Introduction to The Economics of Collusion:
Cartels and Bidding Rings

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**The article is an excerpt from "The Economics of Collusion: Cartels and Bidding Rings", by Robert C. Marshall and Leslie M. Marx, published by the MIT Press. © 2012. Massachusetts Institute of Technology. All rights reserved. It provides a motivating example for the economic analysis of collusion, a discussion of collusion within the context of Porter's Five Forces, and a discussion of the difficulties of collusion. It also provides an overview of the contents of the book.*

1 Introduction
1.1 Motivating Example

Figure 1 shows a plot of the price for vitamin A acetate 650 feed grade, which is a vitamin product used to supplement the feed of livestock.

Perhaps the most noticeable feature of the price plot in figure 1 is the increase in the price from 1990 through 1994. There could be numerous explanations for the price of a product changing through time. What accounts for this dramatic increase?

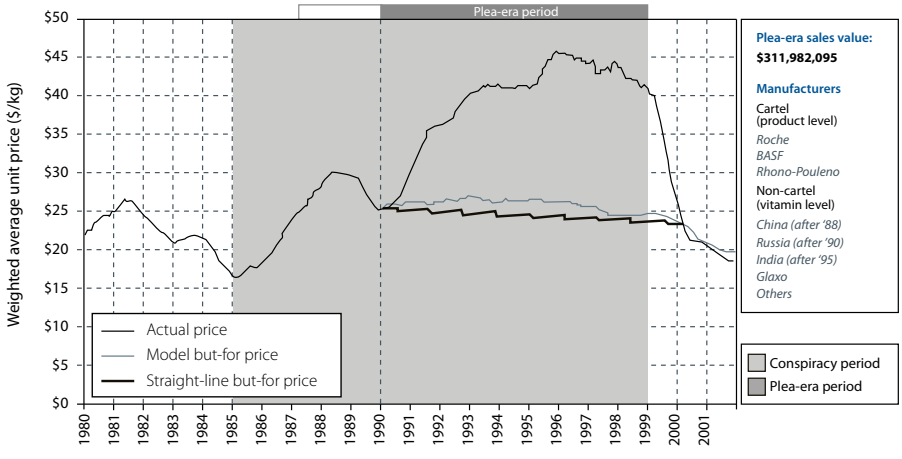
The primary manufacturers of vitamins pled guilty to participation in a worldwide price-fixing conspiracy for much of the 1990s. The conspiracy went far beyond vitamin A. It also included vitamins B1, B2, B5, B6, C, D, E, beta-carotene, biotin, carotenoids, choline chloride, and others. During the 1990s, the world's leading manufacturer of vitamins was Hoffman la Roche. Roche's criminal fine in the United States was $500 million. BASF, another leading vitamin manufacturer during the 1990s, paid a criminal fine in the United States of $225 million.

Purchasers of vitamins, who were charged higher prices during the 1990s as a consequence of the conspiracy, recovered billions of dollars in damages from the major vitamin manufacturers through civil litigation. In addition, several executives of the major vitamin manufacturers served time in prison for their roles in the criminal endeavor.

Examples of price-fixing cartels are not difficult to find. Over the last century, many cartels have been prosecuted by enforcement authorities, and it is reasonable to believe that the list of cartels that have been apprehended by enforcement authorities is small relative to the total number of cartels that have functioned over that time.

Because collusive agreements are illegal, the members of a cartel cannot enter into legally binding collusive contracts with one another. There is no external judicial authority to enforce the agreements. Compliance comes from within the cartel's inner workings and from each member's willingness to comply. This creates many difficulties and precludes certain kinds of agreements. Economists

Figure 1: Data on vitamin A acetate 650 feed grade. Source: Bernheim (2002, fig. 12-6).



Source: 7-month centered moving average for U.S. "tel quel" feed price from Roche ROVIS data

often note that repeated interaction can sometimes solve these problems. There are many theoretical constructs that speak directly to the veracity of this. However, it appears that repeated interaction is not enough in practice, at least not for many firms in many industries. Even for duopolies, such as methylglucamine, vitamin A500 USP, and beta-carotene, explicit collusion was required to substantially elevate prices and profits.

1.2 Collusion within Porter's Five Forces

1.2.1 Market Structure

Ideally, firms want to maximize the expected discounted value of the flow of profits, accounting for risks associated with their actions. For publicly traded companies, this is often stated as maximizing the price of a common share of stock.

By definition, the firms in an industry produce products or services that are, at a minimum, reasonably good substitutes for one another. At one extreme, when no reasonable substitutes exist for the product of a firm, then that firm is a monopoly. At the other extreme, we have perfect competition when (1) there is a large number of firms in an industry, (2) the product made by any firm is a perfect substitute for what any other firm in the industry makes, and (3) information about the product price is publicly available. The competition between the firms will be such that they take the price in the market as given and recognize that they cannot individually affect the market price in a meaningful way.

At one extreme, we have a monopoly firm that is only constrained by the demand curve in choosing price, and at the other extreme, we have perfect competition, where no individual firm has influence over price and each firm takes price as given.

Intermediate between the extremes of monopoly and perfect competition are industries with more than one firm, where each firm has some degree of market power. Such industries are referred to as oligopolies.

Intermediate between the extremes of monopoly and perfect competition are industries with more than one firm, where each firm has some degree of market power. Such industries are referred to as oligopolies. In an oligopoly, the bulk of production is typically done by a few firms, and these firms recognize that their actions will be taken into account by other firms in the industry. The other firms may react to those actions with actions of their own. For example, if a major car manufacturer increases the warranty on its cars, other manufacturers may do so as well. Firms in an oligopoly recognize their mutual interdependence in the market.

There is no single characterization of competition among oligopolistic firms. In some industries, the firms may be aggressive competitors; in other industries, the competition may be less fierce.

1.2.2 Forces Affecting Profits

A variety of factors affect the profitability of an oligopolistic industry. As just mentioned, the extent of interfirm rivalry is one factor, but there are others as well. If there are substantial barriers to entry in the industry, then this will be a positive contributor to industry profits. If the firms have substantial leverage against suppliers of inputs, then this will contribute positively to industry profits. If there are few good substitutes for the products made by the firms in the industry, then this will contribute positively to industry profits. If the producers have substantial leverage in their dealings with purchasers, then this will contribute positively to industry profits. There can also exist government regulations that improve industry profitability.

The forces that affect industry profitability have been enumerated by Michael Porter in his book *Competitive Strategy*.

In the Five Forces, collusion acts on the center force, suppressing interfirm rivalry. Actions that suppress rivalry increase industry profits and the profits of individual firms. Outwith the Five Forces are actions an individual firm can take to improve its own profits, such as reducing production costs or introducing new successful products. An individual firm allocates scarce resources to those activities that yield the greatest expected returns in terms of profitability. In contrast to many investments that individual firms can make to increase their profits, the successful suppression of interfirm rivalry can produce relatively quick improvements in profits.

If the suppression of interfirm rivalry has such an immediate positive impact on profits, why do not all firms in an industry do it to the maximal extent and essentially function as a single firm, thus earning monopoly profits? In answer to this, first, there are many circumstances in which collusion is illegal, and second, collusion is often difficult work for the firms involved. Part of the difficulty comes from the fact that colluding firms are not a single corporate entity. Each firm is responsible to its owners to seek its own profits.

Firms can potentially overcome the difficulty associated with not being a single corporate entity by merging; however, there are legal and administrative issues related to mergers as well as potentially increasing costs of control as firm size increases. Although we do not consider mergers in detail, it is useful to understand why firms that are willing to take actions to suppress interfirm rivalry might choose collusion over merger. We address this in section 1.3.3.

1.3 Difficulties of Collusion

We now return to the question of what, other than legal issues, makes collusion difficult.

1.3.1 Communication and Transfers

We use the term explicit collusion to mean an agreement among competitors that relies on interfirm communication and/or transfers to suppress rivalry. Thus, communication and transfers are key features of the cartels and bidding rings considered in the book.

Communication that directly supports the implementation of collusive agreements and collusive structures are conveyances of information that could be unilateral, bilateral, or multilateral. In addition, the communication could be public or private in the sense that the conveyed information may or may not be observable to those not directly involved in the communication.

Firms may also engage in information exchanges that could be conducive to collusion but are not directly part of the implementation of a cartel agreement or collusive structure. These conveyances may be pro-collusive or pro-competitive. As examples, communication related to patent licensing, arranging product swaps, or organizing lobbying efforts may serve a dual purpose, potentially providing consumer benefits as well as potentially supporting collusion.

Transfers may involve direct cash payments between firms or, alternatively, some other kind of interfirm transaction that results in the movement of resources between firms. For example, product transactions made between firms at nonmarket prices are transfers between the firms.

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1.3.2 Secret Deviations

A key difference between producers in a monopolistic versus a competitive industry is that a monopolist chooses to produce less than what would have been produced by competitive firms. By restricting output, the monopolist is able to increase its profits. Similarly, if the firms in an oligopolistic industry collude, they can restrict output and thereby earn higher profits. Holding all else constant, an output restriction causes prices to increase.

A monopolist internalizes the consequences of decreased output and so achieves enhanced profits. In contrast, when prices increase as a consequence of collusion, each colluding firm has a strong profit incentive not to restrict its own output. Each firm wants to sell more, not less, at higher prices. If the other colluding firms cannot observe that a fellow conspirator has breached the agreement to restrict output, then the deviant firm may be able to get away with cheating on the agreement, at least partially and at least for a while.

In the same light, even if all firms are initially complying with the agreement to restrict output, it may be the case that one firm finds the temptation irresistible to obtain a large customer account by reducing price and increasing output. Other colluding firms may find it difficult to observe the identity of the firm who landed the big customer account, and even if they do discover it, they may not be able to learn the terms.

The central difficulty of collusion is that it is often profitable for firms to secretly deviate from the collusive agreement. Cartels recognize this issue and create structures to limit or avoid this problem. In general, firms in an oligopolistic industry that successfully collude create: (1) pricing structures that enable them to implement price increases, (2) allocation structures that allow them to divide the collusive gain and reallocate resources among one another when things do not go as expected, and (3) enforcement structures that facilitate monitoring and establish the threat of punishment for noncontrite deviant behavior.

In some environments, these tasks can be accomplished without communication and without transfer payments between firms, but in many environments they cannot.

1.3.3 Advantage of Collusion over Merger

The current-day environment of laws, administrative processes, and litigation associated with collusion and mergers obviously affects firms' choices regarding each other.

However, looking back at the history of U.S. industrial organization, we see examples of firms choosing collusion over merger when there was no meaningful legal encumbrance to either. In other words, although collusion is difficult, it is chosen when a seemingly good alternative is available.

Prior to 1895, firms were essentially unencumbered in choosing between merger and collusion, yet many firms chose collusion. For a more recent example, pre-stressing steel manufacturers in Europe, including the large firms Arcelor and Mittal, were found to have participated in a cartel from at least 1984 to 2002, and then in 2006 the two firms merged. This suggests that a cartel was chosen for the suppression of interfirm rivalry instead of a merger for at least eighteen years.

Although it would seem that a merged entity could do anything a cartel could do, plus many other things, a cartel has the key advantage over a merged entity in that a merger is common knowledge to all market participants, but a cartel is a clandestine operation. Suppliers and buyers know that the divisions of a merged entity are not actively competing against each other and, therefore, that competitive processes are not providing the same benefits that they provided pre-merger. In contrast, given the secretive nature of a cartel, buyers and suppliers may still believe that the firms are acting noncollusively and that competitive processes are still functioning in a meaningful way to police market transactions. This provides a cartel with a distinct advantage over a merged entity.

Outline of the Book

The book begins with an examination of collusion in practice using three narratives: a story of a cartel, a story of a bidding ring, and a story of a parent company concerned about detecting collusion at its divisions. Although fictitious, these narratives are each rooted in the inner workings and details from actual cartel cases.

Next, the book considers the economics of cartels and the

economics of bidding rings. The first sections discuss the pure suppression of rivalry in the context of a cartel and a bidding ring, respectively. The later chapters address the collusive structures that are needed for the successful implementation of the suppression of rivalry. Finally, the book examines cartel conduct to enhance profits once the cartel has successfully suppressed interfirm rivalry among its members. The issue of how auction and procurement design can make collusion by bidders more or less difficult is also examined. In later sections, the narrative discusses how economic evidence can be used to detect collusion for a cartel as well as a bidder ring. The book concludes by addressing the concern regarding future collusion that could emerge from a merger.

**For full footnotes and references, please refer to the original book.*

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References

• Athey, S., and Bagwell, K. 2001. Optimal collusion with private information. *RAND Journal of Economics* 32 (3): 428—65.
• Aubert, C., Kovacic, W., and Rey, P. 2006. The impact of leniency and whistle- blowing programs on cartels. *International Journal of Industrial Organization* 24: 1241—66.
• Bernheim, B. D. 2002. Expert report of B. Douglas Bernheim. MDL 1285. In Re: Vitamins Antitrust Litigation, Misc. 99—0197 (TFH), May 24, 2002.
• Bittlingmayer, G. 1985. Did antitrust policy cause the great merger wave? *Journal of Law and Economics* 28: 77—118.
• Coase, R. 1937. The nature of the firm. *Economica* 4: 386—405. Connor, J. 2008. *Global Price Fixing*, 2nd ed. Berlin: Springer.
• Green, E. J., and Porter, R. H. 1984. Noncooperative collusion under imperfect price information. *Econometrica* 52 (1): 87—100.
• Hammond, S. D. 2005. Cracking cartels with leniency programs. http://www.justice. gov/atr/public/speeches/212269.pdf.
• Harrington, J. E. Jr., and Skrzypacz, A. 2010. Private monitoring and communi- cation in cartels: Explaining recent collusive practices. *American Economic Review*, forthcoming.
• Kandori, M., and Matshushima, H. 1998. Private observation, communication and collusion. *Econometrica* 66: 627—52.
• Kovacic, W. E., Marshall, R. C., Marx, L. M., and White, H. L. 2011. Plus factors and agreement in antitrust law. *Michigan Law Review* 110 (3): 393—436.
• Kumar, V., Marshall, R. C., Marx, L. M., and Samkharadze, L. 2011. Cartel versus merger. Working paper. Penn State University.
• Marshall, R. C., Marx, L. M., and Raiff, M. E. 2008. Cartel price announcements: The vitamins industry. *International Journal of Industrial Organization* 26:762—802.
• Miller, N. H. 2009. Strategic leniency and cartel enforcement. *American Economic Review* 99 (3): 750—68.
• Motta, M., and Polo, M. 2003. Leniency programs and cartel prosecution. *International Journal of Industrial Organization* 21: 347—79.
• Porter, M. E. 1980. *Competitive Strategy: Techniques for Analyzing Industries and Competitors.* New York: Free Press.
• Priest, G. L. 1977. Cartels and patent license arrangements. *Journal of Law and Economics* 20 (2): 309—77.
• Spagnolo, G. 2004. Divide et impera: Optimal leniency programmes. Discussion paper 4840. CEPR.
• Stocking, G. W., and Watkins, M. W. 1991. *Cartels in Action: Case Studies in International Business Diplomacy*. Buffalo, NY: Hein.
• Turner, D. F. 1962. The definition of agreement under the Sherman Act: Conscious parallelism and refusals to deal. *Harvard Law Review* 75 (4): 655—706.
• Williamson, O. E. 1985. *The Economic Institutions of Capitalism*. New York: Free Press.