyFair)
  - rides (Uber)
  - household tasks (TaskRabbit, Handy)

Outline

- Market Design
  - Matching Buyers and Sellers (Search)
  - Pricing Mechanisms
  - Trust and Reputation
- Peer Production and Traditional Industries
  - A Simple Model
  - When is Peer Production Efficient?
- Regulation of Peer-to-Peer Markets

- Reference: Einav, Farronato, and Levin (2016), "Peer-to-Peer Markets", *Annual Review of Economics*.

Market Design

Market Design

- The goal of peer-to-peer markets is to create trade between buyers and sellers.
- For economists, the rise of peer-to-peer markets has provided a fascinating set of examples of innovative market design:
  - selling mechanism, such as eBay
  - public good mechanism, such as Kickstarter
  - centralized mechanism, such as Uber
- Three important issues:
  - Match buyers and sellers effectively and keep search frictions low
  - Establish prices in the market, and let it be set competitively
  - Ensure that transactions are safe and reliable for buyers and sellers

Matching Buyers and Sellers

- A high degree of heterogeneity creates a problem of matching buyers and sellers
- Trade off between two priorities:
  - keep transaction costs low
  - use information efficiently
- One way is to centralize the process:
  - Example: Uber
  - Matches between riders and drivers should be made in real time
  - Riders only specify the type of service, but not the specific driver
- The other way is to rely on decentralized markets:
  - Example: Airbnb
  - Sellers are diverse and offer a wide array of products and services
  - Main challenge is to create an informative search process

Literature Related to Search

- The presentation of search results matters a great deal.
  - In Internet search advertising, buyers are about twice as likely to click a listing in the top position as they would be if it were moved one position down (Goldman and Rao, 2014).
  - So literature points out that the incentives faced by intermediaries may not align fully with consumer interests.
- In addition, recent studies have used data to quantify search frictions.
  - Fradkin (2015) studies search frictions in Airbnb and finds that even after buyers identify apartments of interest, many transactions fall through.
  - Dinerstein et al. (2014) use eBay market data to show that guiding buyers toward a price ranking can lead to higher surplus, but only when the relevant product is clearly defined with few variants.

Pricing Mechanism

- The Internet enables peer-to-peer markets to use a wide array of different pricing mechanisms.
- Auctions are appealing because they allow prices to respond to market conditions.
  - eBay: buyers can bid the product through an auction
  - Prosper: peer-to-peer lending
    - borrowers posted a maximum interest rate
    - lenders were able to make offers at lower rates
  - Internet advertising markets: Google, Facebook, ...
- Some marketplaces directly let sellers adjust prices in real time
  - Examples: Airbnb, Etsy, and Amazon
- Some marketplaces use an automated algorithms
  - Uber uses its surge-pricing algorithm to vary the per-mile price of a ride as supply and demand conditions change.

Trade Off in Pricing Mechanism

- Einav et al. (2015) have studied the trade-offs between auctions and posted prices using data on eBay sellers.
  - Sellers tend to use auctions for used goods or when they have less selling experience.
  - Auctions have been in steady decline for more than a decade.
  - For a given seller, offering a given item, the returns to using an auction were relatively high 15 years ago and are much lower today.
- Cullen and Farronato (2015) study a peer-to-peer labor market
  - TaskRabbit initially allowed buyers either to post a price for their job or to request bids and then pick their preferred offer.
  - Auction prices do not adjust much with market conditions, which suggests that a simpler mechanism might be preferable.
  - TaskRabbit has moved toward a mechanism in which workers post an hourly wage and schedule, giving buyers a simple way to hire.

Trust and Reputation

- When eBay started, it was not obvious that
  - people would send money to nearly anonymous sellers
  - sellers would reciprocate by sending the promised items
- Besides general goodwill, what are the mechanisms that make this possible?
- A key component of many peer-to-peer markets is the use of reputation or feedback mechanisms.
  - It is easy to set up online and appear to have significant bite
  - Example: eBay's reputation system
- In addition, two-sided reviews play an important role.
  - Uber uses customer reviews to screen out problematic drivers
  - It also shows drivers the ratings of potential riders, so that riders who behave badly may have a harder time finding a ride in the future.

Peer Production and Traditional Industries

Model

- Consider a market with two types of sellers:
  - dedicated or professional sellers, such as Hilton in accommodations
  - peer sellers, such as an apartment owner on Airbnb
- For each dedicated seller:
  - incurs an up-front cost $k(q)$ to create q units of capacity
  - marginal cost c_0 for each unit
- For each peer seller:
  - has unit capacity, and pays no up-front cost
  - marginal cost $c_0 + c$, where c is drawn from a distribution G.
- Demand $D_s(p)$:
  - s: demand state, drawn from a distribution H. high $s \Rightarrow$ high demand
  - p: market price

Model

- Both professional and peer sellers must advertise their services to buyers.
  - advertising requirement takes the form of a fixed cost f
  - larger $f \Rightarrow$ larger the advertising or reputational barrier to entry
- Timing:
  1. Potential sellers decide whether to enter the market.
     - Q_k: the amount of dedicated capacity
     - Q_c: the amount of flexible capacity.
  2. Demand state s is realized and peer sellers draw their marginal costs.
  3. Market clears at a price p that equates demand and supply.

Solving the Model

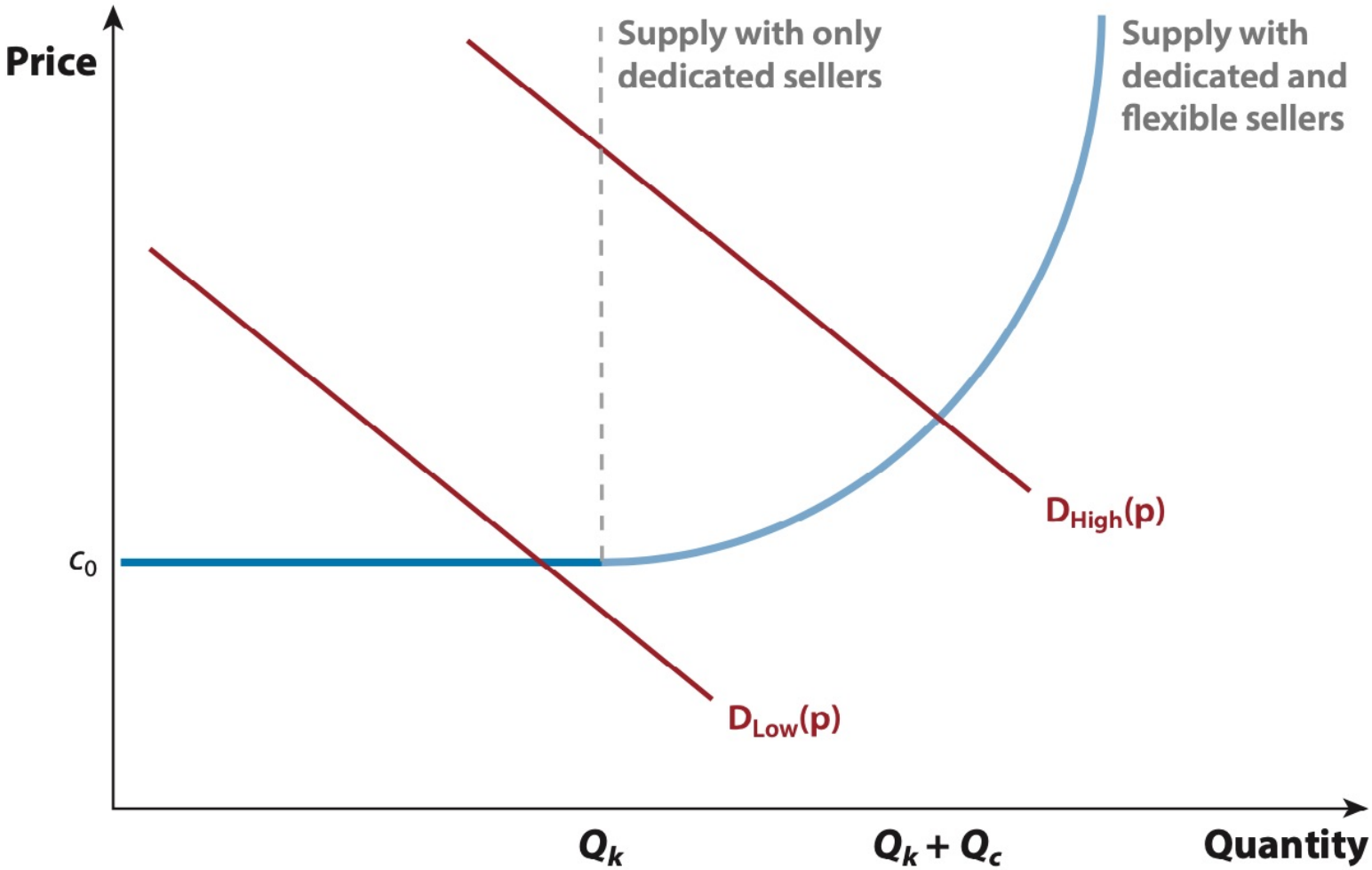
- Market price: $p = c_0 + \pi$, where $\pi \geq 0$ is the "price premium".
- Supply is $Q_k + G(\pi)Q_c$
- Demand in state s is $D_s(c_0 + \pi)$
- Let

$$\pi^*(s) = \{\pi \mid D_s(c_0 + \pi) = Q_k + G(\pi)Q_c\},$$

  denote the price premium that clears the market when $D_s(c_0) \geq Q_k$.
- Therefore, the market-clearing premium:

$$\pi(s) = \begin{cases} 0 & \text{if } D_s(c_0) < Q_k \\ \pi^*(s) & \text{if } D_s(c_0) \geq Q_k \end{cases}$$

Market with Dedicated and Flexible Sellers



Model Implications

- If demand is low
  - $\pi = 0$
  - only dedicated sellers are in the market
  - the price is equal to their marginal cost
- If demand is high
  - there is a positive price premium, $\pi > 0$
  - Both dedicated and flexible sellers are in the market
- With flexible sellers, short-run supply will be more elastic.
- Example: Cullen and Farronato (2015)
  - labor supply of peer workers on TaskRabbit is very elastic
  - 10% increase in the wage rate $\Rightarrow$ workers to apply for 30% more jobs

Expected Profits for Sellers

- A dedicated seller's expected profit, per unit of capacity, is

$$U_k = \int_s \pi(s) dH(s) - \frac{f + k(q)}{q}.$$

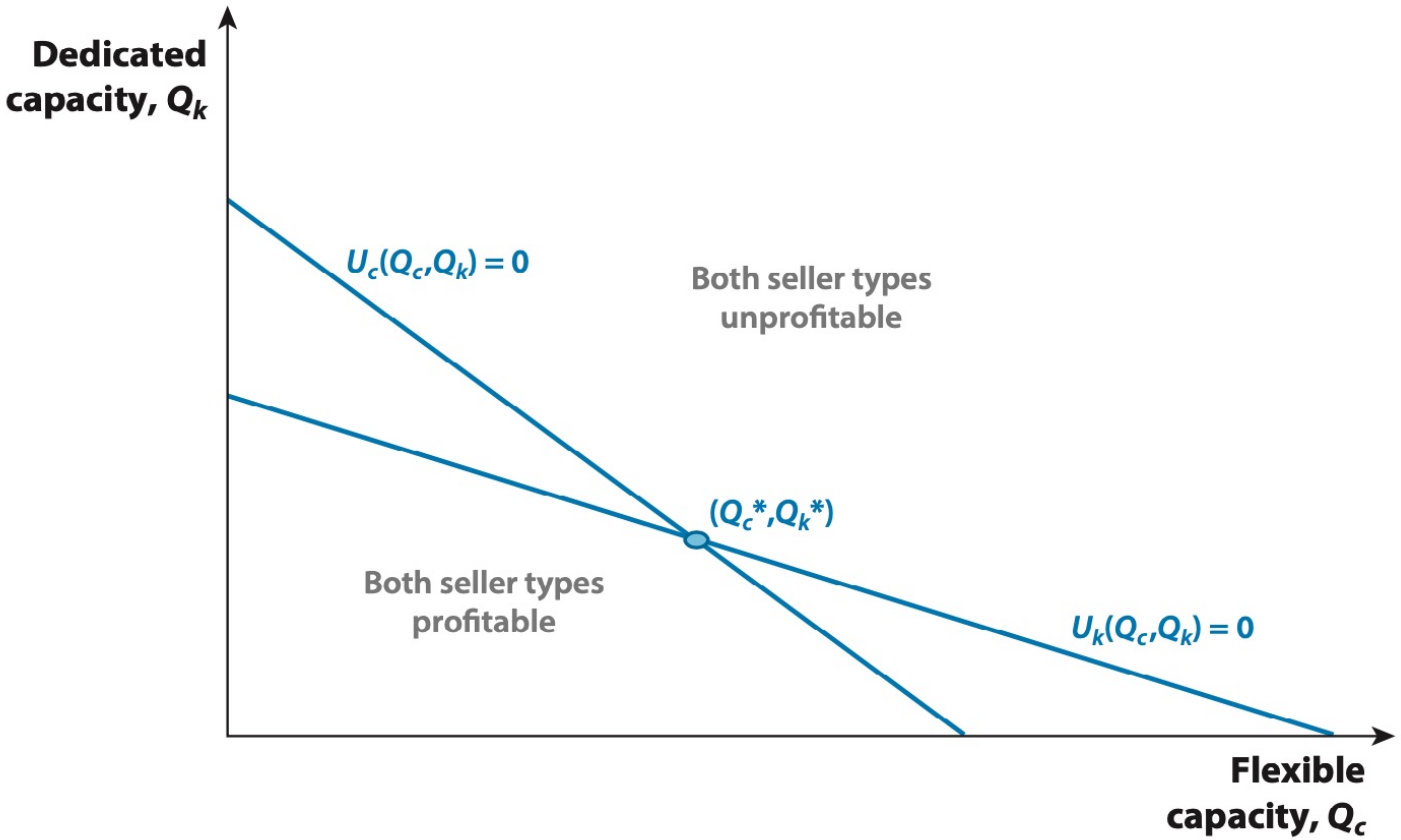
- Each dedicated seller will maximize per-unit profits by choosing the capacity level q^* that minimizes $\frac{f+k(q)}{q}$.
- In equilibrium, this is exactly what will happen.
- A flexible seller's expected profit

$$U_c = \int_s \left[\int_0^{\pi(s)} (\pi(s) - c) dG(c) \right] dH(s) - f.$$

- Increase in seller capacity reduces both market prices and seller profits.

Equilibrium

- Due to competition, capacity will adjust to drive seller profits to 0.
- An Equilibrium is a pair of capacity levels (Q_c^*, Q_k^*):
  - No further entry, $U_c(Q_c^*, Q_k^*) \leq 0$, and $U_k(Q_c^*, Q_k^*) \leq 0$.
  - no active seller wants to exit



When is Peer Production Efficient?

- What are the conditions that favor peer production?
  - Relative costs: up-front costs $k(q)$ v.s. marginal costs c
    - higher capacity costs $\Rightarrow$ favor peer sellers
  - Advertising costs:
    - higher f $\Rightarrow$ fewer flexible sellers $\Rightarrow$ favor dedicated sellers

  Note: internet in general is to lower down advertising costs
  - Variability in demand:
    - When demand is variable, the efficient way is to have flexible sellers.
    - Example: Airbnb in accommodations

Regulation of Peer-to-Peer Markets

Regulation

- Peer-to-peer markets raise a number of new regulatory issues.
- The first issue is related to entry and licensing standards
- Businesses such as Airbnb and Uber have attracted recent attention since they struggle with local regulators and incumbent businesses.
- Decisions by governments vary across countries and cities.
- What is the appropriate economic framework for thinking about these decisions?
  - A response to market failures
    - unregulated taxi drivers might take advantage of tourists, so the regulations exist to protect consumers.
  - Serve the interests of incumbents by limiting competition
    - peer-to-peer entry enhances competition

Regulation

- The second issue is related to employment regulation.
- Do we treat those flexible suppliers as workers or employees?
- The third concern is about data and privacy regulation.
- Since markets rely extensively on user data and algorithms to match buyers and sellers, set prices, and monitor behavior, how can they use customers' data?
- The last concern is about the timing of regulation.
- Those businesses can grow and evolve extremely fast if they succeed; however, regulations cannot easily be changed, or withdrawn.
- Most of the questions are still open, we might need someone to answer in the future.