

# Practices to be Explained and Policy Guidance to be Provided: Some Work for the Theory of Collusion

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# Introduction

## Lysine Cartel (1992-95)

- Agreed to an allocation of sales quotas
- Monitoring - monthly reporting
  - Each company telephoned or mailed their sales volumes to Kanji Mimoto of Ajinomoto.
  - Mimoto prepared a spreadsheet - monthly "scorecard"
- Price and compliance - quarterly meetings
  - Spreadsheet was distributed.
  - Price was decided.

## Market Allocation (tons)

Company	Global	Europe
Ajinomoto	73,500	34,000
ADM	48,000	5,000
Kyowa	37,000	8,000
Sewon	20,500	13,500
Cheil	6,000	5,000

# Introduction

- Express communication and partial coordination on price - practices to be explained
  - Coordination on list prices
  - Coordination on surcharges
- Non-express communication, facilitating practices, and tacit collusion - policies to be developed
  - Advance price announcements
  - Capacity discipline
  - Information sharing
- Collusion in online markets with pricing algorithms
  - Wall posters
  - Uber
  - "Chinese room"

# Partial Coordination on Price

## List Prices

Consider an intermediate goods markets in which firms announce list prices and routinely offer privately-negotiated discounts.

- Collusion in such markets often involves
  - coordination on transaction prices
  - market allocation in terms of sales, territories, or customers
  - monitoring of sales or customers
- But there are cases in which colluding firms
  - coordinate on list prices
  - do not coordinate on discounts
  - do not monitor sales.

# Partial Coordination on Price

## List Prices

### Reserve Supply v. Owens-Corning Fiberglas (7th Circuit, 1992)

*[Plaintiff] Reserve asserts that [list prices] have no independent value because no buyer in the industry pays list price for insulation. Instead, it claims that the price lists are an easy means for producers to communicate and monitor ... by providing a common starting point for the application of percentage discounts. ...*

*[Defendants] Owens- Corning and CertainTeed counter by arguing that the use of list prices to monitor pricing would not be possible because the widespread use of discounts in the industry ensures that list prices do not reflect the actual price that a purchaser pays.*

## Coordination on List Prices

### Reserve Supply v. Owens-Corning Fiberglas (7th Circuit, 1992)

The 7th Circuit Court expressed skepticism with regards to the plaintiffs' claim:

*[T]he industry practice of maintaining price lists and announcing price increases in advance ... would be ... an awkward facilitator of price collusion because the industry practice of providing discounts to individual customers ensured that list price did not reflect the actual transaction price.*

# Collusion in List Prices

## In Re: Urethane Antitrust Litigation (10th Circuit, 2014)

Plaintiffs claimed:

*[T]hroughout the alleged conspiracy period, the alleged conspirators announced identical price increases simultaneously or within a very short time period. ... [P]urchasers could negotiate down from the increased price. But the increase formed the baseline for negotiations.*

# Partial Coordination on Price

## List Prices

### In Re: Urethane Antitrust Litigation (10th Circuit, 2014)

10th Circuit Court quoted the District Court in supporting this assessment:

*The court reasoned that the industry's standardized pricing structure - reflected in product price lists and parallel price-increase announcements - "presumably established an artificially inflated baseline" for negotiations. Consequently, any impact resulting from a price-fixing conspiracy would have permeated all polyurethane transactions, causing market-wide impact despite individualized negotiations.*



# Partial Coordination on Price

## List Prices

### Cement (United Kingdom, 2016)

- Annually, suppliers sent letters to their customers announcing price increases.
- Prices were individually negotiated so the full price increase was rarely implemented.
- Competition and Markets Authority stated that "price announcement letters served to coordinate on list prices and soften customer resistance to price increases."
- Justin Coombs (Compass Lexecon): *How do price announcements help firms coordinate on prices if prices are ultimately individually negotiated?*

# Partial Coordination on Price

## List Prices

J. Harrington and L. Ye, "Coordination on List Prices and Collusion in Negotiated Prices" (2016)

- When are list prices informative of transaction prices?
  - Suppose list price is set for the quarter based on a firm's expected cost.
  - Suppose final price is set for a customer based on cost at that time.
- Trade-off from setting a low list price *when* it signals low expected cost
  - Attracts more buyers to negotiate with it ("inclusion" effect).
  - Induces buyers to negotiate more aggressively ("bargaining" effect).
- Separating equilibrium can exist so that list prices are informative of a firm's expected cost and thus can impact expected final prices.
  - Only a firm with low expected cost is willing to have buyers bargain more aggressively in exchange for having more buyers.

# Partial Coordination on Price

## List Prices

- Suppose sellers can be competing or colluding.
  - Under competition, a seller posts a low (high) price when it is a low (high) cost type (separating)
  - Under collusion, a seller always posts a high list price (pooling)
- Assume buyers are uncertain about whether sellers are competing.
- By coordinating on high list prices, sellers cause buyers to assign a higher probability that sellers are high cost types.
- Collusion results in higher final prices
  - even though sellers do not coordinate on final prices
  - because buyers bargain less aggressively.

# Partial Coordination on Price

## Surcharges

Collusion exclusively involved coordinating on a common surcharge.

- Fuel surcharge - Air freight (global), 2000-06
  - Over 40 air cargo companies
  - Damages > \$1.2 billion
- Fuel surcharge - Air passenger (U.K.), 2004-06
  - Virgin Atlantic admitted to colluding with British Airways.
- Fuel surcharge - Rail freight (U.S.), 2003-07
  - On-going private litigation against four rail companies, with guilt not yet determined
- Lead surcharge - Batteries (Belgium), 2004-11
  - Six battery manufacturers found guilty

# Partial Coordination on Price

## Surcharges

- Air freight
  - Surcharge was per kilogram; independent of origin, destination, and distance
  - BA increased fuel surcharge from 4 cents/kilogram to 72 cents/kg
- Air passenger
  - Surcharge was per ticket
  - Surcharge rose from \$10/ticket in 2004 to \$110/ticket in 2006
- Rail freight
  - Dec 2003: Association of American Railroads announced a new cost index that excluded fuel costs.
  - Fuel surcharge was a percentage of the rail freight transport base rate.
  - Surcharges increased 55% more than the rise in fuel costs

# Partial Coordination on Price

## Surcharges

- *How can coordination on one artificial component of price be effective?*
  - Why couldn't an air cargo company reduce its base rate in order to get more business? Such "cheating" would be difficult to observe.
- Internal organization for price setting
  - Collusion is typically among high-level executives, while final prices are set by lower-level employees.
  - Delegation - Does the high-level executive have limited control over the price-setting agent?
  - Pricing complexity (passenger airline) - With complicated pricing formulas, could it be difficult to adjust prices to offset a surcharge?

# Partial Coordination on Price

## Surcharges

Some questions in modelling the internal setting of price

- Suppose sales representatives have compensation schemes that induce them to maximize a weighted average of revenue and cost.
- How would a surcharge imposed from above impact the prices set by the sales rep?
- Can a high-level executive control the "cost" as perceived by the sales rep?
- Can a high-level executive manipulate the sales rep's compensation scheme?
- High-level executive can always centralize pricing but will that be optimal?

# Coordination Practices and Information

## Advance Price Announcements

### Container liner shipping (European Commission, 2016)

- Since 2009, 15 shipping companies would publicly announced their future General Rate Increase (GRI) of prices
- GRI announcements were made 3-5 weeks before their implementation date.
- Other carriers responded by announcing similar rate increases.
- Announced GRIs were modified by carriers to align them with the GRIs announced by other carriers.
- EC: "this practice may allow the companies to signal future price intentions to each other and may harm competition and customers by raising prices."



# Coordination Practices and Information

## Advance Price Announcements

- Advance price announcements may reduce "strategic uncertainty" and thereby promote coordination on higher prices.
  - A firm announces a future price increase through some public medium.
  - If rivals respond with similar announcements then proposed price increases are implemented.
  - If rivals do not respond in kind then the initial firm retracts the proposed price increase before any transactions occur.
- Advance price announcements can have an efficiency benefit when they inform consumers.
- Policy challenges
  - *How do we distinguish between announcements intended to inform consumers and those intended to coordinate with other firms?*
  - *How are guidelines to be defined so that firms know how to avoid unlawful announcements?*

# Coordination Practices and Information

## Advance Price Announcements

Australia (2012): Attempt to formulate guidelines for banks

- It is illegal for banks to
  - disclose prices to competitors in private where doing so is not in the ordinary course of business (per se prohibition)
  - disclose information (in public or private) for the purpose of substantially lessening competition in a market (general prohibition)
- *What is the evidentiary standard for violating the general prohibition?*
- *Will firms know when they are violating the law?*

# Coordination Practices and Information

## Advance Price Announcements

### Theoretical issues

- Derive conditions on the market and the type of announcements for which
  - announcements will have little value to consumers so the efficiency benefit can be dismissed
  - collusive equilibria exist
- Multiple audience cheap talk model where a firm may be communicating with other firms and/or customers
  - When can we determine that messages are intended for rival firms, not consumers?
  - When can rival firms determine that the message is intended for them?

# Coordination Practices and Information

## Capacity Discipline

### Steel (U.S. private litigation, on-going)

- At a series of industry venues, senior executives conveyed a message of curtailing supply and reducing capacity.
  - Mittal executive: "If we are going to see improved conduct and thus improved performance, it will only be because the consolidation we have undergone encourages a change in behavior to match the industry structure. This means ... a focus on profits rather than on tons."
  - Steel Dynamics CEO: "I've been around the industry for 20 years. And I haven't seen this kind of discipline ... everybody is, to some degree, giving that pint of blood."
- Plaintiffs claim that these public announcements were followed with output reductions and the closing of capacity.
- If capacity is constrained, firms do not need to coordinate on prices.

# Coordination Practices and Information

## Capacity Discipline

### Airlines (U.S.)

- Background facts
  - 2002-2014: Load factor rose from 72% to 83%.
  - In recent years, price-cost margins have risen.
  - *Why has capacity not increased?*
- U.S. Dept of Justice opened an investigation because
  - airlines constrained capacity at roughly the same time.
  - airline executives publicly expressed their commitment to a new business model of "capacity discipline".
    - CEO of United: "We are very focused on capacity discipline, but we're not going to do it at the expense of United and to the benefit of others. The whole industry needs to have that level of discipline."
  - Closed investigation in early 2017 for lack of evidence.
- Private litigation remains active.

# Coordination Practices and Information

## Capacity Discipline

- Questions
  - When will tacit collusion in capacities work?
  - How is compliance monitored?
  - How effective is the punishment given the lag in adjusting capacities?
- Policy issues
  - Should firms be prohibited from commending/chastising, recommending, or forecasting the conduct of rival firms' conduct?
  - What is the efficiency loss with regards to customers and capital markets?

# Coordination Practices and Information

## Proposed Policy (Israel 2014)

### "A Manifesto Regarding Public Statements that Harm Competition" - Israel (2014)

- Since Public Statements may formulate a forbidden cartel, they will be prohibited when
  - they influence the business conduct of another competitor that is acting according to an agreement.
  - the information delivered is clear and accurate enough so that at least one competitor would be able to promote collusion.

# Coordination Practices and Information

## Proposed Policy (Israel 2014)

- Conditions that increase the likelihood that it will be judged a "forbidden statement" include
  - sensitive information relevant to competition
  - market structure is conducive to collusion
  - future plans
  - action and reaction
  - reference to competitors
  - part of a series of mutual statement
- *Is the prohibition clear enough?*
- *How to take account of the potential value for consumers?*
- *Is there a role for theory to clarify?*



# Coordination Practices and Information

## Information Sharing

- Consider firms sharing information
  - on past prices and/or sales
  - directly or through a third party such as a trade association or an accounting firm.
- Why would firms exchange information?
  - Allows them to make more informed decisions by having better demand information.
  - Facilitates collusion by enhancing monitoring.

# Coordination Practices and Information

## Information Sharing

Firms are better able to monitor compliance with a collusive outcome when past prices and sales are

- common to firms (so firms can coordinate on a punishment)
- learned with shorter lag (as it reduces the time between a deviation and a punishment)
- more accurate and disaggregated
  - Expands the set of allocation schemes
  - More effective monitoring

# Coordination Practices and Information

## Information Sharing

- Aggregating sales data from firm to market level makes it more difficult to
  - implement the common collusive practice of setting sales quotas with monitoring of individual firm sales.
  - implement firm-specific punishments such as inter-firm sales and targeted low prices.
- Carlton, Gertner, and Rosenfield (1997): "... aggregating the data largely removes the value of information in facilitating collusion."
  - No theoretical justification for this claim.
  - If there are two firms then no information is lost with aggregation.
- *Does the aggregation of firms sales to the industry level make the information ineffective for sustaining collusion?*

# Coordination Practices and Information

## Information Sharing

Some cartels chose to aggregate sales and were able to collude.

- Plasterboard and copper plumbing tubes (EC) reported their individual data to an intermediary which then returned only aggregate statistics.
- Cement (South Africa) - Firms submitted monthly sales data to Deloitte which aggregated the data and disseminated it to firms.
- Isostatic graphite cartel (EC) used "pass the calculator" to share only industry sales.

Recent economic theory shows that industry sales can be sufficient (and might actually be preferable)

# Coordination Practices and Information

## Information Sharing

### D. Spector: "Facilitating Collusion by Exchanging Non-verifiable Sales Reports" (2015)

- Firms learn their own sales at a high frequency (e.g., monthly)
  - If firms punish based on this information, punishment is quick but is often used inappropriately.
- Firms learn all actual industry sales at a low frequency (e.g., annually)
  - If firms punish based on this information, punishment is used appropriately but is delayed.
- If firms share their private information on sales they can have precise public information at high frequency.
  - Self-reported sales are truthful because the truth will be revealed in the future and it can be harshly punished.
  - Key is that industry sales are validated and distributed.

# Coordination Practices and Information

## Information Sharing

T. Sugaya and A. Wolitsky, "Maintaining Privacy in Cartels" (2016)

- Sharing individual firm sales can affect collusion through
  - 1 monitoring: more information makes it easier to detect deviations
  - 2 collusive conduct: more information helps the cartel tailor collusive prices to current market conditions
  - 3 *deviation conduct: more information helps individual firms tailor deviations to current market conditions*

# Coordination Practices and Information

## Information Sharing

T. Sugaya and A. Wolitsky, "Maintaining Privacy in Cartels" (2016)

- Consider cartels that use the "home market principle": each cartel member is the exclusive supplier of its primary market.
- Monitoring only requires information on own sales.
- Home market demand is independent of demand for other markets so optimal collusive price is not informed by sales in other markets.
- Sharing firms' sales informs rival firms when demand is stronger and deviation is more profitable.

Sharing individual firm sales can make collusion *less* effective.

# Collusion with Price Algorithms

- General setting
  - Online retail markets
  - Price is set according to an algorithm
- ① Traditional collusion with automated pricing: Illegal
  - How do we detect it?
- ② Hub and spoke collusion on platforms: Legal or illegal?
  - What is the optimal definition of liability?
- ③ Autonomous agents colluding: Legal
  - How do we make it illegal?



# Collusion with Price Algorithms

## Traditional collusion with automated pricing

- Wall posters (U.S. Dept of Justice, 2015)
  - Online retailers fixed the prices of posters sold online through Amazon Marketplace, 2013-14.
  - Coordination involved the adoption of pricing algorithms that would ensure identical prices and coordinate price changes.
- Per se illegal
  - Coordination is with express communication
  - Collusion may be more effective with prices updated through algorithms
- Issues
  - Detecting the use of "collusive" pricing algorithms.
  - Could economic evidence be enough to state a claim? to avoid summary judgment? to prove a violation?

# Collusion with Price Algorithms

## Hub and spoke collusion on platforms

*Spencer Meyer v. Travis Kalanick* (U.S. District Court, 2016)

- Plaintiffs claimed "that Mr. Kalanick had conspired with Uber drivers to use Uber's pricing algorithm to set the prices charged to Uber riders, thereby restricting price competition among drivers to the detriment of Uber riders."
- Defendants: In the contract, a driver "shall always have the right to charge a fare that is less than the pre-arranged fare."
- Plaintiffs: "Though Uber claims to allow drivers to depart downward from the fare set by the algorithm, there is no practical mechanism by which drivers can do so."
- Judge dismissed defendant's motion to dismiss for failure to state a claim.

# Collusion with Price Algorithms

## Hub and spoke collusion on platforms

- Platform matches buyers and sellers
- Range of price intervention
  - Uber - controls price
  - Airbnb - offers a non-binding recommended price
    - "Smart Pricing lets you set your prices to automatically go up or down based on changes in demand for listings like yours. You're always responsible for your price, so Smart Pricing is controlled by other pricing settings you choose. Smart Pricing is based on the type and location of your listing, the season, demand, and other factors."
  - TaskRabbit - no role in setting price
- Questions
  - What is illegal?
  - What should be illegal?
  - Per se (by object) Rule of reason (effect-based)?

# Collusion with Price Algorithms

## Hub and spoke collusion on platforms

### Two antitrust approaches to Uber's pricing policy

- Vertical agreement
  - Maximum resale price maintenance?
- Hub-and-spoke horizontal agreement
  - *BMI v. CBS* (1979) - "An agreement is per se illegal as price fixing only if it affects the price at which the parties will sell something, *which they could have sold individually.*"
  - Should not be per se violation because it might not be technologically feasible to decentralize pricing authority and still provide the service.
  - Would Uber had entered the market if it could not set price?

# Collusion with Price Algorithms

## Hub and spoke collusion on platforms

- Is it technologically feasible for sellers to set price?
  - If so, should the platform be required to give sellers the option to control price?
  - Should the platform be prohibited from recommending a price (upon which drivers could coordinate)?
  - How should it depend on the platform's market power?
- If the platform sets or recommends price, is it prohibited from choosing price to maximize joint profit?
- If it is not involved in the pricing process, can the platform still approximate a coordinated outcome through the fees it charges drivers?

# Collusion with Price Algorithms

## Autonomous agents colluding

- A price-setting autonomous agent (AA) is a software program that adapts a pricing rule with the objective of maximizing profit, and does so without intervention by a human agent.
- Suppose two competitors independently adopt price-setting AAs.
- Due to their complexity, the behavior of AAs is unpredictable from the perspective of managers.
- Each manager observes its AA results in higher profits.
- AAs have developed collusive pricing rules.

## Questions

- 1 *How easily can this happen?*
- 2 *Is it illegal?*

# Collusion with Price Algorithms

Autonomous agents colluding

## B. Salcedo, "Pricing Algorithms and Tacit Collusion" (2016)

- Two firms compete with a random arrival rate for consumers.
- Each firm has a pricing algorithm that is a finite automaton.
- A firm has an opportunity to change its algorithm when a random revision date occurs.
  - It knows the other firm's algorithm.
  - It chooses an algorithm to maximize payoff.

# Collusion with Price Algorithms

## Autonomous agents colluding

### B. Salcedo, "Pricing Algorithms and Tacit Collusion" (2016)

- **Result:** If the consumer arrival rate is sufficiently fast and the algorithm revision rate is sufficiently slow then, eventually, prices are close to monopoly prices.
- Collusion is inevitable but
  - how easily can a firm "decode" another firm's algorithm? (Can machine learning identify another firm's algorithm?)
  - is "instant optimization" a good approximation for what an AA does? (Can Q-learning approximate it?)



# Collusion with Price Algorithms

## Autonomous agents colluding

- Firms are liable when there is *an agreement ("mutual understanding") to restrict competition*. Firms must have
  - "a unity of purpose or a meeting of minds"
  - "a conscious commitment to a common scheme"
- But managers do not have a "meeting of minds."
- But AAs do not have "understanding" - Chinese room argument (John Searle)
  - "Whatever purely formal principles you put into the computer, they will not be sufficient for understanding, since a human will be able to follow the formal principles without understanding anything."
  - Syntax is not semantics.
  - Simulation is not duplication.
- Legal challenge: *How does one prosecute collusion by price-setting autonomous agents?*

# Collusion with Price Algorithms

Autonomous agents colluding

