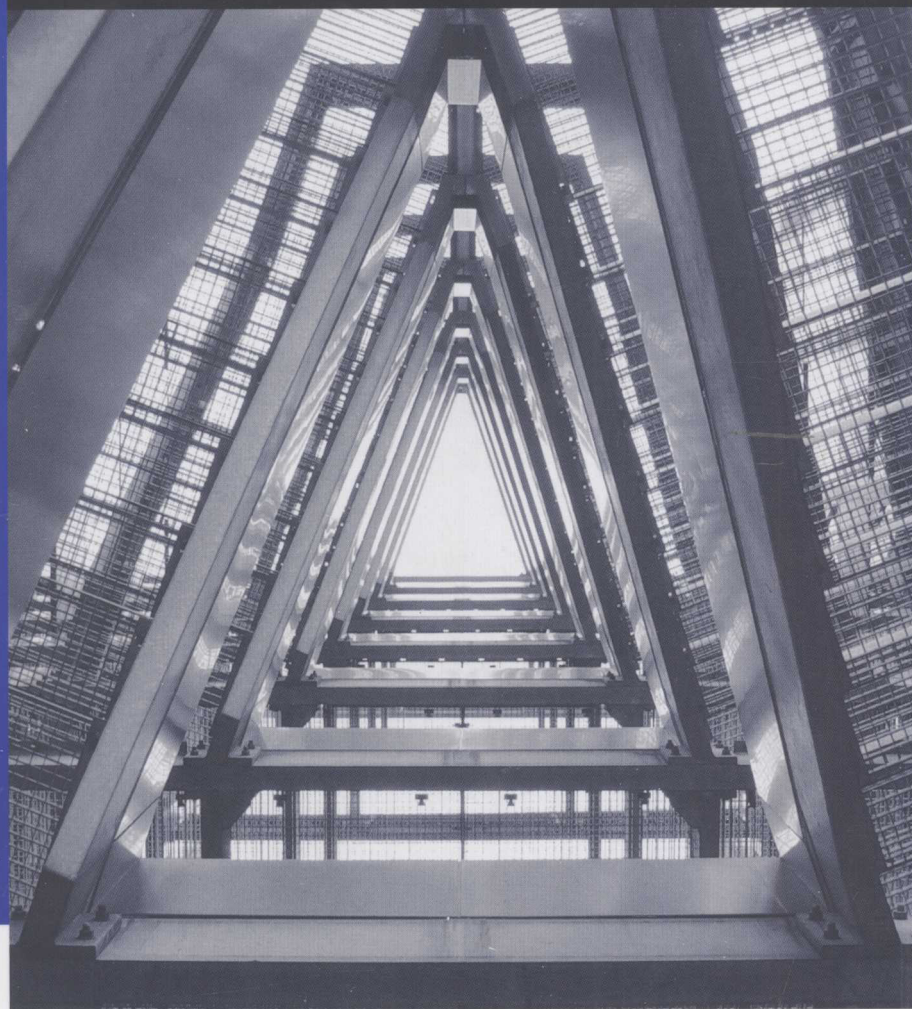

THE ECONOMICS OF COLLUSION

CARTELS AND BIDDING RINGS

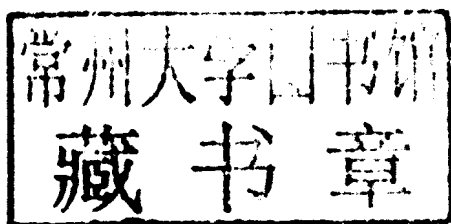


Robert C. Marshall and Leslie M. Marx

The Economics of Collusion

Cartels and Bidding Rings

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**The MIT Press
Cambridge, Massachusetts
London, England**

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This book was set in Palatino by Toppan Best-set Premedia Limited. Printed and bound in the United States of America.

Library of Congress Cataloging-in-Publication Data

Marshall, Robert C.

The economics of collusion : cartels and bidding rings / Robert C. Marshall and Leslie M. Marx.

p. cm.

Includes bibliographical references and index.

ISBN 978-0-262-01732-9 (hardcover : alk. paper)

1. Price fixing. 2. Cartels. 3. Competition. I. Marx, Leslie M. II. Title.

HF5417.M37 2012

338.8'2—dc23

2011044177

10 9 8 7 6 5 4 3 2 1

We dedicate this book to our spouses, Anne Marshall and Jeffrey Wilcox

Preface

This book is about explicit collusion. By *explicit* collusion we mean an agreement among competitors that relies on interfirm communication and/or transfers to suppress rivalry.¹ In general, rivalry between competitors erodes profits. The suppression of rivalry increases profits.

Some scholars have the view that explicit collusion is rare and that firms generally exhibit something like tribalism in the ferocity of their competition. Others have the opposite view, quoting Adam Smith, the father of Economics, who noted in the *Wealth of Nations*: “People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the publick, or in some contrivance to raise prices.”²

We do not have either view. Our view is that firms pursue profits, accounting for risks associated with their decisions. If some action has a higher expected rate of return, considering risks, for a given amount of resource investment than another activity, then a firm will pursue the former over the latter. It might be that explicit collusion is the former, or it might be that it is the latter.

This being said, we admit to a fascination with collusive conduct. The successful suppression of competition is a thing of economic beauty. Each of us would rather read European Commission decisions for cartel cases than best-selling nonfiction literature. However, it is a tragedy to read about firms that were fined huge amounts for engaging in nominally anti-competitive actions that had no chance of being successful. We have read of managers of competing firms, meeting at fast-food restaurants or coffee shops, discussing bids or prices, and

1. In the text, whenever we use the word “collusion” we mean explicit collusion unless otherwise specified.

2. Smith 1981 reprint, ch. 10, para. 27, p. 145.

then meeting again the following week to complain that their discussions failed to yield results. How could a competent manager believe that substantial gains in profits are available for the price of a lunch and one hour of conversation? Successful explicit collusion requires planning, investments in administration, clear thinking, and hard work.

This book comes from over two decades of thinking about collusion. Much of that research concerns collusion by bidders at auctions, but in the last decade that work has broadened to cartels, largely because of our involvement in major cartel cases as testifying and consulting experts.

The level and scope of the book has been a challenge. We wanted it to be accessible to advanced undergraduates, and we wanted the audience to include antitrust practitioners and law students, as well as applied economists with an interest in antitrust. We have strived to keep the mathematical requirements of the book to a minimum because some of our target audience is uncomfortable with mathematical arguments and presentations. Our reader is expected to understand basic economic reasoning. More mathematical material in the book is contained in sections flagged with asterisks.

This book does not do everything that one might envision regarding the economics of collusion. As examples, we have virtually no discussion of enforcement policy. Also, our discussions of cartels focus on those that produce an intermediate good to be sold to other firms rather than cartels that sell consumer goods or services directly to individuals. We refer to the former as industrial cartels. Much of our discussion of collusion at auctions and procurements³ is rooted in a particular informational framework.⁴ Our main goal in writing the book is to provide readers with simple ways to understand collusive behavior—what it is, why it is profitable, how it is implemented, and how it might be detected.

Many of the statements in the book are offered starkly, without extensive qualifications or caveats. In part, this is a natural consequence of moving away from the precision of mathematical models in order to cover comprehensively the central issues of collusion for our target audience while enhancing readability. Also, although many statements

3. When we use the words auction or procurement, we mean the simultaneous consideration of offers to buy or sell, respectively.

4. The informational framework is referred to in the economics literature as the “independent private values” model. See, for example, Krishna (2009).

are conditional on a product/market/industry, it is just too tedious for a reader to frequently forebear that qualification.

We gratefully acknowledge the support of many. The firm of Bates White, LLC, in which we are both partners, and Matt Raiff as leader of the cartel practice at Bates White, LLC, have provided us with a remarkable window to understand and study cartels.

We have benefitted from financial support provided to Penn State's Center for the Study of Auctions, Procurements, and Competition Policy (CAPCP) by the Human Capital Foundation, and especially Andrey Vavilov, who has demonstrated an inspiring dedication to the advancement of economic research at Penn State. Funding from the Human Capital Foundation has allowed CAPCP to post data and software that are available for all to use, including the Russian oil and gas auction data that is discussed, in part, in the appendix to chapter 12.

We received substantial comments on various parts of this book from Dave Barth, Lee Greenfield, Joe Harrington, Jeff Howard, Paul Johnson, Chip Miller, Mark Schechter, Terry Vaughn, and especially Steve Schulenberg. Workshop participants at Wilmer Hale and the Federal Trade Commission provided insightful comments as well. We are grateful to George Bittlingmayer for discussions about the Addyston case and for providing us with the Transcript of Record for the case proceedings. Discussions over the years with Jim Anton, John Asker, Susan Athey, Pat Bajari, Laura Baldwin, Charley Bates, Doug Bernheim, Kalyan Chatterjee, Bobby Filipi, Eric Gaier, John Geweke, Dan Graham, Ed Green, Randy Heeb, Ken Hendricks, Keith Hylton, Barry Ickes, Jim Jordan, Ehud Kalai, Brett Katzman, Evan Kwerel, Vladimir Kreyndel, Vijay Krishna, Bernard Lebrun, Scott Lobel, Pino Lopomo, David McAdams, Mike Meurer, Roger Myerson, Rob Porter, Jean-Francois Richard, George Rozanski, Joel Sobel, Martha Stancill, Jeroen Swinkels, Bob Weber, and Hal White have substantially contributed to our depth of understanding of key issues relevant to collusion. A special thanks is owed to Bill Kovacic, who recently completed his term as a Commissioner of the Federal Trade Commission, for numerous enlightening discussions. It is enormously reassuring that government service can still attract people of such intellectual depth and dedication as Bill.

Michele Moslak provided excellent support for all aspects of the work. We benefited from the presentation insights of Lucy Pless. Research assistance was provided by John Dougherty, Yuriy Horokhivskyy, Andrei Karavaev, Pradeep Kumar, Vikram Kumar, Chris Leng-erich, Lily Samkharadze, and Dane Wilburne. We were lucky to have

as our editor John Covell, who provided insightful comments and help throughout the process. In addition we are grateful to the very able staff at the MIT Press, especially Dana Andrus and Katie Hope.

Finally, our families have suffered so that our readers may benefit. Hopefully, we have produced something worthy of the sacrifice.

Bob Marshall and Leslie Marx

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1 Introduction

1.1 Motivating Example

Figure 1.1 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.¹

Perhaps the most noticeable feature of the price plot in figure 1.1 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 included vitamins A, 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.³ BASF, another leading vitamin manufacturer during the 1990s, paid a criminal fine in the United States of \$225 million.⁴

1. The figure is obtained from the Expert Report of B. Douglas Bernheim, MDL No. 1285, In Re: Vitamins Antitrust Litigation, Misc. No. 99-0197 (TFH), May 24, 2002. This report was submitted as exhibit number 243 in *In re: Vitamins Antitrust Litigation*, case No. 99-0197 (TFH) filed in the District Court of the District of Columbia. We obtained the document through a request to the law clerk to Chief Judge Thomas F. Hogan. The document was made available based on DC Local Civil Rule 79.2 and the United States District Court for the District of Columbia's policy of not retaining exhibits that are admitted into evidence at trial in civil cases.

2. As described in the caption of the figure, the price shown is the seven-month centered moving average for United States "tel quel" price from the Roche ROVIS data. The qualifier "tel quel" means that these are prices for vitamin sold in their straight form rather than as part of a blend of different vitamin products.

3. Marshall, Marx, and Raiff (2008, tab. A.4).

4. Marshall, Marx, and Raiff (2008, tab. A.4).

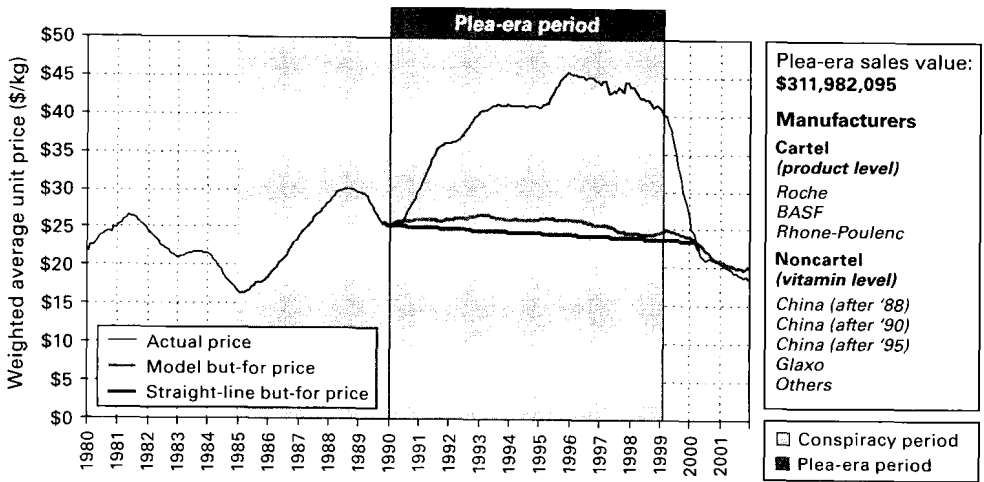


Figure 1.1

Data on vitamin A acetate 650 feed grade. Seven-month centered moving average for U.S. “tel quel” feed price from Roche ROVIS data. Source: Bernheim (2002, fig. 12.6).

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.⁵ In addition, several executives of the major vitamin manufacturers served time in prison for their roles in the criminal endeavor.⁶

Examples of price-fixing cartels are not difficult to find. Over the last century, many cartels have been prosecuted by enforcement authorities,⁷ and it is reasonable to believe that the list of cartels that have been

5. Figure 1.1 shows the “but-for price,” which is the price that would have prevailed in the absence of the conspiracy. We discuss the econometrics underlying the construction of a but-for price in chapter 11.

6. See Conner (2008, p. 466). See also the U.S. Department of Justice press release of April 6, 2000, titled “Four Foreign Executives of Leading European Vitamin Firms Agree to Plead Guilty to Participating in International Vitamin Cartel: Executives to Plead Guilty, Serve Time in U.S. Prisons, and Pay Substantial Fines,” available at <http://www.justice.gov/opa/pr/2000/April/179at.htm> (accessed April 7, 2011).

7. See, for example, Stocking and Watkins (1991) and the reference list of EC decisions cited in this book. Enforcement authorities typically acquire their information through leniency programs, discovery, subpoena, and investigatory probes. According to Hammond (2005, slide 2), “Since its revision in 1993, the [U.S. Department of Justice] Antitrust Division’s Corporate Leniency Program has been the Division’s most effective investigative tool.” On the impact of leniency and whistleblowing programs on cartels, see Aubert, Kovacic, and Rey (2006). On leniency, see also Motta and Polo (2003), Spagnolo (2004), and Miller (2009).

apprehended by enforcement authorities is small relative to the total number of cartels that have functioned over that time.

Because collusive agreements are illegal,⁸ 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 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,⁹ 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.

8. See Turner (1962).

9. See the European Commission (EC) decisions in *Methylglucamine* and *Vitamins*. See the references for the complete citations for EC decisions referenced in this book.

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*. These “Five Forces” are depicted in figure 1.2.

Within the Five Forces diagram, collusion acts on the center force, suppressing interfirm rivalry. Actions that suppress rivalry increase industry profits and the profits of individual firms. Not depicted in the diagram 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.

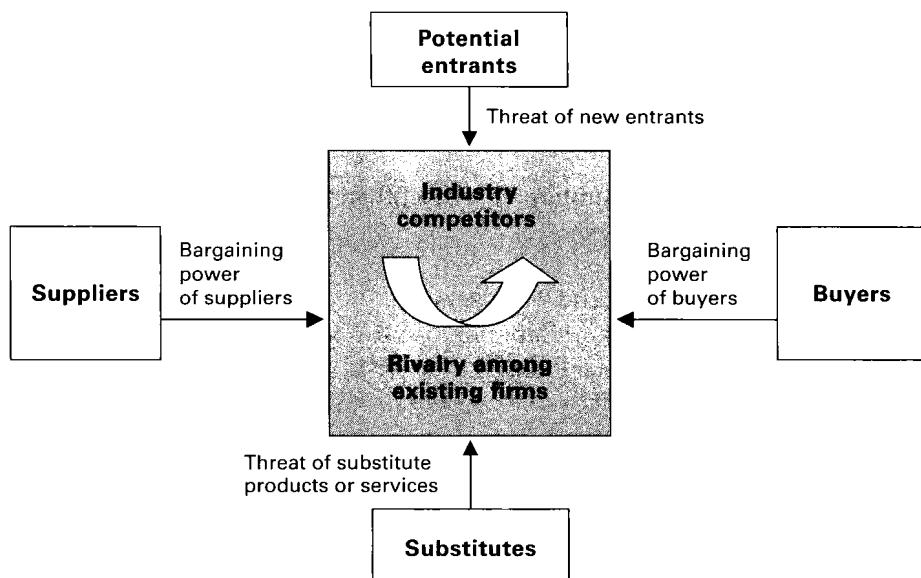


Figure 1.2

Five Forces diagram. Source: Porter (1980, fig. 1.1). Adapted and modified with the permission of Free Press, a Division of Simon and Schuster, Inc., from *Competitive Strategy: Techniques for Analyzing Industries and Competitors* by Michael E. Porter. Copyright © 1980, 1998 by the Free Press. All rights reserved.

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?¹⁰ 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.¹¹ Although we do not consider mergers in detail, it is useful to understand why firms that are

10. This is a fundamental motivating query in the economics field of Industrial Organization.

11. See, for example, Coase (1937) and Williamson (1985).

willing to take actions to suppress interfirm rivalry might choose collusion over merger. We address this in chapter 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

As we mentioned in the preface, we use the term *explicit* collusion to mean an agreement among competitors that relies on interfirm communication and/or transfers to suppress rivalry.¹² Thus, communication and transfers are key features of the cartels and bidding rings considered in this book.

Communication that directly supports the implementation of collusive agreements and collusive structures (see chapter 6 on collusive structures) are conveyances of information that could be unilateral, bilateral, or multilateral.¹³ 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.¹⁴

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 transac-

12. For a discussion of explicit collusion and agreement from a legal perspective, see Kovacic et al. (2011).

13. In the economics literature, the role of communication in supporting collusion is highlighted in, for example, Kandori and Matsushima (1998), Athey and Bagwell (2001), and Harrington and Skrzypacz (2010), where ongoing communication is part of equilibrium behavior, and in Green and Porter (1984), where it is natural to think that communication would be required to establish agreement on which equilibrium would be played (see Green and Porter 1984, p. 89, n. 5).

14. See Priest (1977).

tions made between firms at nonmarket prices are transfers between the firms.

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 nonconforming deviant behavior.¹⁵

In some environments, these tasks can be accomplished without communication and without transfer payments between firms, but

15. A typical “punishment” is the abandonment of the attempt to collude.