

EC 360: Industrial Organization

Lecture 11 - oligopolies and tacit collusion

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 - Collusion amongst firms can be tacit or explicit
- The easiest way to model collusion is with **oligopoly**, which occurs when a small number of firms produce a homogeneous product
 - For simplicity, we'll assume that an oligopoly only consists of two firms (i.e. **duopoly**)
- Oligopolies must have **mutual interdependence**
 - All firms must be aware of each other's prices, and care about their actions

Game theory

Nash equilibrium

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 - A Nash equilibrium consists of a strategy for every player
- Suppose we want to determine if a set of strategies constitutes a Nash equilibrium
 - We want to see if any player has incentive to unilaterally deviate from their current strategy (i.e. can **one** player increase profit by unilaterally changing their strategy)
 - We'll do this for every player in the game
 - If no player can better their profit unilaterally, then we have found a Nash equilibrium

Nash equilibrium example

- Consider the following game between player 1 and player 2
 - Each player can select either a high price (H) or a low price (L)

		Player 2	
		H	L
Player 1	H	(4, 4)	(8, 1)
	L	(1, 8)	(5, 5)

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Player 1	H	(4, 4)	(8, 1)
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- The Nash equilibrium occurs when both player 1 and player 2 price high, resulting in a payoff of 4 to each player
 - Neither player can unilaterally deviate and increase their profit

Oligopoly models

Oligopoly models

- We'll focus on three models of oligopoly
 - Bertrand model
 - Cournot model
 - Chamberlin model

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 - Bertrand model
 - Cournot model
 - Chamberlin model
- Recall that a model is a collection of assumptions
 - Thus, the results of each model depend on which assumptions we're willing to make

Bertrand model

- The Bertrand model is built on the following assumptions
 - Firms choose the price they will charge for their good
 - Consumers buy the cheaper good, and firms charging the same price results in them splitting the market evenly
 - Both firms supply homogeneous goods, and firms have mutual interdependence
 - Demand is linear, both firms have a constant marginal cost C , and no fixed costs

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- In a static framework, this model results in a competitive equilibrium
 - Both firms make zero profit, and choose to price at marginal cost C

Bertrand model: intuition

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- Suppose both firms are choosing a price equal to C , thus making zero profit
 - If a firm raises its price, it will still make zero profit, since no one will buy their goods
 - If a firm lowers its price, it will make negative profits, since the price will be below C

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- Notice this outcome is a Nash equilibrium

Cournot model

- The Cournot model is built on the following assumptions
 - Firms choose the output they will produce, based on the belief of what the other firm is supplying to the market
 - The market price is determined by the inverse demand function and the amount supplied by the two firms
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- This model results in profits above the competitive level, and below the monopoly level (even without collusion)
 - Example 11.1

Chamberlin model

- The Chamberlin model assumes that an incumbent firm adjusts to an entrant to get back to monopoly-level profit
 - An incumbent firm in the industry gains monopoly profit
 - A new firm enters, maximizing their profits off of the residual demand
 - The new entrant drives down the price, leading to less total profit in the industry
 - The incumbent firm notices that by cutting back its output, they can raise total profits to the monopoly level
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Chamberlin model: problems

- If we use game theory to analyze the Chamberlin model, we notice a few problems
 - Cutting back production to reach the joint monopoly output is equivalent to accomodating the entrant
 - The incumbent firm can expand its production to increase its own profit, at the expense of the entrant firm
 - At this point, the entrant can make a higher profit by fighting back against the incumbent

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Dynamic games

- Under all of the previous models, we imposed a **static** framework, meaning firms don't think about the future
 - More modern models allow for a **dynamic** framework, where firms make decisions while thinking about the future
 - This can lead to different conclusions relative to the static models we've discussed

Practices leading to tacit collusion

Price visibility

Price visibility can either promote competition, or promote tacit collusion

- Promote competition
 - Consumers observe all prices and make more informed decisions
 - Firms can competitively adjust to price changes more easily
- Promote tacit collusion
 - Firms observe all other firms' prices
 - Visible prices make it easier to see if another firm is cheating the collusive agreement

Price preannouncement

- Price preannouncements could lead to tacit collusion
 - Suppose firms are supplying in a way that maximizes their joint profits
 - Further suppose there is a change in the market (i.e. demand, or costs change)
 - Collusive firms announce how they will adjust their prices, thus colluders are aware and can adjust accordingly
 - A firm can match the announced price to show agreement with the price change, or announce a different price to show disagreement

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- However, there are benefits to price preannouncements
 - Preannouncements help vendors submit bids (i.e. construction companies)
 - Eliminating preannouncements makes bidding much more difficult

Precommitments

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- A most favored customer (MFC) clause guarantees that a certain customer will never pay anything but the lowest rate charged by the firm
 - MFC acts as a price ceiling, which is good for consumer welfare
 - A firm who offers an MFC signals that they will not cheat a collusion price

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 - MFC acts as a price ceiling, which is good for consumer welfare
 - A firm who offers an MFC signals that they will not cheat a collusion price
- A meet the competition clause states that a firm is always willing to match prices offered by competitors on any future sale
 - These clauses ensure that all attempts to undercut the collusive price will be matched, thus eliminating any potential profits from cheating the collusive agreement

Price leadership

- Price leadership can also facilitate collusive behavior
 1. Dominant firm price leadership
 2. Low cost price leadership
 3. Barometric price leadership
 4. Collusive price leadership

Price leadership

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 1. Dominant firm price leadership
 2. Low cost price leadership
 3. Barometric price leadership
 4. Collusive price leadership
- In general, these methods are hard to distinguish
 - Antitrust authorities must be very careful when convicting collusive behavior on the basis of price leadership

Dominant firm price leadership

- **Dominant firm price leadership** can be thought of using our dominant firm model
 - A dominant firm observes the total demand of the industry and the presence of fringe suppliers
 - The dominant firm chooses a profit maximizing price above the competitive level, and the competitive fringe follows
 - The competitive fringe is now making profit

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 - The competitive fringe is now making profit
- This is not necessarily collusive, just sound business practices

Low cost price leadership

- **Low cost price leadership** has an intuitive explanation
 - Suppose firms are initially at a long-run competitive equilibrium
 - Further suppose that a firm has found some new way to significantly cut its costs
 - The low cost firm now sets a lower price, capture more of the market, and increase profit
 - Other firms can match this lower price and experience temporary losses, while they scramble to find ways to reduce their costs

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 - Other firms can match this lower price and experience temporary losses, while they scramble to find ways to reduce their costs
- This is not anticompetitive, nor is it tacitly collusive
 - Graph 11.1

Barometric price leadership

- **Barometric price leadership** occurs when market participants believe that one firm is representative of the industry as a whole
 - Other firms observe what the representative firm is doing, and adjust their strategies accordingly
 - If the representative firm serves as a good barometer of the industry, then all other firms will follow its lead

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Collusive price leadership

- **Collusive price leadership** can be thought of as a tacit alternative to an explicit collusive agreement
 - The assumptions of an oligopoly must be present (i.e. few firms, high entry barriers, homogeneous goods, etc.)
 - One collusive firm will be “elected” as the price leader
 - All other firms will match the price of the leader
 - This allows them to tacitly agree on a cartel price

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 - This allows them to tacitly agree on a cartel price
- This is considered anticompetitive

Antitrust enforcement dilemma

Antitrust enforcement dilemma

- Section 1 of the Sherman Act forbids “contracts, combinations, or conspiracies in restraint of trade”
 - Evidence is required, which makes prosecution difficult
- Tacit collusion is also termed **conscious parallelism**
 - The Supreme Court explicitly states that conscious parallelism is “not in itself illegal”

Antitrust enforcement dilemma

“Oligopolies have always posed problems for conventional antitrust law: without something that can be called an agreement, they elude scrutiny under section 1 of the Sherman Act, and yet no individual firm has enough market power to be subject to Sherman Act section 2. Tacit collusion is easy in those markets, and **firms have little incentive to compete on the basis of price, preferring to share the profits rather than to fight with each other**. This appeal concerns the fine line between agreement and tacit collusion, or, put another way, conscious parallelism” *Kleen Products LLC v. Georgia Pacific LLC* (2018)

Court cases

Interstate Circuit, Inc. v. United States (1939)

- Texas Consolidated and Interstate Circuit were movie theater companies that had local monopolies on first-run movies in many cities throughout Texas and New Mexico
 - The GM of both companies sent a letter to all eight of his film distributors
 - The letter included the name of all branch managers, a notice that all other branch managers received the letter, and commanded them to raise the evening price for an adult ticket to 25 cents
 - All eight managers agreed to the terms of the letter

Interstate Circuit, Inc. v. United States (1939)

- The Supreme Court found Interstate guilty
 - They ruled “it was enough that, knowing that concerted action was contemplated and invited, the distributors gave their adherence to the scheme and participated in it. Each distributor was advised that the others were asked to participate; each knew the cooperation was essential to successful operation of the plan”
- This set precedent that if one could infer agreements, then it's enough to prosecute collusive behavior
 - There was no evidence of a formal agreement; however, there seemed to be enough evidence of a conspiracy between members

E.I. Du Pont De Nemours & Co. v. FTC (1984)

- This case serves as the only major case to use preannouncements or pre-commitment strategies
 - Du Pont and other major chemical firms produced a chemical used in gasoline
 - The demand for these chemicals were declining, as unleaded gas became required

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 - Du Pont and other major chemical firms produced a chemical used in gasoline
 - The demand for these chemicals were declining, as unleaded gas became required
- The FTC noticed that prices were rising and inferred non-competitive behavior based on price preannouncements and most favored customer clauses
 - The courts ruled there was not enough evidence of anticompetitive intent, and there was no explicit collusion

US v. International Harvesters Co. et al (1927)

- International Harvesters formed as a merger of five firms
 - They exceeded 85% of market share for agricultural equipment
 - The courts found this violated the Sherman Act
 - They were forced to divest two of its manufacturing plants and alter its market strategies

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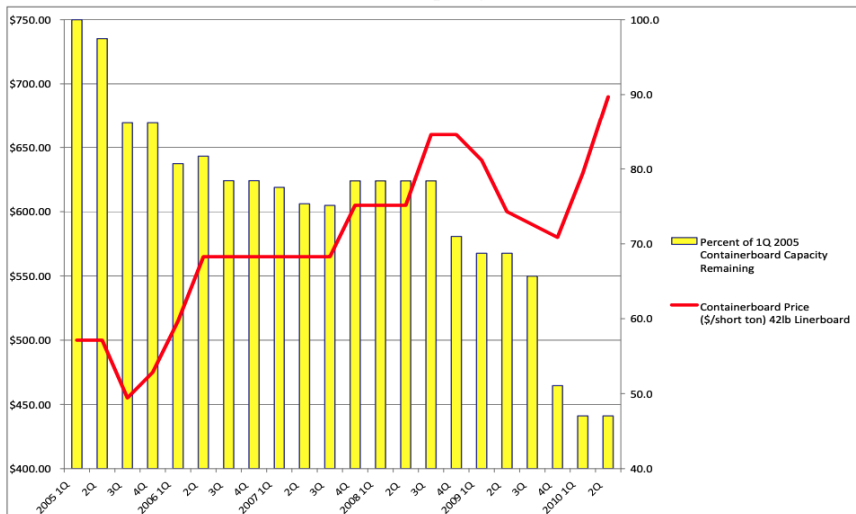
- International Harvesters formed as a merger of five firms
 - They exceeded 85% of market share for agricultural equipment
 - The courts found this violated the Sherman Act
 - They were forced to divest two of its manufacturing plants and alter its market strategies
- Later, it was observed that whenever International changed prices, all other manufacturers followed
 - This was not deemed a violation, as the courts believed the reason for the price correlation was that firms were following the barometric firm in the market

Kleen Products LLC v. Georgia Pacific LLC (2018)

- Kleen Products alleged several containerboard firms engaged in a price-fixing strategy within months of attending industry conferences in June and November 2005
 - Most of the defendants settled
 - Georgia-Pacific and WestRock did not settle and convinced the court there wasn't enough evidence to proceed to trial
- The courts ruled there wasn't any evidence that the executives discussed price-fixing or output restrictions
 - However, the industry did experience an increase in price and decrease in output following the period in which the alleged price-fixing occurred

Kleen Products LLC v. Georgia Pacific LLC (2018)

Containerboard Capacity and Prices



Kleen Products LLC v. Georgia Pacific LLC (2018)

- Economic consultants for the plaintiff stated that the containerboard industry has characteristics that make it highly susceptible to horizontal price-fixing and output restrictions
 - Entry is restricted, as the industry is very capital intensive
 - There are no major substitutes for containerboard, and as a result demand is relatively inelastic
 - Industry concentration has increased over the last several decades

Kleen Products LLC v. Georgia Pacific LLC (2018)

North American Containerboard Market Share 1998 versus Today

