Industrial Organization: Theory and Application

Jie Shuai

Nankai University

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Outline of the speech

- Introduction
- Game theory
- Oligopoly market
- Application
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Introduction

Why do we study Industrial Organization

- Industrial Organization has been one of the hottest fields in Economics since three decades ago. Many outstanding economists have devoted themselves into this filed.
  - One of the best (and probably the most talented) economists, Jean Tirole, wrote a book *The Theory of Industrial Organization*.
- IO is a very interesting subject, sometimes you feel like you are setting up a game, and then play the game yourself.
- IO is very practical as well, with IO we can explain many things in our daily life.
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What is IO?

- IO studies the function of markets, strategies of firms. It is a central topic in Microeconomics nowadays.
- Traditional Microeconomics focus more on ideal markets, such as perfect competitive market.
- IO extends the scope of Microeconomics, and focus on non-perfect competitive markets, such as monopoly and oligopoly.
- IO adopts game theory to study strategic interactive among firms.
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IO: Application

- **Mobile phone market**
  - Android V.S. IOS V.S. Windows Phone
  - Samsung V.S. Apple V.S. Nokia

- **E-commerce**
  - Online retailing market: B2C (eg. Amazon.com), Platform (eg. Ebay.com)
  - Service/content provider (two-sided-market): Google, Facebook, Youtube

- **Mixed oligopoly**
  - Benefit of privatization
  - Cost of privatization
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A brief introduction to game theory

- For short, game theory is a theory studies games.
- We are not going to study it in a very formal and rigorous way today.
- An important concept in game theory is Nash Equilibrium. Movie *A Beautiful Mind* by Russell Crowe.
- Nash equilibrium is a state that no player wants to change his/her action unilaterally.
- Meet in New York game.
  - Times square
  - The statue of Liberty
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Static game

Prisoner’s dilemma.

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<tbody>
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</tr>
<tr>
<td></td>
<td>3, −3</td>
</tr>
<tr>
<td>D</td>
<td>−3, 3</td>
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Battle of the sexes

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Guessing number

- Each student guesses a number privately.
- We calculate the average $\bar{x}$.
- Winner: the student whose number is closest to the one third of the average, i.e. $\frac{\bar{x}}{3}$.
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Dynamic game

Pirates of Caribbean

Five pirates together decide how to divide 100 gold coins.

- Pirates A proposes a plan, if half or more than of pirates disagree with this plan, pirates A is killed, otherwise they divide the golds according to this plan.
- Pirates B then makes a plan, again, if half or more than half of pirates disagree, B got killed; otherwise the rest pirates follow this plan.
- Keep going this way.
- A humanity assumption about pirates, if they can get the gold coins without killing, they prefer not to kill.

Question: What is your plan, if you are pirates A?
Dynamic game

Pirates of Caribbean

Five pirates together decide how to divide 100 gold coins.

- Pirates A proposes a plan, if half or more than 1/2 of pirates disagree with this plan, pirates A is killed, otherwise they divide the golds according to this plan.

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A simpler version

Assume there are three pirates (C, D, E) instead of five.

- When only pirate E left, he doesn’t have to make a plan and get all golds.
- When pirate D and E left, what plan will D make?
  - To survive, D needs E to agree with his plan.
  - Give out all golds to E. So D gets 0 and E gets 100.
- When pirate C, D and E left, what plan will C make?
  - C needs at least two pirates (including himself) agree with him.
  - Who can he buy at what price?
  - Give 1 coin to D, and 0 to E, and he takes the rest.
  - D will agree with the plan (otherwise he gets 0), C himself will agree with the plan, then the plan is agreed by majority. They reach a deal.
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Now consider B, C, D and E left. What plan will B make?

- B needs two other pirates agree with him.
- Give 1 coin to E, give 2 coin to D, and he takes the rest. Both D and E will agree.
- The plan will be carried out, and B survives with 97 coins.

Finally we reach full version, A, B, C, D, and E left. What plan will A propose?

- A needs two other pirates agree with him.
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- We start at the last stage of the game, and go back one by one until the first stage.
- This method is Backward Induction
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Oligopolistic competition

Basic models studied in Microeconomics.

- Cournot Competition
  - Two identical firms compete in quantity simultaneously.
  - Production costs are normalized to 0.
  - Each firm produces $\frac{1}{3}$ of the market capacity.

- Bertrand Competition
  - Two identical firms compete in price simultaneously.
  - No fixed cost, marginal costs are constant.
  - Prices are driven down until the marginal cost.

- Stackelberg Competition
  - Two identical firms choose quantities in sequence.
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- **Hotelling model**
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- If you want to build a shopping mall, what is its best location?
  - Too close to other malls, price competition is severe.
  - Too far away from other malls, no consumer will come.

- What is the optimal size of a outlet mall?
  - Outlet malls are usually in suburb.
  - Problem of a too small size: consumers think it doesn’t worth the trip.
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- Location can be treated as product positioning.
  - The taste of a new soft drink: sweet, sour, other flavor, or mixed.
  - Design of a new car: sports car, family car.
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Mobile phone market

We focus on the smart phones. Operation system is the basis and key feature of a smart phone.

- Three major operation system
  - Android developed by Google
  - IOS developed by Apple
  - Windows Phone developed by Microsoft

- Android is free and rely on the revenue from advertisers (similar as Google search engine).
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  - Pros: Open system, abundant apps.
  - Cons: Safety, high memory (RAM) usage

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- **Windows Phone**
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<thead>
<tr>
<th></th>
<th>Samsung</th>
<th>Apple</th>
<th>Nokia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market share</td>
<td>36%</td>
<td>19%</td>
<td>22%</td>
</tr>
<tr>
<td>Product line</td>
<td>High to low</td>
<td>High</td>
<td>High to low</td>
</tr>
<tr>
<td>Competition</td>
<td>Intense</td>
<td>moderate</td>
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</tr>
<tr>
<td>Advantage</td>
<td>Screen to processor</td>
<td>Reputation</td>
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Answer

- To encourage more mobile phone manufacturer to use Windows Phone OS, and consequently more apps will be developed.
- Differentiate its product from the rest.
- Build a more comprehensive ecosystem.
- Expand product line, compete for medium or low end consumers.

- Other strategies?
Online market

- Online market has grown very fast in last two decades.
  - It significantly lowers transaction cost.
  - Information acquisition is much easier.
  - Cost of starting a business is much lower online.
  - More and more people prefer to do business online.
  - Example: Ebay, Amazon, Groupon, Craigslist

- Advantage and disadvantage of shopping online.
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- From a consumer’s point of view
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- From industry’s point of view
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  - From the location model, when firms are the same, they compete in price severely.
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  - Need time for companies to establish their reputation, and value their reputation.
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Two-sided-market

What is two-sided-market

- The market brings two sides of participants together, each side exert externality on the other.
- Example,
  - Content providers such as magazine, Youtube, etc. brings advertisers and viewers together. Advertisers exert negative externality on viewers but viewers exert positive externality on advertisers. The content provider may charge both sides or one sides only.
  - Ebay, brings buyers and sellers together. Both buyers and sellers exert positive externality on the other side.
  - Example of one-sided-market, Walmart.
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Externality in two-sided-market

The key feature of the two-sided-market: externality

- What is externality
  - Positive externality.
  - Negative externality.

- Externality in two-sided market.

- Externality within one side
  - More ads reduces viewers attention to each ad (negative externality).
  - More sellers may attract more shoppers (positive), but at the mean time cause the shoppers more spread among sellers (negative).

- Externality across sides.
  - More viewers attract more advertisers (positive).
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Strategies in two-sided-market

- **Platform’s Optimal strategy.**
  - Choose which side to charge fees.
  - Due to the externality, the platform may make profit from only one side. For the other side, they get “free” service.
  - For example, the viewers can view free video stream on Youtube, and advertisers pay for it.
  - Choose optimal rate. Need to consider externality.

- **Viewer’s optimal strategy.**
  - Whether to participate in the platform
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Trueview ads

- What is trueview ads?
  - Traditional ads.
  - Match between ads and viewers: good match V.S. bad match.
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The advance of information technology improves firms’ ability to collect information, the *era of Big Data*.

- Amazon.com recommend products based on consumers’ browsing, purchase history.
- Tesco maintain its dominant status via its ability to collect and analyze consumer information.
- Prada used to remove the clothes from the rack if not sold within 2-3 months, now if the dress has been tried various times during the period, it will not be simply removed.
- Youtube may allow viewers to skip ads so as to increase its ability to target ads to appropriate viewers.
  - During an experiment, Youtube was able to track viewers’ focus.
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Viewers notice the skip button but focus on the video.

82% of users think the skip button is very or extremely clear.

Q. The highlighted button allows you to skip an ad after 5 seconds before watching a video. How clear do you think this was when the button appeared?
Effects of information on firms’ profitability.

- Better information improves firms’ ability to differentiate consumers.
  - Finer price discriminate across consumers.
- Better product design that matches consumers’ need.
  - Long tail market
- Likely to improve monopoly’s profit.
- Effects on oligopoly market is ambiguous.
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Mixed oligopoly

What is mixed oligopoly?

- Oligopoly market with different kinds of firms.
- Domestic firms and foreign firms.
- National firms and private firms.

As a socialism country, many markets in China contains more than one type of firms.

- Automobile market: national firms, private firms, foreign firms, and joint venture.
- Supermarket: private firms, foreign firms.
- Food market: national firms, private firms, and foreign firms.
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National firm

What does a national firm should be?
- Generally, a firm’s purpose is to maximize its owners’ revenue.
- Private firm owned by its share holders, thus maximize its profit to generate largest possible revenue to its owners.
- National firm owned by the country, all citizens of the country. It therefore should maximize revenue to all citizens in the country, that’s social welfare.

What does a national firm actually is?
- Sometimes a government prefers to protect consumers, national firm thus focus more on consumer surplus.
- A more general problem: we can not have all citizens manage a national firm. Agent who manage the firm will maximize his/her own revenue.
- Combined, in practice, national firm maximizes a mixture of social surplus, consumer surplus, and profit.
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- Private firm owned by its share holders, thus maximize its profit to generate largest possible revenue to its owners.
- National firm owned by the country, all citizens of the country. It therefore should maximize revenue to all citizens in the country, that’s social welfare.

What does a national firm actually is?

- Sometimes a government prefers to protect consumers, national firm thus focus more on consumer surplus.
- A more general problem: we can not have all citizens manage a national firm. Agent who manage the firm will maximize his/her own revenue.
- Combined, in practice, national firm maximizes a mixture of social surplus, consumer surplus, and profit.
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National firm in China

- There are lots of national firms in China from almost all area.
- When they decide their strategies, what are their purpose?
  - Simply maximize the firms’ profit.
  - COFCO, China’s leading food company, national firm.
  - State Grid Corporation of China, leading electric power company, national firm.
- Government control of national firm.
  - General manager is appointed by government.
  - Government will set a price to regulate some national firm, like SGCC.
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Nationalization or privatization

No definite answer to this question.

- Advantages of nationalization
  - Supply product that private firms will not.
  - Protect certain national security related industry, such as gasoline, bank.
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• Approaches of privatization
  ▶ National firm enters stock market.
    ★ Most popular way in the world.
    ★ Sell part of national assets in the form of stock to privates.
    ★ Starts in 1980s, reaches a peak in 1990s.
  ▶ Nation owned stock sold to private.
    ★ Following previous step.
    ★ A approach that privatization gradually.
    ★ Ceased by government couple years ago.
  ▶ Managements Buys-Outs
    ★ Firm is sold to its employees.
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- In Hotelling model, two firms locate at the two ends of the line.
- Social efficient location is one firm located at $\frac{1}{4}$ and the other at $\frac{3}{4}$.
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- National firm is more aggressive in location choice since it doesn’t care profit.
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