Chapter 1

Introduction

No one has the right, and few the ability, to lure economists into reading another article on oligopoly theory without some advance indication of its alleged contribution.

George J. Stigler (1964, p. 44)

1.1 Motivation

Voluntary cooperation between independent actors typically promotes social welfare. Collusion, which can be defined as the overt or tacit coordination between firms on one or more strategic variables such as price or advertising, is an important exception to this principle. When two or more firms coordinate on a high price, they may increase their joint profits, but typically ignore the negative externality they impose on consumers. As a result, collusion between firms has, in general, a negative impact on social welfare (Whinston, 2006). This is why collusive agreements are subject to legal prosecution in the United States, member states of the European Union, Canada, and many other countries.

Many important aspects of collusion are still poorly understood. The aim of this thesis is to shed light on a few of those aspects. Using existing game-theoretic models when possible and proposing new frameworks when necessary, the chapters in this thesis contribute to a better understanding of cartels. Each chapter is intended to appeal to both academics and economists at antitrust authorities or in policy circles.

The thesis is split into two parts. Each essay in Part I considers the impact of a particular real-world disturbance on collusion. Actual cartels do not operate in
a sterile and solitary space, but interact with various other agents on the market. External parties such as the antitrust authority, potential entrants or upstream firms continuously aim to affect the cartel. Part II is devoted to the analysis of collusion in auctions. An auction is a special type of market, in which many of the imperfections that are common in many other markets are ‘designed away’. This allows for a clean analysis of the scope for collusion.

The first chapter introduces a conflict between an incumbent cartel and potential entrants. New firms may join the cartel, but possibly have a destabilizing effect on collusion. Entry deterrence, for instance by lobbying the government, is feasible but costly. The model features equilibria with finite cartel duration. The analysis could therefore help to explain why some cartels are active for a much longer period than others.

A key task of antitrust authorities, such as the Antitrust Division of the U.S. Department of Justice or the German Bundeskartellamt, is to enforce antitrust legislation by searching for cartels and appropriately penalizing them. A formal model of the interaction between the antitrust authority and firms can reveal whether and how the institutional structure can be adjusted to decrease the incidence of collusion. Chapter 3 deals with this challenge.

The typical industrial organization model supposes that, if firms form a cartel, they coordinate on all strategic variables. In practice, coordination is imperfect. According to Symeonidis (2002), most cartels fix prices, but still compete on other dimensions, such as quality. What are the consequences of this form of imperfect coordination for consumers, firms, and antitrust authorities? Chapter 4 investigates this issue.

Chapter 5 takes up a classic theme in industrial organization theory: resale price maintenance. A popular view, articulated by policymakers and theorists, is that resale price maintenance helps firms to form a cartel. Nevertheless, the U.S. Supreme Court recently lifted the ban on this type of vertical restraint and an obvious question is whether the European Union should copy this move.

The first chapter of Part II presents a survey of the literature on collusion in auctions. This form of collusion, also known as bid rigging, has received quite some attention from industrial organization economists. The knowledge contained in this literature is highly relevant, given the fact that an increasing number of transactions are nowadays settled through auctions. Unfortunately, this literature is rather dispersed and, due to the mathematical nature of many key contributions, inaccessible to many laymen.
There are, still, some open questions about bid rigging. Public procurement is often conducted by means of multidimensional auctions. In multidimensional auctions a bidder’s offer consists of at least two elements, most often a price and an index of quality. Given that public procurement is plagued by cartels, it would be helpful to understand how collusion works in multidimensional settings and how to deter it.

Economists often marvel at the efficiency and simplicity of auctions to allocate resources. However, many desirable properties of auctions vanish as bidders start to collude. This raises the question whether other allocation mechanisms, such as negotiations, are to be preferred in collusive environments.

The remaining part of this introduction substantiates on the general approach (section 1.2) and offers a detailed preview of the subsequent chapters (section 1.3).

1.2 Methods and main themes

1.2.1 Collusion as a research topic

As the reader will quickly notice, many chapters in this thesis start with a quotation from a distinct antitrust economist. Five chapters cite Nobelist George Stigler and one chapter (5) vouches Lester Telser. Both scholars are renowned exponents of the famed (and infamous?) Chicago school of economics. The use of their words is not intended to conceal a distress of original ideas or to convey a sectarian adherence to a blunt free market ideology. Instead, the use of Telser and Stigler’s lines is meant to honor the contribution of the Chicago school to industrial organization. An important methodological contribution of the Chicago school is the insistence on concepts such as rational consumers and profit maximizing firms. Those concepts are nowadays considered as standard assumptions.

According to Posner (1979), early members of the Chicago school probably did not consider collusion as a serious problem. Since Adam Smith (“People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices.”)¹, the incentive of firms to coordinate was well understood, but Chicagoans considered it unlikely that firms can successfully cooperate, as any cartel member has a destabilizing incentive to undercut the collusive price and supra-competitive profits attract new firms. And even if firm are able to form a stable cartel, their

¹Smith (1776), book I, chapter 10.
economic impact was deemed to be small, according to Harberger’s (1954) modest estimate of the deadweight loss of monopoly. Stigler brought the subject of collusion back to the main stage. In his seminal article *A theory of oligopoly*, he introduced the idea of tacit, instead of explicit, cooperation and approached collusion as any other economic activity. Firms are expected to collude whenever the (long-run) benefits exceed the (long-run) costs.

Simple cost-benefit analysis also forms the basis of much of this thesis. Cartel members deter entry by new firms only if it is in their self-interest. Antitrust agencies investigate suspicious prices only if they have an incentive to do so.

### 1.2.2 Approach

This thesis does not pretend to form a full-blown comprehensive theory of collusion, but merely tries to contribute to the literature by focusing on a few selected topics. Consult Feuerstein (2005) for a recent survey of the economics of collusion.

The general method in this thesis is to construct theoretical models of firm interaction and study the equilibrium properties. This approach has a long tradition in the industrial organization literature and is still the dominant theoretical framework. There are various reasons for relying on theory instead of a more empirical approach.

The first reason is that many important questions (e.g. what is the effect of semicollusion on quality?, what is the effect of resale price maintenance on the scope for collusion?) are difficult to answer empirically, because they require the use of control groups or proper instruments to identify the effect the researcher is interested in. It is practically impossible to set up two antitrust authorities with different objective functions to determine the optimal objective for antitrust policy, for instance. Theoretical models allow the economist to conduct a small-scale thought experiment. These experiments are useful because the results guide policymakers at low costs. For instance, a government procurement agency can independently experiment with various procurement procedures, but it seems more efficient to first seek advice from theoretical models. A second reason for theorizing is that important phenomena may not be directly observable and, as a result, are plagued by a lack of data for empirical research. As an example, chapter 2 models cartel duration, which is typically an unobservable variable. The first step to understand such unobservable processes is to develop a consistent theory. After that, the theory may be used to derive empirical implications. This relates to the third reason for theory, which is that theoretical insights help empirical economists by informing
1.3 Outline of the thesis

1.3.1 Part I

The traditional Chicago view holds that collusion is likely to break down when new firms are free to enter the market. This sounds reasonable, but ignores that in reality cartels do exist for some period, and that incumbents have an incentive to prevent entry by various means. A cartel may deter entry by legitimate means, such as an industry-wide advertising campaign, or illegitimate means, such as threats of violence. An expressive example of such unlawful strategies comes from the New York garbage hauling sector, in which an entrant received the severed head of a dog. The accompanying note said “Welcome to New York”. *(The Economist*, March 12, 1994, pp. 33–34).

A more conventional entry-deterrence strategy is to lobby the government. Cartel members may protect their cartel by pressing for stricter regulation, high import tariffs, or a permit system. This behavior is typically legal in many countries. In the United States, for instance, the Noerr-Pennington doctrine states that it cannot be a violation of antitrust laws to lobby to change the law in a way that would reduce competition.\(^2\)

To study the interplay between collusion and entry, chapter 2 introduces a model in which incumbents may lobby the government to deter entry. In each period, entry is perfectly deterred if at least one incumbent invests a fixed amount in an entry deterrence technology. Assuming that cartel members do not coordinate their lobbying activity, the model yields finite cartel duration in the symmetric equilibrium. Each firm deters entry with positive probability. It is possible to derive a closed-form expression for cartel duration and testable predictions of its determinants. When demand is subject to unobservable shocks, a cartel is more likely to collapse during price wars than during a collusive phase.

These results reconcile the Chicago view of collusion with the standard ‘folk theorem’ interpretation of collusion. Even when entry occurs with certainty, collusion can still be a stable equilibrium. Finite cartel duration is also a novel result. Conventional models of collusion predict that cartels are either stable, and last forever, or are unstable, and fail to emerge at all. Therefore, the model may help to

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explain actual cartel duration. This can be valuable to antitrust authorities, as the predictions of the model help to determine which cartel is likely to be most stable.

In practice, the task of enforcing antitrust laws is delegated to a specialized antitrust agency. With respect to collusion, the goal of an antitrust agency is, or should be, to deter collusive practices by detecting cartels and impose monetary sanctions, or even prison sentences, if a firm is found guilty. The interaction between antitrust agencies and firms has been studied in considerable detail in the industrial organization theory literature. Besanko and Spulber (1989) is exemplary for this literature. The aim of Besanko and Spulber (1989) is to derive an optimal strategy for the antitrust authority that maximizes social welfare. The critical assumption is that the antitrust authority commits to this strategy. Thus, the focus of this literature can be classified as normative.

Chapter 3 offers a positive analysis of the strategic interaction between the antitrust agency and cartels. In line with the fundamentals of price theory, the chapter proposes a model in which the antitrust authority is rational. It decides to investigate an industry if and only if it believes that the expected payoff outweighs the costs. Moreover, the antitrust authority is willing to impose a fine if and only if it is optimal to do it, \textit{ex post}.

The assumption that the antitrust authority behaves opportunistically carries a substantial degree of realism. The recent Dutch experience in the settlement of the large-scale construction cartel suggests that antitrust authorities refrain from imposing high fines.\(^3\) Stephan (2006) forcefully argues that, in general, antitrust authorities suffer from ‘weak knees’ in deterring collusion and provides several additional examples.

It is found that collusion cannot be deterred perfectly. Firms still collude with some probability, even if the antitrust authority is given strong incentives to investigate suspiciously high prices. The government can induce the antitrust authority to adopt a tougher anti-cartel stance by adjusting the antitrust authority’s objective function. This result may explain why antitrust authorities often seem to maximize consumer welfare.

When firms decide to form a cartel, it seems to be optimal, at least in theory, to collude on \textit{all} strategic variables, such as price, quality and advertising. A remarkable feature of real-world cartels, however, is that they seem to collude on

\(^3\) See for instance “Bouwbond vreest banenverlies na recordboete NMa” (Construction union fears loss of jobs after record-high fines Dutch antitrust authority), \textit{Het Financieele Dagblad}, January 6, 2004 and “NMa verlaagt boetes voor bouwfraude; Risico van ‘omvallen’ hele bedrijfstak” (Dutch antitrust authority lowers fines construction cartel; Risk of collapse entire industry), \textit{NRC Handelsblad}, October 15, 2004.
only a subset of strategic variables (Symeonidis, 2002). This behavior is known as semicollusion. In particular, firms tend to fix prices in collusive negotiations, but subsequently compete against each other by providing service. The analysis in Chapter 4 takes this behavior as given and explores the consequences on prices, quality, profits and consumer welfare.

The main question in this chapter is whether semicollusion nullifies the adverse effect of high collusive prices on consumer welfare by increasing the level of services. The chapter develops a model in which firms have two strategic variables, price and quality. The model is based on recent theoretical papers by Anderson and Renault (1999) and Wolinsky (2005). It is found that the ability to compete on one dimension constrains firms to obtain fully collusive profits. The semicollusive price is set below the monopoly price to prevent firms to compete the collusive profits away by offering excess quality and may even be lower than the non-cooperative price. As a result, a detection strategy based on investigating ‘suspiciously’ high prices may expose only non-cooperative behavior.

Chapter 5 considers the impact of vertical restraints on collusion. Vertical restraints, such as price floors or exclusive territories, are subject of much controversy. The traditional Chicago position can broadly be characterized as stressing the efficiency effects of vertical restraints. A franchise system (or a two-part tariff), for instance, allows an upstream firm to solve the so-called double marginalization problem. This specific vertical restraint generally increases social welfare and, most importantly, increases the upstream firm’s profits. Other economists emphasize the potential pro-collusive effects of vertical restraints. As a specific example, a price floor might enable downstream firms to form a stable cartel. The problem with this example is that an upstream has no incentive to assist the downstream firms in forming a cartel, as his profits decrease when the downstream firms increase their price-cost margin.

The legal stance toward vertical restraints is, in general, dismissive of price constraints, but much more lenient toward non-price restraints such as exclusive dealing or tie-ins. This seems reasonable. After all, a price floor, which is a common type of vertical restraint, hinders downstream firms to compete by charging lower prices.

This chapter reexamines this reasoning. The analysis produces a surprising insight. It is rational for a manufacturer to impose a price floor, not because this fosters downstream collusion, but because this induces non-cooperative behavior. A high price floor is shown to have a destabilizing effect on cartels. This is a notable
result, because it provides an additional argument in favor of the efficiency view of vertical restraints and destroys an important part of the justification of the *per se* illegality rules of price floors.

### 1.3.2 Part II

In many countries, the government regularly procures goods and services by means of auctions. The amounts involved in these procurement auctions are substantial. One estimate holds that the value of goods and services purchased via auctions sums to 16% of the European Union’s GDP.\(^4\) Auctions are a fast, transparent and often efficient method to allocate contracts. Unfortunately, auctions are also particularly sensitive to collusion.

The typical procurement auction (e.g. for the construction of a hospital) has many features that make it particularly susceptible to collusion. The procurement agency has unit demand (the hospital) and its maximum willingness to pay (the agency’s budget) is often publicly announced. These conditions imply that the demand function is known with certainty and eases the firms’ ability to determine a collusive price. Furthermore, the auction rules often stipulate that the contract is to be awarded to the firm which announced the lowest price. This rule seems to be pro-collusive as it makes it more difficult for a firm to deviate from a cartel’s agreement. A firm that charges below the price of the cartel’s designated winner is immediately caught by its fellow conspirators.

These and many other properties make auctions the ideal environment for collusion. Accordingly, a vast majority of antitrust violations occurred in auctions (Froeb, 1988). Not surprisingly, the auction theory literature devoted much attention to the possibility of collusion in auctions over the last twenty years. Chapter 6 summarizes this literature. The aim of this chapter is to inform auction theorists of the current insights and to help policymakers to design auctions that are less vulnerable to collusion.

Public procurement auctions typically have price and quality aspects. To understand collusion in these settings, chapter 7 characterizes optimal collusive mechanisms for two-dimensional procurement auctions. The government, which is ultimately the buyer in public procurement, can lower the costs of collusion by using a reservation utility auction. This auction is the natural extension of a one-dimensional auction with a reserve price and may even deter collusion in some cases.

Auctions are not the only method to procure goods and services. A popular method is to simply negotiate the terms of the contract with a single firm. However, standard auction theory (see Binmore and Klemperer, 1996) shows that auctions are likely to result in considerably lower prices than negotiations. An important question is therefore why negotiations are still widely used. The analysis in chapter 8 establishes that negotiations are optimal when the buyer faces a cartel. An auction with an all-inclusive cartel results in a zero surplus for the buyer. Negotiations, on the other hand, with a single cartel member allow the buyer to extract some of the cartel profits.

The final chapter offers a general conclusion. It elaborates on the main implications for antitrust policy and discusses various avenues for future research.
Part I

Collusion on markets